Concise Dictionary of Pharmacological Agents

Properties and Synonyms

by

Ian K.M. Morton

King's College,
London, United Kingdom

and

Judith M. Hall

University of Surrey,
Guildford, Surrey, United Kingdom

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Introduction

The purpose of this dictionary is to provide a convenient and affordable personal desk reference resource. The authors, who have many years experience in pharmacological research, teaching and editing, recognized a need for a single up-to-date volume encompassing material that hitherto could be gathered only from a well-stocked library. This book comprises two main sections: an A–Z listing of drugs and their properties; and a descriptive glossary of technical terms. The level and scope of this reference material will make it essential for pharmacologists and medicinal chemists, from the graduate student to established worker. It should also be valuable to workers in allied biomedical disciplines, such as biochemistry and physiology, medical students and science writers and editors.

Scope

The dictionary is centred on pharmacologically active agents. Workers in drug-related disciplines need to correctly identify individual agents from an arsenal of pharmacologically active compounds, each with a number of alternative drug names according to the country or naming convention.

The **A–Z Section** contains details of individual drugs together with their alternative names (some 10,000 in all), classified into families according to mechanism and use. These families are the subject of descriptive articles (see below). Some of the drugs detailed here were developed for use in therapeutics, including most of those currently in clinical use (especially in the UK and USA), together with many formerly used in medicine, and some featuring in drug development programmes. Also listed are numerous agents – not themselves of therapeutic value – but important as pharmacological tools in the analysis of receptor recognition mechanisms and physiological or biochemical processes. Many compounds listed are of natural origin, including plant or animal alkaloids, antibiotics and toxins or venoms that can be used as 'chemical scalpels' in the analysis of mechanisms.

The **Glossary** is a straightforward alphabetical reference source, explaining the meaning of some 3,000 biomedical terms. Researchers and writers in biomedical science need, at times, to understand the precise and accurate meaning of sometimes arcane terms. Collected here are definitions from pharmacology, biochemistry, molecular biology, immunology, pathology, physiology, anatomy and microbiology. We have given rather more explanation for terms that can cause confusion, for example, certain terms relating to drug receptors and to mediators, including autacoids, hormones and neurotransmitters. The rapidly evolving area of molecular biology is also covered.

How to use this book

The **A–Z Section** lists both *names* and *families* of pharmacologically active agents. Of the 10,000 cross-referenced names of these agents, about 4,000 entries are short descriptions of the properties and uses of agents under their main generic drug names. Where available, all official names are given. Main articles are listed alphabetically under *British Approved Names* [BAN], with *United States Adopted Name* [USAN], *Japanese Accepted Name* [JAN] and *International Non-proprietary Name* [INN] also provided in brackets. Some types of agents, mainly pesticides, also have certain other standard names quoted, including *American National Standards Institute* [ANSI], *British Standards Institution* [BSI] and *International Standards Organization* [ISO]. Individual agent's entries also give the main alternative names, alternative spellings, abbreviations, chemical names, alternative chemical forms,

company codes and main British and American proprietary names that are in current use. All name variants are cross-indexed (in **bold** type) to the main entries. The spelling of common medical and scientific terms is in British English rather than American English: thus oestrogen, not estrogen; haemoglobin, not hemoglobin; sulphonamide, not sulfonamide. This book provides a much-needed biological companion to encyclopaedic database references, such as the *Merck Index* and the *Dictionary of Pharmacological Agents*, which extensively detail full chemical names and much other chemical material. It might be noted that the classification of drugs into families corresponds fairly closely to the latter of these books (the pharmacology of which was also our responsibility).

Drug family articles form the other component of the A–Z Section. Groupings of agents are described in some 300 short articles, each with references to further reading. Family grouping is by mechanism (e.g. β-adrenoceptor antagonists) as well as by clinical application (e.g. antihypertensive agents); these cross-references are in **BOLD SMALL CAPS**.

The **Glossary** (Appendix A) contains nearly 3,000 technical terms and acronyms, with coverage of most areas that are related to drug discovery, extending to trials and licensing. There is an emphasis on the specialized nomenclature of material related to drug receptors and molecular biology.

Appendix B comprises three tables: amino acid abbreviations (common natural), amino acid abbreviations (found in literature – related and unnatural) and Greek and Latin multiplicative prefixes.

This is the first edition of the work. The authors welcome (via the publishers) all criticisms, corrections and suggestions for material that might be covered in subsequent editions.

IKMM & JMH
King's College London
& University of Surrey

Contents

A–Z Section

A

A 301 ➡ **norgestrienone**.
A 2774 ➡ **delprostenate**.
A 3665 ➡ **trefentanil**.
A 4492 ➡ **pentamorphone**.
A 4828 ➡ **trofosfamide**.
A 4942 ➡ **ifosfamide**.
A 5610 ➡ **azelastine**.
A 8103 ➡ **pipobroman**.
A 33547 ➡ **remoxipride**.
A 46745 ➡ **gestrinone**.
A 71623 is a substituted pentapeptide structure, a selective (CCK_A-subtype) CHOLECYSTOKININ RECEPTOR AGONIST. It is an APPETITE SUPPRESSANT with low oral bioavailability, and is used as a pharmacological tool.
AA 149 ➡ **trepibutone**.
AA 673 ➡ **amlexanox**.
AA 861 ➡ **docebenone**.
AB 1404 ➡ **ethchlorovynol**.
Abbokinase™ ➡ **saruplase**; **urokinase**.
Abbott 41070 ➡ **gonadotrophin-releasing hormone**.
Abbott 43818 ➡ **leuprorelin**.
Abbott 44090 ➡ **valproic acid**.
Abbott 47631 ➡ **estazolam**.
abciximab [BAN, USAN] (CentoRx™; ReoPro™) is a monoclonal antibody, a purified 47,615 dalton Fab fragment manufactured in mammalian cell culture. This antibody binds to the glycoprotein IIb/IIIa (GPIIb/IIIa) receptors, members of the integrin family of adhesion receptors, and the major platelet surface receptor involved in platelet aggregation of human platelets. Acting through this mechanism, it is a PLATELET AGGREGATION INHIBITOR, and can be used parenterally as an ANTITHROMBOTIC AGENT (as an adjunct to heparin and aspirin), especially for the prevention and treatment of acute arterial occlusive disorders, including prevention of ischaemic complications in high-risk patients undergoing percutaneous transluminal coronary angioplasty.
ablukast [INN, USAN] (ablukast sodium [USAN]) is a benzopyran derivative, a (LTC_4) LEUKOTRIENE RECEPTOR ANTAGONIST with potential as an ANTIASTHMATIC AGENT.
ablukast sodium ➡ **ablukast**.
AC ➡ **ethotoin**.
AC 187 (acetyl-[Asn^{30},Tyr^{32}]-salmon calcitonin$_{8-32}$) is an AMYLIN RECEPTOR ANTAGONIST that inhibits several metabolic actions of amylin.
AC 223 ➡ **melinamide**.
ABORTIFACIENTS are drugs used to induce abortion or miscarriage. A number of types of drug have been used, but commonly the PROGESTOGEN antagonist **mifepristone** is used (orally) and/or the prostaglandin **gemeprost** or **dinoprostone** (by the extra-amniotic route) (see PROSTANOID RECEPTOR AGONISTS). A wide variety of the synthetic or natural agents, e.g. **quinine**, **urea**, ergot alkaloids, including **ergotmetrine**, and certain microbial toxins, may cause abortion (depending on dose and route of administration).

See also LUTEOLYTIC AGENTS.

Petrie, R.H. et al (1981) Maternal and fetal effects of uterine stimulants and relaxants. *Diagn. Gynecol. Obstet.*, **3**, 111-117.
Silvestre, L. et al (1990) Voluntary interruption of pregnancy with mifepristone (RU 486) and a prostaglandin analogue. A large-scale French experience *N. Engl. J. Med.*, **322**, 645-648.
Baulieu, E.E. (1995) The combined use of prostaglandin and antiprogestin in human fertility control. *Adv. Prostaglandin. Thromboxane. Leukot. Res.*, **23**, 55-62.

ABT 077 ➡ **zileuton**.
acadesine [BAN, INN] (GP 1-110) is a purine nucleoside analogue. It accumulates in the culture medium of *E. coli* under SULPHONAMIDE stasis, and is manufactured by *Bacillus pumilus* and *Bacillus subtilis*. It is being investigated for the management of myocardial ischaemia (it may act by influencing ischaemic cells to release **adenosine**, which has beneficial actions as a PLATELET AGGREGATION INHIBITOR) and also an ANTIARRHYTHMIC AGENT (with CARDIAC DEPRESSANT and VASODILATOR ACTIONS).
acamprosate [BAN, INN] is related to **taurine** and is a GABA RECEPTOR AGONIST and PSYCHOTROPIC AGENT. It has been used in the treatment of alcoholism.
acarbose [BAN, INN, USAN] (Bay g 5421; α-GHI; Glucobay™) is an oligosaccharide isolated from the microorganisms of the *Actinoplanes* sp. It is an ENZYME INHIBITOR potently active against α-glucosidases and saccharases (a 'starch blocker'); and thereby delays conversion in the intestine of starch and sucrose to glucose, so slows its subsequent absorption. It can be used as an ANTIDIABETIC AGENT, usually as an adjunct to (sulphonylurea or biguanides) oral HYPOGLYCAEMICS in the treatment of non-insulin-dependent diabetes mellitus (NIDDM). It can also be used in ANTIHYPERLIPIDAEMIC and obesity treatment.
ACARICIDES are chemicals used to kill ticks and mites. Ticks belong to an order of the arthropods called Acarina, which also contains the mites; and chemicals used against the latter may be referred to as SCABICIDAL agents (or miticides in USA). Some ticks transmit other diseases (including Lyme disease, typhus and Rocky Mountain spotted fever), but they may themselves cause local irritation (e.g. in scabies caused by itch-mites *Sarcoptes scabiei*), and sometimes serious skin lesions and more general toxic manifestations. scabicidal drugs are used to kill the mites that cause scabies, in which the female mite tunnels into the top surface of the skin in order to lay eggs, causing severe irritation as she does so. Newly hatched mites, which also cause irritation with their secretions, then pass easily from person to person by direct contact; so every member of an infected household should be treated, and clothing and bedding should also be disinfected. Treatment is usually with local applications of a cream to kill the mites, but some agents can be irritant or have toxic manifestations; further resistance to many of these agents has developed in many ticks and mites. Acaricides that can, or have been used, include the halogenated hydrocarbons (e.g. **dieldrin** and **lindane**), organophosphorus compounds (e.g. **malathion**), carbamates (e.g. **carbaryl**), pyrethroids (e.g. **permethrin**, **phenothrin**), and a number of other substances, including **benzyl benzoate**, **crotamiton** and **monosulfiram**. Some of these agents are also used as pediculicidal treatments against lice.

Solomon, L.M. *et al.* (1977) Gamma benzene hexachloride toxicity: a review. *Arch. Dermatol.* **113**, 353-357.
Kunz, S.E. *et al.* (1994) Insecticides and acaricides: resistance and environmental impact. *Rev. Sci. Tech.* **13**, 1249-1286.
Brown, S. *et al.* (1995) Treatment of ectoparasitic infections: review of the English-language literature, 1982-1992. *Clin. Infect. Dis.* **20** *Suppl 1*, S104-9.

accelerator globulin ➡ **factor V**.
Accolate™ ➡ **zafirlukast**.
Accupril™ ➡ **quinapril**.

Accupro™ ➡ **quinapril.**
AccuSite™ ➡ **adrenaline**; **fluorouracil.**
Accutane™ ➡ **isotretinoin.**
acebutolol [BAN, INN, USAN] (acebutolol hydrochloride [JAN]; Secadrex™; Sectral™) is a **β-ADRENOCEPTOR ANTAGONIST** showing β_1-selectivity and some intrinsic β_1-partial agonist activity, which is relatively lipophilic. It can be used therapeutically as an **ANTIANGINAL, ANTIARRHYTHMIC,** and **ANTIHYPERTENSIVE,** and in **ANTIGLAUCOMA TREATMENT.**
acebutolol hydrochloride ➡ **acebutolol.**
aceclidine [INN, USAN] is an acetoxyquinuclidine analogue, a **MUSCARINIC CHOLINOCEPTOR AGONIST** and has been used in **ANTIGLAUCOMA TREATMENT.**
acedapsone [BAN, INN, USAN] is a sulphone with **ANTIMALARIAL** and **ANTILEPROTIC** activity.
aceglutamide [INN, JAN] (acetylglutamine) has been given as a psychostimulant and **NOOTROPIC AGENT** in an attempt to improve memory and concentration.
aceglutamide aluminium [JAN, USAN] (KW 110) is an Al(III) complex, an **ANTIULCEROGENIC AGENT** and gastric cytoprotectant.
ACE INHIBITORS (angiotensin-converting enzyme inhibitors) act by inhibiting the enzyme EC 3.4.15.1, variously known as angiotensin-converting enzyme (ACE), kininase II, dipeptidyl peptidase A. This peptidase, found in vascular endothelial cells and plasma, converts, by carboxyterminal dipeptidyl cleavage, the circulating vascular hormone angiotensin from its inactive decapeptide form **angiotensin I**, to the active octapeptide form, **angiotensin II**. Since angiotensin II is a very potent vasoconstrictor, the effect of ACE inhibitors is to cause vasodilatation with an overall hypotensive effect. Such drugs can be used as **ANTIHYPERTENSIVES,** and also in **HEART FAILURE TREATMENT.** However, drugs of this class have a number of side-effects (in particular an irritating cough), some of which can be attributed to the fact that ACE inhibitors necessarily prolong the duration of action of, and so potentiate, **bradykinin**. This sensory nerve activator and hypotensive hormone is degraded to an inactive dipeptidyl cleavage product by the same enzyme (in the kinin context commonly referred to as kininase II).

ACE inhibitor drugs were developed by modelling interaction with the active site of the enzyme of a snake-venom-derived **bradykinin-potentiating peptide**, and from this the necessary structure of non-peptide inhibitors was inferred. The first such ACE inhibitor used medicinally was **captopril**. Later examples in clinical use include: **cilazapril, enalapril, fosinopril, lisinopril, perindopril, quinapril, ramipril, trandolapril.** Several ACE inhibitors are now administered clinically as prodrugs – which have good bioavailability, but are inactive in their own right. They are then converted to the active molecule *in vivo*, usually by esterases (e.g. enalapril to **enalaprilat**, and ramipril to **ramiprilat**).

Petrillo, E.W. *et al.* (1982) Angiotensin-converting enzyme inhibitors: medicinal chemistry and biological actions. *Med. Res. Rev.*, **2**, 1-41.
Ondetti, M.A. (1991) Angiotensin converting enzyme inhibitors: An overview. *Hypertension Suppl. 3*, **18** III134-III135.
Leonetti, G. et al (1995) Choosing the right ACE inhibitor: A guide to selection. *Drugs*, **49**, 516-535.
Opie, L.H. et al (1995) The discovery of captopril: From large animals to small molecules. *Cardiovasc. Res.*, **30**, 18-25.

acemetacin [BAN, INN, JAN] (Bay f 4975; Emflex™) is the glycolic acid ester of **indomethacin** (to which it is partly converted *in vivo*). It is one of the indole acetic acid series of **CYCLOOXYGENASE INHIBITORS** with **NSAID ANALGESIC** and **ANTIINFLAMMATORY** activity. It has been used orally to treat serious pain and inflammation in rheumatic disease and other musculoskeletal disorders.
acenocoumarol ➡ **nicoumalone.**
acetaminophen ➡ **paracetamol.**
acetarsol [INN] is a pentavalent organic arsenical, an antisyphilitic and **ANTIPROTOZOAL** used in veterinary practice.
acetazolamide [BAN, INN, JAN, USAN] (acetazolamide sodium [USAN]; Diamox™) is a thiadiazolesulphonamide derivative with potent **CARBONIC ANHYDRASE INHIBITOR** activity. Clinically, it is used for **ANTIGLAUCOMA TREATMENT.** It is a weak **DIURETIC.** It can be used to treat mountain sickness.
acetazolamide sodium ➡ **acetazolamide.**
acethydroximic acid ➡ **acetohydroxamic acid.**
acetohexamide [BAN, INN, JAN, USAN] (Dimelor™) is one of the sulphonylurea (oral) **HYPOGLYCAEMICS.** It can be used as an **ANTIDIABETIC** in non-insulin-dependent diabetes mellitus (NIDDM). Its active metabolite is **hydroxyhexamide.**
acetohydroxamic acid [INN, USAN] (N-acetylhydroxylamine; N-hydroxyacetamide; acethydroximic acid; Lithostat™) is a **UREASE INHIBITOR,** reversibly acting on bacterial forms of the enzyme preventing formation of ammonia from urea. It is used in adjunctive therapy in chronic urease-splitting urinary tract infection.
acetomenadione ➡ **acetomenaphthone.**
acetomenaphthone [BAN] (acetomenadione; menadiol diacetate; vitamin K_4 diacetate) is a naphthoquinone, a diacetate salt of **menadiol**, a synthetic **VITAMIN** and an analogue of vitamin K. It can be used as a **HAEMOSTATIC** prothrombogenic agent to treat haemorrhagic states in cases of deficiency. It also has **VASODILATOR** properties.
acetomorphin ➡ **diamorphine.**
acetonide ➡ **desonide.**
p-acetophenetidide ➡ **phenacetin.**
acetophetidin ➡ **phenacetin.**
acetorphan [INN, USAN] (Tiorfan™) is a mercapto-glycine derivative, a prodrug of **thiorphan**, a **NEUTRAL ENDOPEPTIDASE INHIBITOR** ('enkephalinase' inhibitor). It has been used as an **ANALGESIC** in humans, and as an **ANTIDIARRHOEAL.** The (*S*)-form is ecadotril, the (*R*)-form is dexecadotril [INN], and the racemic form is racecadotril [INN].
acetorphine [BAN, INN] (M 183; NIH 8074; UM 501) is a derivative of **etorphine** and member of the thebaine series. It is an **OPIOID RECEPTOR AGONIST** potent as an **OPIOID ANALGESIC.**
acetosulfone sodium [USAN] (sulfadiasulfone sodium [INN]) is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity.
acetoxyprogesterone ➡ **hydroxyprogesterone.**
N-acetyl-2-benzyltryptamine ➡ **luzindole.**
acetylcholine ➡ **acetylcholine chloride.**
acetylcholine chloride [BAN, INN, USAN] (acetylcholine; Miochol™) is a quaternary ammonium choline ester. Acetylcholine itself occurs endogenously in cholinergic neurons. Also found in plants in complexed form (e.g. in ergot). It is a neurotransmitter in the peripheral autonomic and somatic nervous systems and in the CNS. It is a **MUSCARINIC CHOLINOCEPTOR AGONIST** that has **PARASYMPATHOMIMETIC** actions; it is a **CARDIAC DEPRESSANT,** has peripheral **VASODILATOR** actions and is a **HYPOTENSIVE AGENT.** It is a stimulant of gut motility and exocrine gland secretions. It is a **NICOTINIC CHOLINOCEPTOR AGONIST** and can stimulate autonomic ganglia and at the skeletal neuromuscular junction. It is quickly hydrolysed *in vivo* by cholinesterases, which limits its clinical uses, though administered anticholinesterases potentiate endogenous acetylcholine. It can be used on local application to the eye as a **MIOTIC AGENT.**
acetylcysteine [BAN, INN, USAN] (Ilube™; Mucomyst™;

Parvolex™) is used a MUCOLYTIC AGENT, which reduces the viscosity of sputum, so can be used as an EXPECTORANT in patients with disorders of the upper respiratory airways, such as chronic asthma and bronchitis. It is also used orally to treat abdominal complications associated with cystic fibrosis, and locally in the eye to increase lacrimation and mucus secretion. It is also used intravenously as an ANTIDOTE in paracetamol poisoning.

acetyldigitoxin [INN] is a CARDIAC GLYCOSIDE and derivative of **digoxin** with CARDIAC STIMULANT actions similar to other cardiac glycosides.

acetyldihydrocodeinone ➡ **thebacon**.

acetylglutamine ➡ **aceglutamide**.

N-acetylhydroxylamine ➡ **acetohydroxamic acid**.

***N*-acetyl-5-hydroxytryptamine** ➡ NAS.

N-acetylmescaline ➡ **mescaline**.

acetylmethadol ➡ **dimepheptanol**.

N-acetyl-5-methoxytryptamine ➡ **melatonin**.

acetylsalicylamide ➡ **salacetamide**.

acetylsalicylic acid ➡ **aspirin**.

acetyl-[Asn^{30},Tyr^{32}]-salmon calcitonin8-32 ➡ AC 187.

Achromycin™ ➡ **tetracycline**.

aciclovir [BAN, INN, JAN] (acyclovir [USAN]; acyclovir sodium [USAN]; Zovirax™) is a synthetic nucleoside analogue ANTIVIRAL. It can be used orally or topically to treat infection by the herpes viruses, and is valuable in immunocompromised patients. It is also used in the form of chemical derivatives.

'Acid' ➡ **lysergide**.

acifran [INN, USAN] (AY 25712) is a furancarboxylic acid derivative, an ANTIHYPERLIPIDAEMIC AGENT.

acipimox [BAN, INN] (K 9321; Olbetam™) is a pyrazinecarboxylic acid derivative, used as an ANTIHYPERLIPIDAEMIC AGENT.

acitretin [BAN, INN, USAN] (Ro 10-1670; Neotigason™) is a retinoid and metabolite of **etretinate**. It is a topical DERMATOLOGICAL AGENT that effects epithelial proliferation, and is used topically to relieve severe psoriasis and other skin conditions. It is also an ANTICANCER AGENT active against epithelial tumours.

Aclacin™ ➡ **aclarubicin**.

aclarubicin [BAN, INN, USAN] (MA 144A1; NSC 208734; antibiotic MA 144A1; Aclacin™) is an (anthracycline group) ANTIBIOTIC isolated from *Streptomyces galilaeus*, used as an ANTICANCER AGENT for leukaemia; it shows ANTI-HIV activity.

aclatonium napadisylate [BAN, INN, JAN] (celatonium napadisilate; SKF 100916J; TM 723) is a choline ester, a MUSCARINIC CHOLINOCEPTOR AGONIST with PARASYMPATHOMIMETIC actions. It has been tested in gastrointestinal disorders.

Aclovate™ ➡ **alclometasone**.

Acnecide™ ➡ **benzoyl peroxide**.

Acnegel™ ➡ **benzoyl peroxide**.

Acnisal™ ➡ **salicylic acid**.

aconiazide [INN] is an **isoniazid** analogue and an ANTITUBERCULAR and ANTIBACTERIAL AGENT.

aconitine is an alkaloid from monk's hood or wolfsbane (*Aconitum napellus*) and other *Aconitum* spp. (Ranunculaceae). It is a NEUROTOXIN implicated in poisoning by *A.* spp., especially *A. chasmanthum* in India. Experimentally, it is a SODIUM-CHANNEL ACTIVATOR that binds to Na^+-channels, slows inactivation, shifts inactivation to a more negative value, and alters ion specificity. This results in repetitive firing of neurons, with marked effects on the heart including positive inotropism and arrhythmias. Aconitine (and the related alkaloid **delphinine**) were formerly used in medicine to promote sweating, and in liniments to relieve pain, but have proved too toxic so are now obsolete. It is used as a pharmacological tool.

acrisorcin [INN, USAN] is an ANTIFUNGAL and ANTHELMINTIC.

acrivastine [BAN, INN, USAN] (BW 825C; Semprex™) is a pyrrolidinyltolylpyridylacrylic acid derivative, a HISTAMINE H_1-RECEPTOR ANTAGONIST. It is one of the newer less sedative agents. It can be used orally for the symptomatic relief of allergic conditions, such as allergic rhinitis and urticaria.

Ac-SDKP ➡ **goralatide**.

Actal™ ➡ **alexitol**.

ACTH ➡ **corticotrophin**.

Acthar™ ➡ **corticotrophin**.

Acthrel™ ➡ **corticotrophin-releasing factor**.

Actifed™ ➡ **pseudoephedrine hydrochloride**; **triprolidine**.

Actigall™ ➡ **ursodeoxycholic acid**.

Actilyse™ ➡ **alteplase**.

Actimmune™ ➡ **interferon γ**.

Actinac™ ➡ **chloramphenicol**.

Actinex™ ➡ **masoprocol**.

actinomycin AIV ➡ **dactinomycin**.

actinomycin B_1 ➡ **dactinomycin**.

actinomycin BIV ➡ **dactinomycin**.

actinomycin C [BAN] (cactinomycin [INN, USAN]; S-67; antibiotic HBF 386; antibiotic S-67; NSC 18268) is a mixture of ANTIBIOTICS; actinomycin D, actinomycin C_2 and actinomycin C_3. It is produced by *Streptomyces chrysomallus*. It has ANTIBACTERIAL activity against Gram-positive bacteria; and is also a cytotoxic agent active in ANTICANCER chemotherapy against tumours. No longer marketed.

actinomycin C_1 ➡ **dactinomycin**.

actinomycin D ➡ **dactinomycin**.

actinomycin DIV ➡ **dactinomycin**.

actinomycin Fo ➡ **dactinomycin**.

actinomycin IV ➡ **dactinomycin**.

actinonin is a microbial product that is an ENZYME INHIBITOR with selectivity as an AMINOPEPTIDASE INHIBITOR active against aminopeptidase N (EC 3.4.11.2). It can be used as a pharmacological tool in experimental analytical studies.

Activase™ ➡ **alteplase**.

Acular™ ➡ **ketorolac trometamol**.

Acupan™ ➡ **nefopam**.

acyclovir ➡ **aciclovir**.

acyclovir sodium ➡ **aciclovir**.

AD 810 ➡ **zonisamide**.

AD 1590 ➡ **bermoprofen**.

Adagen™ ➡ **pegademase**.

Adalat™ ➡ **nifedipine**.

adamexine [INN] is an adamantyl derivative, an ANTISPASMODIC and MUCOLYTIC AGENT, used in the treatment of respiratory tract disorders.

Adamsite (DM; diphenylamine chloroarsine; phenarsazine chloride) is a toxic arsenical vesicant and SENSORY IRRITANT, used as war gas and riot-control agent.

adapalene [BAN, INN, USAN] (CD 271; Differene™) is an adamantylnaphthoic acid derivative, a retinoid-like agent used as a topical DERMATOLOGICAL AGENT for mild to moderate acne, where it is a modulator of cell differentiation.

Adapin™ ➡ **doxepin**.

adaprolol ➡ **adaprolol maleate**.

adaprolol maleate [USAN] (adaprolol [INN]) is a β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically as an ANTIHYPERTENSIVE.

ADCA ➡ **bisantrene**.

Adcortyl™ ➡ triamcinolone.

adefovir [BAN, INN, USAN] (prodrug: adefovir dipivoxil [BAN, USAN]) is an **ANTIVIRAL AGENT**, an **ANTI-HIV AGENT** and an inhibitor of related retroviruses. It also has **IMMUNOMODULATOR** properties.

adefovir dipivoxil ➡ adefovir.

Adenic™ ➡ adenosine.

adenine [JAN, USAN] (vitamin B_4; 6-aminopurine) is a vitamin of the B group, and is widespread throughout animal and plant tissue. It is a purine component of DNA, RNA, and coenzymes and biosynthetic intermediates. It has **ANTIVIRAL** activity, and is used as a pharmaceutical aid to extend storage life of whole blood.

adenine arabinoside ➡ vidarabine.

Adenoco™ ➡ adenosine.

Adeno-Jec™ ➡ adenosine.

Adenoscan™ ➡ adenosine.

adenosine [BAN, USAN] (Adenic™; Adenoco™; Adeno-Jec™; Adenoscan™) is a purine nucleoside, one of the four principal nucleosides of nucleic acid, and is widely distributed endogenously in mammals and in nature. It is a (P1 purinoceptor) **ADENOSINE RECEPTOR AGONIST**, and has a wide range of actions including as a **HYPOTENSIVE, VASODILATOR** and **PLATELET AGGREGATION INHIBITOR**. It also causes intestinal inhibition and has CNS actions. On the heart, it is a **CARDIAC DEPRESSANT** (bradycardia). It has a very short-lived intravenous action but can be used as an **ANTIARRHYTHMIC** (rapid reversion of paroxysmal supraventricular tachycardias, including e.g. Wolff-Parkinson-White syndrome), and as a diagnostic for supraventricular tachycardias. It can also be used (as **adenosine phosphate**, by bolus injection) for the symptomatic relief of varicose vein complications.

adenosine cyclic 3′,5′-monophosphate ➡ cyclic AMP.

adenosine phosphate [BAN, INN, USAN] (adenosine 5′-phosphate; adenosine 5′-monophosphate; AMP) is an endogenous nucleoside involved in many biological processes. Clinically, it has **ANTIVIRAL** properties, and also can be used for complications of varicose veins. Therapeutically, adenosine phosphate and **adenosine** are not interchangeable.

adenosine 5′-phosphate ➡ adenosine phosphate.

adenosine 5′-monophosphate ➡ adenosine phosphate.

ADENOSINE RECEPTOR AGONISTS act extracellularly at receptors variously known as adenosine receptors, P1 purine receptors, P1 receptors, P_1 purinoceptors, or nucleoside receptors. Adenosine receptors have a wide range of mainly inhibitory actions in the body, including cardiac slowing, a fall in blood pressure, dilation of blood vessels, inhibition of platelet aggregation, inhibition of intestinal movements and actions within the central nervous system.

Subtypes of adenosine receptors exist – A_1, A_2 and A_3 – which have differential sensitivities to adenosine nucleoside analogues, including **2-methylthio-AMP**, **2-thioadenosine**, **DPMA**, **IB-MECA**, NECA, CPA, CCPA and DPCPX. These receptors, and subtypes within A_2, have all been cloned. They have structures typical of the seven-transmembrane G-protein-coupled superfamily of receptors, but have amongst the shortest sequences known (A_3 has only 318 amino acids), and a lack of sequence similarity with any other receptors appears to put them in a class of their own. Adenosine receptors are not sensitive to nucleotides such as **ADP** (adenosine diphosphate) and **ATP** (adenosine triphosphate), which instead act as P_2 receptor agonists that are nucleotide-preferring (see **P2 receptor agonists**)

A_1 receptors are selectively activated by **CPA**, **CCPA** and **GR 79236**. Coupling is negatively to adenylyl cyclase ($G_{i/o}$). They have been cloned from human and other sources, and show a wide distribution in the body. There is pharmaceutical interest in this receptor in view of the beneficial actions that adenosine and its analogues can have on the heart, including a block of conduction that may mean it can be antiarrhythmic. A_1 receptors reduce neurotransmitter release from neurons in the peripheral and central nervous systems, and the overall effects on the CNS is depression, reduced anxiety, sleep and a neuroprotective action (possibly through reduced glutamate release when this is induced by trauma, ischaemia etc.). The actions of xanthines, such as caffeine, which are antagonists at adenosine receptors, have largely the opposite actions. See **ADENOSINE RECEPTOR ANTAGONISTS**.

A_2 receptors have been divided into subtypes. At A_{2A} receptors **CGS 21680** has a high affinity. A_{2B} receptors are similar, but have lower affinity for the agonists. A_2 receptors inhibit platelet aggregation, may stimulate nociceptive afferents, and cause vasodilatation (including in the coronary circulation). There are high concentrations of A_2 receptors in certain areas of the brain, suggesting an interaction with dopaminergic systems. A_{2A} receptors on polymorphonuclear leucocytes reportedly delay apoptosis and may have a normal 'brake' role. A_{2B} receptors are thought to be involved in degranulation of mastocytoma cells and certain mast cells in the lung, suggesting asthma and allergic lung disease as possible therapeutic targets.

A_3 receptors are selectively activated by the adenosine analogues **IB-MECA** and **2-chloro-IB-MECA**, which show higher affinity compared to A_1 receptors. A_3 receptors show a 58% identity with cloned A_1 and A_2 receptors. Coupling is negatively to adenylyl cyclase ($G_{i/o}$). Analysis of mRNA expression show highest levels in the testes, low levels in the lung, kidneys, heart and some parts of the CNS. The high-expression level of the A_3 receptor in the testes suggests a possible role for adenosine in reproduction. This receptor subtype has been shown functionally to be expressed on white blood cells such as mast cells. There is recent evidence that activation of A_3 receptors on macrophages reduces endotoxin-evoked cytokine release, antigen-evoked responses in a mast cell line, and that there was reduced apoptosis in lymphocytes and astrocytes. These models of infection and disease suggest possible therapeutic uses of adenosine A_3 receptor agonists.

Adenosine can be used therapeutically, by intravenous injection, as an antiarrhythmic, when it rapidly corrects certain abnormal cardiac rhythms, and also aids in diagnosis of certain arrhythmias. **Dipyridamole** acts as though it stimulates adenosine receptors, but does so indirectly by virtue of inhibiting adenosine uptake, thus prolonging the action of endogenous adenosine. It can therefore be used therapeutically as an antiplatelet drug to prevent thrombosis, though it is not an anticoagulant. See **ANTIARRHYTHMICS; PLATELET AGGREGATION INHIBITING AGENTS**.

Fredholm, B.B. *et al.* (1994) Nomenclature and classification of purinoceptors. *Pharmacol. Rev.*, **46**, 143-156.

Olah, M.E. *et al.* (1995) Adenosine receptor subtypes: Characterisation and therapeutic regulation. *Annu. Rev. Pharmacol. Toxicol.*, **35**, 581-606.

Fredholm, B.B. *et al.* (1997) Towards a revised nomenclature for P1 and P2 receptors. *Trends Pharmacol. Sci.* **18**, 79-82.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

ADENOSINE RECEPTOR ANTAGONISTS block adenosine receptors, activation of which has a wide range of mainly inhibitory actions in the body (see **ADENOSINE**

RECEPTOR AGONISTS). Subtypes of adenosine receptors include A_1, A_{2A}, A_{2B} and A_3. Most selective antagonists used experimentally are xanthine analogues: these include **8-SPT** (8-sulphophenyltheophylline), **DPCPX** (8-cyclopentyl-1,3-dipropylxanthine) and **CSC** (8-chlorostyrylcaffeine). At A_1 receptors, DPCPX is a relatively selective antagonist. At A_{2A} receptors, **ZM 241385**, **SCH 58261** and CSC are relatively selective antagonists. At A_{2B} receptors there are no established antagonists. There is some evidence suggesting these receptors as possible therapeutic targets for antagonists in treating asthma and allergic lung disease. At A_3 receptors relatively selective antagonists include: **L 268605**, **MRS 1191** and **BWA 1433**.

Although not selective or potent, some of the wide-ranging pharmacological actions of a number of naturally occurring methylxanthine drugs and their derivatives (e.g. **aminophylline**, **caffeine**, **theobromine**, **theophylline**) are thought to result from their adenosine receptor antagonist properties (however, they also act as PHOSPHODIESTERASE INHIBITORS). Though they are rather inactive as adenosine antagonists, **flavinoids** (e.g. **galangin**) are consumed in dietary quantities sufficient to have relevant pharmacological actions. Also, though much less active than as calcium-channel blockers, agents such as **nitrendipine**, **nicardipine** and **nifedipine** have a low affinity at A_3 receptors.

adenosine 5′-(tetrahydrogen triphosphate) ➡ **adenosine triphosphate**.

adenosine triphosphate (ATP; adenosine 5′-(tetrahydrogen triphosphate); adenosine 5′-triphosphoric acid; adenylpyrophosphoric acid; adenosine triphosphate disodium [JAN]) is a nucleoside that can be isolated from skeletal muscle extracts, and also from various plant sources. It has a fundamental role in biological energy transformations, being the key energy storage and release agent. It was formerly used in the treatment of supraventricular tachycardias. It is used as a biochemical and pharmacological tool. It is a PURINE P2 RECEPTOR AGONIST, though it is rapidly degraded *in vivo*. Paradoxically, **ATP** is a purine P2 receptor antagonist at the $P2Y_{ADP}$ subtype.

adenosine triphosphate disodium ➡ **adenosine triphosphate**.

adenosine 5′-triphosphoric acid ➡ **adenosine triphosphate**.

adenylpyrophosphoric acid ➡ **adenosine triphosphate**.

ADH ➡ **lypressin**; **vasopressin**.

adibendan [INN] is a pyridinylpyrrolobenzimidazol derivative, a (type III) PHOSPHODIESTERASE INHIBITOR. It has CARDIAC STIMULANT and peripheral VASODILATOR actions, and is being investigated for congestive HEART FAILURE TREATMENT.

adicillin [BAN] (5′-epimer = penicillin N) is a (penicillin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL agent to treat certain infections.

Adifax™ ➡ **dexfenfluramine**.

adimolol [INN] is a β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically as an ANTIHYPERTENSIVE.

Adipex-P™ ➡ **phentermine**.

adjuvant peptide (muramyl dipeptide; MDP) is a *N*-acetylmuramyl dipeptide, identified as the minimum structural constituent of the mycobacterial cell wall component of Freund's complete adjuvant, which is necessary for adjuvant activity. It and many of its analogues have been investigated as adjuvants in the immunization of animals, as (IMMUNOSTIMULANT) IMMUNOMODULATORS. It also has some pyrogenic activity.

ADM ➡ **adrenomedullin**.

ADM22-52 (human) ➡ **adrenomedullin(22-52) (human)**.

ADR 529 ➡ **razoxane**.

adrafinil [INN] is a sulphinylacetohydroxamic acid derivative, an (α_1) α-ADRENOCEPTOR AGONIST which can be use as a CNS STIMULANT.

Adrenalin™ ➡ **adrenaline**.

adrenaline [BAN] (epinephrine [INN, USAN]; epinephrine bitartrate [USAN]; arterenol; levorenin; Adrenalin™; Eppy™; Suprarenaline™; Suprarenin™) acts both as an α-ADRENOCEPTOR AGONIST and a β-ADRENOCEPTOR AGONIST, and in its natural form is a catecholamine hormone secreted by the adrenal gland in mammals and by neurons as a neurotransmitter in lower phyla. The (laevo)- or (*R*)-form is the pharmacologically active isomer, and is normally used in the form of a salt (normally bitartrate) in therapeutics. It has powerful SYMPATHOMIMETIC actions and can be used therapeutically as a VASOCONSTRICTOR, CARDIAC STIMULANT, ANTIGLAUCOMA TREATMENT and occasionally as an ANTIASTHMATIC.

adrenalone [INN, USAN] shows similar SYMPATHOMIMETIC actions as **adrenaline**. It can be used as a weak local VASOCONSTRICTOR and HAEMOSTATIC. It can also be used topically in ANTIGLAUCOMA TREATMENT.

ADRENERGIC NEURON BLOCKING DRUGS act to prevent the release of **noradrenaline** from nerves in the sympathetic nervous system, which is involved in controlling involuntary autonomic functions including blood pressure, heart rate and the activity of muscles of internal organs (e.g. blood vessels, gastrointestinal tract, urogenital tract). Noradrenaline is the main neurotransmitter of the sympathetic nervous system, so adrenergic neuron blocker drugs act like other ANTISYMPATHETIC AGENTS to cause an overall fall in blood pressure. Their therapeutic action normally takes some weeks to develop, and their mechanisms of action result in some initial release of noradrenaline. The main use of such drugs is in ANTIHYPERTENSIVE therapy, but side-effects limit their use. Examples include **bethanidine**, **bretylium**, **debrisoquine** and **guanethidine**.

Stjärne, P. (1989) Basic mechanisms and local modulation of nerve impulse-induced secretion of neurotransmitters from individual sympathetic nerve varicosities. *Rev. Physiol. Biochem. Pharmacol.*, **112**, 1-137.

α-ADRENOCEPTOR AGONISTS (also known as α-adrenergic receptor agonists or α-adrenoceptor stimulants) are drugs that act by directly stimulating α-adrenoceptors, and they thus induce some actions of the sympathetic nervous system by mimicking the action of the catecholamines, **adrenaline** and **noradrenaline** – mediators acting predominantly as hormone or neurotransmitter, respectively. They are thus SYMPATHOMIMETICS. The actions of α-adrenoceptor and β-adrenoceptor activation together account for nearly all of the very widespread actions of the sympathetic division of the autonomic nervous system (with the exception of certain cholinergic sympathetic actions, notably sweating), both in normal physiology and in stress.

The α-adrenoceptors are divided into two subtypes with very different properties, called α_1-adrenoceptors and α_2-adrenoceptors, though both are of the seven-transmembrane G-protein-coupled superfamily. The α_1-adrenoceptors in the periphery are largely found on smooth muscle and glandular tissues, and generally activate systems through coupling to the $InsP_3$/DAG Ca^{2+}-mobilizing system. The α_2-adrenoceptors couple negatively to adenylyl cyclase, and are located notably on sympathetic nerve terminals where they

have an autoinhibitory function, and on cholinergic and other neurons where they inhibit excitation and neurotransmitter release. They are also found on some vascular smooth muscle, hepatocytes, platelets and CNS neurons. A number of different α_1- and α_2-adrenoceptors have been cloned and differentiated by functional studies, and there appear to be three or more variants of each (termed α_{1A}, α_{1B}, α_{1D}, and α_{2A}, α_{2B}, α_{2C}, respectively) Notable effects of α_1-adrenoceptor activation include: constriction of many blood vessels, stimulation of smooth muscle of the seminal tract, stimulation of the smooth muscle of the iris of the eye and suppression of motility within the gastrointestinal tract.

These actions can be mimicked for clinical purposes, but effects tend to be widespread and potentially dangerous. The VASOCONSTRICTOR action of α_1-adrenoceptor agonists is used particularly in nasal DECONGESTANT treatments, either by mouth or by nose-drops: e.g. **phenylephrine**, **oxymetazoline** and **xylometazoline**. Others are used by injection to treat circulatory shock: e.g. **metaraminol**, **methoxamine**, **noradrenaline** and **phenylephrine**. Vasoconstrictors can be co-injected to prolong the effects of local anaesthetics: e.g. adrenaline. In addition to direct α-adrenoceptor agonists, indirect-sympathomimetic drugs may cause the eventual activation of α-adrenoceptors (or β-adrenoceptors), depending on tissue factors, by causing release of noradrenaline (e.g. **ephedrine**, **pseudoephedrine**), or by preventing noradrenaline reuptake (e.g. **cocaine**).

Ruffolo, R.R. *et al.* (1993) Pharmacologic and therapeutic applications of α_2-adrenoceptor subtypes. *Annu. Rev. Pharmacol. Toxicol.*, **33**, 243-279.
Ruffolo, R.R. *et al.* (1994) α-Adrenoceptors. *Pharmacol. Ther.*, **61**, 1-64.
Hieble, J.P. *et al.* (1995) International Union of Pharmacology. X. Recommendation for nomenclature of α-adrenoceptors: Consensus update. *Pharmacol. Rev.*, **47**, 267-270.
Hieble, J.P., *et al.* (1995) α- and β-adrenoceptors: from the gene to the clinic. 1. Molecular biology and adrenoceptor subclassification. *J. Med. Chem.* **38**, 3415-3444.
Ruffolo, R.R. *et al.* (1995) α- and β-adrenoceptors: from the gene to the clinic. 2. Structure-activity relationships and therapeutic applications. *J. Med. Chem.*, **38**, 3681-3716.
Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

β-ADRENOCEPTOR AGONISTS (also known as β-adrenergic receptor agonists or β-receptor stimulants) are a class of drugs that act through stimulating β-adrenoceptors, and thus induce some actions of the sympathetic nervous system by mimicking the action of **adrenaline** and **noradrenaline** – catecholamine mediators acting predominantly as hormone or neurotransmitter, respectively. The actions of α-adrenoceptor and β-adrenoceptor activation together account for nearly all the very widespread actions of the sympathetic division of the autonomic nervous system, both in normal physiology and in stress. Among other actions, β-adrenoceptors have cardiac stimulant actions, they dilate certain blood vessels, suppress motility within the gastrointestinal tract, bladder and uterus, and stimulate certain aspects of metabolism causing an increase in glucose and free fatty acids in the blood. These actions, in concert with α-adrenoceptors help prepare the body for emergency action.

These actions are commonly mimicked for clinical purposes, but effects tend to be widespread. However, it is possible to gain some selectivity of drug action, with consequent minimization of side-effects, by using receptor-subtype-selective β-adrenoceptor agonists. Thus, β_1-adrenoceptor-selective agonists are more active on the heart, and β_2-adrenoceptor-selective agonists are more active at most other sites in the body, including the airways. It is necessary to use β_2-adrenoceptor-selective stimulant drugs to achieve bronchodilation in the widespread common treatment of acute asthma (see ANTIASTHMATICS; BRONCHODILATORS); otherwise there may be significant – and potentially dangerous – stimulation of the heart. Another use of β_2-adrenoceptor agonists is to relax the uterus in premature labour. Conversely, β_1-adrenoceptor agonists (e.g. **dobutamine**, **rimiterol**, **xamoterol**) or non-selective β-adrenoceptor agonists (e.g. noradrenaline) are sometimes used to stimulate the failing heart. Examples of β_2-adrenoceptor agonist drugs used clinically are **bambuterol**, **fenoterol**, **salbutamol**, **salmeterol** and **terbutaline**. Recently, a third type of receptor called 'atypical β', or β_3-adrenoceptors, has been cloned and also shown to be involved in certain functional responses, including lipid metabolism; but many agonist ligands active at this site are also fairly active at the other two sites. However, some such ligands may be used to treat diabetes, for instance, CL 316243. **Carazolol** is used as an analytical tool since it has a high affinity for the β_3-adrenoceptor where it acts as an agonist, but it is also an antagonist at the β_1- and β_2-sites.

All three receptors are of the seven-transmembrane superfamily and are positively coupled to adenylyl cyclase. In addition to β-adrenoceptor agonists, indirect SYMPATHOMIMETICS may cause the eventual activation of β-adrenoceptors (or α-adrenoceptors), depending on tissue factors, by causing release of noradrenaline (e.g. **ephedrine**, **pseudoephedrine**) or preventing noradrenaline reuptake (e.g. **cocaine**).

Bylund, D.B. *et al.* (1994) IV. International Union of Pharmacology nomenclature of adrenoceptors. *Pharmacol. Rev.*, **46**, 121-136.
Reverte, M. (1994) Pharmacological effects of β-adrenoceptors. Additional physiological functions of the β-adrenoceptor. *Trends Pharmacol. Sci.*, **15**, 281.
Giacobino, J.P. (1995) β_3-adrenoceptor: an update. *Eur. J. Endocrinol.*, **132**, 377-385.
Hieble, J.P. *et al.* (1995) α- and β-adrenoceptors: from the gene to the clinic. 1. Molecular biology and adrenoceptor subclassification. *J. Med. Chem.*, **38**, 3415-3444.
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Coleman, R.A. *et al.* (1996) Exosites: their current status, and their relevance to the duration of action of long-acting β_2-adrenoceptor agonists. *Trends Pharmacol. Sci.*, **17**, 324-330.
De Ponti, F. (1997) Pharmacological criteria for the detection of β_3-adrenoceptors. *Trends Pharmacol. Sci.*, **18**, 52-53.
Jack, D. (1997) The interaction between salmeterol and the β_2-adrenoceptor protein. *Trends Pharmacol. Sci.*, **18**, 149-151.
McDonald, E. *et al.* (1997) Gene targeting – homing in on α_2-adrenoceptor-subtype function. *Trends Pharmacol. Sci.*, **18**, 211-219.
Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

α-ADRENOCEPTOR ANTAGONISTS (also known as α-adrenergic receptor antagonists, α-adrenoceptor blocking drugs or α-blockers) are drugs that inhibit certain actions of the sympathetic nervous system by preventing the action of **adrenaline** and **noradrenaline** (catecholamine mediators acting predominantly as hormone or neurotransmitter, respectively) by acting as antagonists at the α-adrenoceptors on which the catecholamines act. (Correspondingly, **β-ADRENOCEPTOR ANTAGONISTS** are drugs used to inhibit the remaining actions, by occupying the other class of adrenoceptor, β-adrenoceptors).

In disease states some sympathetic actions may be inappropriate, exaggerated and detrimental, so α-blockers may be used to restore a balance. One use of antagonists is in lowering blood pressure when it is raised in cardiovascular disease (see ANTIHYPERTENSIVE AGENTS), since they prevent the vasoconstrictor actions of noradrenaline and adrenaline (including in phaeochromocytoma), though a high incidence

of side-effects means they are nowadays much less used. The α_1-blockers are also used to treat urinary retention in benign prostatic hyperplasia (through an action on the blood circulation within the prostate).

Examples of α_1-blockers include compounds of diverse structures, such as the synthetic heterocyclics **prazosin**, **indoramin**, **phentolamine**; the ergot alkaloids **ergotamine** and **dihydroergotamine**; and the haloalkylamine irreversible alkylators, e.g. **phenoxybenzamine**. Examples of antagonists relatively selective for α_2-receptors over α_1-receptors, are the natural indolealkylamine alkaloid **yohimbine** and its diastereoisomer **rauwolscine** (though they also have affinity for 5-HT receptors). However, many of the α_1-blockers (especially prazosin) also have some affinity at the α_2-adrenoceptor site.

β-ADRENOCEPTOR ANTAGONISTS (also known as β-adrenergic receptor blocking drugs, β-adrenoceptor blocking drugs or beta-blockers) are drugs that inhibit certain actions of the sympathetic nervous system by blocking the action of **adrenaline** and **noradrenaline** (catecholamine mediators acting predominantly as hormone or neurotransmitter respectively). Among other actions, β-adrenoceptors have cardiac stimulant actions, they dilate certain blood vessels, suppress motility within the gastrointestinal tract, stimulate certain aspects of metabolism causing an increase in glucose and free fatty acids in the blood. These actions, in concert with those of the α-adrenoceptors, help prepare the body for emergency action. However, in disease, some of these effects may be inappropriate, exaggerated and detrimental to health, so β-blockers may be used to restore the balance. Thus β-blockers are used to lower blood pressure when it is abnormally raised in cardiovascular disease (see ANTIHYPERTENSIVE AGENTS); to correct certain heartbeat irregularities and tachycardias (see ANTIARRHYTHMICS); to prevent the pain of angina pectoris during exercise by limiting cardiac stimulation (see ANTIANGINALS); to treat myocardial infarction, as prophylaxis to reduce the incidence of migraine attacks (see ANTIMIGRAINE AGENTS); to reduce anxiety, particularly its manifestations, such as muscular tremor (see ANXIOLYTICS); as short-term treatment prior to surgical correction of thyrotoxicosis (see ANTITHYROID AGENTS); and as eye-drops to lower raised intraocular pressure in glaucoma treatment (see ANTIGLAUCOMA TREATMENT).

However, there is usually a price to pay for extensive alteration in autonomic processes in the body. For instance, adverse effects include precipitation of asthma attacks. Similarly, the blood flow in the extremities will often be reduced, so patients may well complain of cold feet or hands. It may be possible to gain some selectivity of drug action, with consequent minimization of side-effects, by using receptor-subtype-selective β-blockers. Thus, β_1-adrenoceptor antagonists have a higher affinity for the β_1-adrenoceptor of the heart, and thus they may have some preferential action there, since β_2-adrenoceptors are found at most other sites in the body, including the airways and blood vessels. Antagonists with similar affinity for β_1-adrenoceptor and β_2-adrenoceptors include **nadolol**, **oxprenolol**, **propranolol** and **timolol**; whereas **acebutolol**, **atenolol**, **esmolol** and **metoprolol** show some β_1-adrenoceptor selectivity; and **butoxamine** is β_2-adrenoceptor preferring. **Labetolol**, in the racemic form used in medicine, acts as both a β-adrenoceptor and an α-adrenoceptor antagonist, though these activities reside in different isomers. Further factors determining the uses of individual agents include variations in half-life, lipid-solubility and membrane-stabilizing actions on the heart (in high doses; e.g. **sotalol**). In the treatment of glaucoma, some β-blockers can be used topically as eye-drops when they are not suitable for systemic use (e.g. **carteolol**). See β-ADRENOCEPTOR AGONISTS.

adrenochrome is an indoledione, an oxidation product of **adrenaline** (it can occur on storage in solution), and has a variety of pharmacological properties, including hallucinogenic psychotomometic actions. Its semicarbazone is **carbazochrome**.

adrenocorticotrophic hormone ➡ **corticotrophin**.

adrenocorticotrophin ➡ **corticotrophin**.

adrenocorticotropin ➡ **corticotrophin**.

adrenomedullin (ADM) is a peptide hormone originally shown to be formed by phaeochromocytomas of the adrenal medulla, and now demonstrated in other tissue, including the endothelium of vascular cells. It is a 52 amino acid residue in the human variant and 50 residues in the rat. Active fragments include *adrenomedullin$_{13\text{-}52}$ (human)* and *adrenomedullin$_{11\text{-}50}$ (rat)*. All are potent VASODILATORS and HYPOTENSIVES, and may represent regulatory hormones in the cardiovascular system. They share about 26% homology with CGRP (over a common region), and are similar in many of their actions. For some actions adrenomedullins act as ADRENOMEDULLIN RECEPTOR AGONISTS, but for other actions they act as CALCITONIN GENE-RELATED PEPTIDE RECEPTOR AGONISTS.

adrenomedullin$_{13\text{-}52}$ (human) ➡ **adrenomedullin**.

adrenomedullin(22-52) (human) (ADM22-52 (human)) is an ADRENOMEDULLIN RECEPTOR ANTAGONIST which inhibits certain actions of adrenomedullin agonist analogues.

adrenomedullin$_{11\text{-}50}$ (rat) ➡ **adrenomedullin**.

ADRENOMEDULLIN RECEPTOR AGONISTS act at receptors of the seven-transmembrane G-protein-coupled receptor superfamily, which couple positively to the adenylyl cyclase (G_s) pathway, and putative clones have recently been identified. However, it has been suggested that a receptor protein can be converted to either adrenomedullin or calcitonin gene-related peptide active receptor after combination with different 'accessory factor' proteins ('RAMPs'). Adrenomedullin itself was originally shown to be formed by phaeochromocytomas of the adrenal medulla, but has now been demonstrated in other tissue. Active fragments (e.g. human adrenomedullin$_{13\text{-}52}$ and rat adrenomedullin$_{11\text{-}50}$) share about 26% homology with CGRP (over an homologous region), and are similar in many of their actions. The most notable actions of adrenomedullin are also on the cardiovascular system, and it has been suggested that it may act as a vasodilator hormone in control of blood pressure (since quite high levels of this mediator have been demonstrated in the circulation). It also increases cell proliferation (e.g. smooth muscle). Adrenomedullin also appears to mediate some of its actions through cross-talk to $CGRP_1$ receptors.

Hall, J.M. *et al.* (1995) Interaction of human adrenomedullin13-52 with CGRP receptors in the microvasculature of the rat and hamster. *Br. J. Pharmacol.*, **114**, 592-597.

Poyner, D.R. (1997) Molecular pharmacology of receptors for calcitonin-gene-related peptide, amylin and adrenomedullin. *Biochem. Soc. Trans.*, **25**, 1032-1036.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

Nishikimi, T. (1998) Adrenomedullin in cardiovascular disease. *Adv. Pharmacol.*, **42**, 599-603.

ADRENOMEDULLIN RECEPTOR ANTAGONISTS act at receptors recognizing the peptide hormone **adrenomedullin** and active agonist fragments (e.g. human *adreno-*

medullin$_{13\text{-}52}$). **Adrenomedullin(22-52)** (human) (ADM$_{22\text{-}52}$ (human)) has some affinity in inhibiting certain actions of adrenomedullin agonist analogues, but is not entirely selective, probably also having some action as a CALCITONIN GENE-RELATED PEPTIDE RECEPTOR ANTAGONIST. See ADRENOMEDULLIN RECEPTOR AGONISTS.

Muff, R. *et al.* (1995) Receptors for calcitonin, calcitonin gene-related peptide, amylin, and adrenomedullin. *Can. J. Physiol. Pharmacol.*, **73**, 963-967.
Champion, H.C. *et al.* (1997) Adrenomedullin-(22-52) antagonizes vasodilator responses to CGRP but not adrenomedullin in the cat. *Am. J. Physiol.*, **272**, R234-42.

adrenomone ➡ **corticotrophin**.

Adrenor™ ➡ **adrenaline**.

adrenorphin (metorphamide) is an amidated octapeptide isolated from bovine brain and human phaeochromocytoma tumour. It is a (μ) OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC.

adrenosterone (Reichstein's substance G) is a CORTICOSTEROID, a constituent of the adrenal cortex. It has AROMATASE INHIBITOR (oestrogen synthetase inhibitor) activity and shows ANDROGENIC activity.

Adriamycin™ ➡ **doxorubicin**.

Adrucil™ ➡ **fluorouracil**.

AE 9 ➡ **feclobuzone**.

AE 17 ➡ **suxibuzone**.

Aerobid™ ➡ **flunisolide**.

AF 64A ➡ **ethylcholine aziridinium**.

AF 983 ➡ **bendazac**.

AF 1890 ➡ **lonidamine**.

AF 11377 is a 15 residue peptide that acts as a CYTOKINE RECEPTOR ANTAGONIST both in terms of competing for binding with IL-1 at the IL-1R1 receptor subtype and also blocks functional responses to IL-1 in human and monkey cells.

afloqualone [INN, JAN] is a quinazolinone derivative. It is a centrally acting SKELETAL MUSCLE RELAXANT.

Afrazine™ ➡ **oxymetazoline**.

afurolol [INN] is a β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically in ANTIHYPERTENSIVE treatment.

AG 629 ➡ **spizofurone**.

agarin ➡ **muscimol**.

Agent HD ➡ **trimustine**.

Agent L ➡ **Lewisite**.

AGR 1240 ➡ **minaprine**.

AH 2250 ➡ **bupivacaine**.

AH 22216 ➡ **lamtidine**.

AH 23844 ➡ **lavoltidine**.

AH 23848 is a prostaglandin derivative, an (EP$_4$) PROSTANOID RECEPTOR ANTAGONIST. It has PLATELET AGGREGATION INHIBITOR and ANTITHROMBOTIC properties.

AHR 619 ➡ **doxapram**.

AHR 3053 ➡ **carbocisteine**.

AHR 3260B ➡ **polycarbophil calcium**.

AHR 5850D ➡ **amfenac**.

AHR 10282 ➡ **bromfenac**.

AII$_{3\text{-}8}$ ➡ **angiotensin IV**.

Akineton™ ➡ **biperiden**.

aklomide [BAN, INN, USAN] is an ANTIPROTOZOAL. Clinically, it can be used as a veterinary intestinal ANTICOCCIDIAL.

8 AL ➡ **niceritrol**.

AL 4943A ➡ **olopatadine**.

alacepril [INN, JAN] (Cetapril™) is a (mercapto) ACE INHIBITOR. It is a VASODILATOR used therapeutically as an ANTIHYPERTENSIVE.

β-alanine (3-aminopropanoic acid) is an amino acid widely distributed in plants, including algae, fungi and many higher plants. It is a residue present in **pantothenic acid** (a B VITAMIN). It acts as a GLYCINE RECEPTOR AGONIST.

alanine nitrogen mustard ➡ **melphalan**.

Albamycin™ ➡ **novobiocin**.

albendazole [BAN, INN, USAN] (S-oxide: albendazole oxide [BAN, INN]; Eskazole™) is a broad-spectrum ANTHELMINTIC, clinically investigated for treatment of chronic stronglyoidiasis, and for microsporidiosis in AIDS patients. It is used as a veterinary ANTHELMINTIC.

albendazole oxide ➡ **albendazole**.

albuterol ➡ **salbutamol**.

albuterol sulfate ➡ **salbutamol**.

ALCA ➡ **alcloxa**.

alclofenac [BAN, INN, JAN, USAN] (CP 1044; CG24; My 101; W 7320) is one of the heteroaryl acetic acid series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It has been withdrawn in some countries following reports of toxicity.

alclometasone [BAN, INN] (alclometasone dipropionate [JAN, USAN]; Aclovate™; Modrasone™; Sch 22219; S 3460) is a moderately potent CORTICOSTEROID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically in the treatment of inflammatory skin disorders, particularly eczema.

alclometasone dipropionate ➡ **alclometasone**.

alcloxa [INN, USAN] (aluminium chlorhydroxy allantoinate; ALCA; RC-173) is an aluminium complex of **allantoin**, used topically as a dermatological agent in ASTRINGENT and KERATOLYTIC preparations.

Alcobon™ ➡ **flucytosine**.

alcuronium chloride [BAN, INN, JAN, USAN] (Alloferin™) is a NICOTINIC CHOLINOCEPTOR ANTAGONIST, a (competitive) NEUROMUSCULAR BLOCKING AGENT, which can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia.

Aldactide™ ➡ **spironolactone**.

Aldactone™ ➡ **spironolactone**.

Alderlin™ ➡ **pronethalol**.

ALDEHYDE DEHYDROGENASE INHIBITORS are agents that block a class of enzymes involved in the second stage of the sequence of enzymes involved in the breakdown of ethanol (conversion of acetaldehyde to acetic acid), inhibition of which results in accumulation of acetaldehyde as a metabolite. There is marked human polymorphism in this enzyme, with marked ethnic-related distributions, generally with lower levels of enzyme activity in the East (e.g. in Chinese and Japanese). Acetaldehyde is more active than ethanol and very toxic, especially to neural tissue and the liver. In the presence of aldehyde dehydrogenase inhibitors, if even only a small amount of alcohol is taken, this gives rise to very unpleasant and potentially dangerous reactions, such as flushing, headache, palpitations, nausea and vomiting.

In clinical usage, the aldehyde dehydrogenase inhibitor **disulfiram** can be prescribed to be taken by an alcoholic subject on a regular basis, so there is a powerful disincentive to the consumption of alcoholic beverages (a form of aversion therapy). A number of other chemicals act as aldehyde dehydrogenase inhibitors, including certain industrial chemicals (e.g. thiram (used in rubber vulcanizing), cyanamide, thiocarbamate herbicides, some drugs (e.g. the hypoglycaemic sulphonylureas, **metronidazole**, certain cephalosporins) and certain experimental compounds including phenethyl isothiocyanate. Aldehyde dehydrogenase is also involved in the degradation of monoamines such as noradrenaline and adrenaline, so aldehyde dehydrogenase inhibitors can also modify monoamine metabolism.

Higuchi, S. *et al.* (1995) Alcohol and aldehyde dehydrogenase polymorphisms and

the risk for alcoholism. *Am. J. Psychiatry*, **152**, 1219-1221.
Hsu, L.C. *et al.* (1995) Cloning and characterisation of genes encoding four additional human aldehyde dehydrogenase isozymes. *Adv. Exp. Med. Biol.*, **372**, 159-168.
Lindros, K.O. *et al.* (1995) Phenethyl isothiocyanate, a new dietary liver aldehyde dehydrogenase inhibitor. *J. Pharmacol. Exp. Ther.*, **275**, 79-83.

aldesleukin [BAN, INN, USAN] (Proleukin™) – more fully termed 125-l-Serine-2-133-interleukin 2 (human reduced) is a recombinant version of **interleukin-2**, a peptide cytokine inflammatory mediator, acting as a CYTOKINE RECEPTOR AGONIST. It can be used in therapeutics as an IMMUNOMODULATOR, specifically in ANTICANCER chemotherapy for treatment of renal cell carcinoma.

aldesulfone sodium [INN] (sulfoxone sodium [USAN]) is a sulphone with ANTIBACTERIAL and ANTILEPROTIC activity.

aldioxa [INN, USAN] is a dihydroxyaluminium compound with allantoin and is a topical astringent and keratolytic.

Aldomet™ ➡ **methyldopa**.

ALDOSE REDUCTASE INHIBITORS (ARI) act at the enzyme aldose reductase, which is the first enzyme in the sorbitol (or polyol) pathway which converts glucose to sorbitol. It is thought that in hyperglycaemic states there may be an accumulation of sorbitol, leading to hyperosmotic pathology. ARI agents are under trial for use in the treatment of peripheral diabetic neuropathies, retinopathy and nephropathies. (These include **tolrestat**, also **alrestatin**, **sorbinil**, **zenarestat** and **zopolrestat**)

Tomlinson, D.R. *et al.* (1994) Aldose reductase inhibitors and their potential for the treatment of diabetic complications. *Trends Pharmacol. Sci.*, **15**, 293-297.

aldosterone [BAN, INN] (oxocorticosterone; Reichstein's substance X) is a CORTICOSTEROID, a steroid hormone secreted by the adrenal cortex. It is a MINERALOCORTICOID concerned with controlling salt and water balance, with no appreciable GLUCOCORTICOID activity, so it is not used for ANTIINFLAMMATORY purposes. Though it is very active as the endogenous mediator, it is not normally used in therapeutics, but it has been used in association with glucocorticoids in treatment of adrenocortical insufficiency.

ALDOSTERONE ANTAGONISTS are used mainly as DIURETICS to reduce fluid in the body by increasing the excretion of electrolytes and water by the kidney, so increasing urine production. They work by blocking the action of the endogenous MINERALOCORTICOID hormone **aldosterone**, and this makes them suitable for treating oedema associated with aldosteronism, liver failure, ascites caused by cirrhosis of the liver, hypertension and certain heart conditions. Examples of clinically used oral aldosterone antagonists are **potassium canrenoate** and **spironolactone**. They are relatively 'potassium-sparing' diuretics which cause relative retention of potassium, and this makes them suitable for combination with some of the other diuretic classes that cause K^+-loss, particularly the thiazides.

Berger, B.E. *et al.* (1985) Clinical uses and mechanisms of action of diuretic agents, in *The Kidney*, (eds B.M. Brenner. et al.), W.B. Saunders, Philadelphia, pp. 433-455.
Lant, A. (1985) Diuretics. Clinical pharmacology and therapeutic use (Part I). *Drugs*, **29**, 57-87.
Funder, J.W. (1993) Aldosterone action. *Annu. Rev. Physiol.*, **55**, 115-130.

alendronate sodium ➡ **alendronic acid**.

alendronic acid [BAN, INN] (alendronate sodium [USAN]; Fosamax™; G 704650; L 670452; MK 0217) is one of the bisphosphonate series of CALCIUM METABOLISM MODIFIERS used to treat disorders of bone metabolism, reducing calcium-resorption from the bone. It can be used orally for treating postmenopausal osteoporosis.

alexitol (alexitol sodium [BAN, INN]; Actal™; Magnatol™) is a polyhydroxyaluminium monocarbonate hexitol complex, which is used orally as a non-systemic ANTACID for the relief of hyperacidity, dyspepsia and indigestion, and as an adjunct in the treatment of peptic ulcers.

alfacalcidol [BAN, INN, JAN] (1α-hydroxycholecalciferol; 1α-hydroxyvitamin D_3; AlphaD™; One-Alpha™; many other names) is a synthesized form of **calciferol** (vitamin D), and acts as a VITAMIN and CALCIUM METABOLISM MODIFIER. It is used orally or by injection in vitamin D deficiency, particularly in the treatment of types of hypoparathyroidism and rickets.

alfadolone acetate ➡ **alphaxalone**.

alfaprostol [BAN, INN, USAN] is a synthetic prostaglandin and PROSTANOID RECEPTOR AGONIST, which can be used as an ABORTIFACIENT. It is also used as a LUTEOLYTIC AGENT in veterinary practice.

alfasone acetonide ➡ **algestone acetonide**.

alfaxalone ➡ **alphaxalone**.

Alfenta™ ➡ **alfentanil**.

alfentanil [BAN, INN] (alfentanil hydrochloride [USAN]; Alfenta™; Rapifen™; R 39209) is a **fentanyl** analogue of the phenylpiperidine series, an (μ) OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC.

alfentanil hydrochloride ➡ **alfentanil**.

Alferon™ ➡ **interferon α**.

alfuzosin [BAN, INN] (alfuzosin hydrochloride [USAN]; Xatral™) is a (selective α_1-subtype) α-ADRENOCEPTOR ANTAGONIST with properties similar to **prazocin**. It can be used as an ANTIHYPERTENSIVE and also in the treatment of benign prostatic hypertrophy.

alfuzosin hydrochloride ➡ **alfuzosin**.

algeldrate [INN, USAN] (aluminium hydroxide hydrate) can be used as an oral non-systemic ANTACID.

algestone acetonide [BAN, USAN] (algestone acetophenide [USAN]; alfasone acetonide; W 3395) is a synthetic steroid, a PROGESTOGEN that has been used (together with an OESTROGEN) by intramuscular injection as a CONTRACEPTIVE.

algestone acetophenide ➡ **algestone acetonide**.

Algicon™ ➡ **almagate**; **magnesium carbonate**; **magnesium hydroxide**.

Algipan™ ➡ **ethyl salicylate**; **glycol salicylate**.

alglucerase [BAN, INN, USAN] (glucosylceramidase (human placenta isoenzyme protein moiety reduced); Ceredase™) is an ENZYME. It is a monomeric glycoprotein consisting of 497 amino acid residues, a modified version of glucocerebrosidase. It is used in replacement therapy, for the treatment of Type I Gaucher's disease.

alibendol [INN] is a salicylamide derivative, a CHOLERETIC, ANTISPASMODIC and ANTIDYSPEPTIC AGENT.

alifedrine [INN] is a β-ADRENOCEPTOR AGONIST showing *positive* INOTROPIC activity which can be used in congestive HEART FAILURE TREATMENT.

alimemazine ➡ **trimeprazine**.

alimemazine tartrate ➡ **trimeprazine**.

Alkaloid F ➡ **demecolcine**.

Alka-Seltzer™ ➡ **aspirin**; **sodium bicarbonate**.

Alkeran™ ➡ **melphalan**.

allantoin [BAN, USAN] (glyoxylic diureide) occurs in allantoic fluid. It is a product of purine metabolism, very widely distributed in biological systems, including numerous plants. It has ANTIINFLAMMATORY activity and was formerly used topically as a DERMATOLOGICAL AGENT in preparations for the treatment of psoriasis and other skin conditions (though its efficacy is disputed).

Allegra™ ➡ **fexofenadine**.

Aller-eze™ ➡ **clemastine**.
allethrin [BSI, ISO, JMAF] (bioallethrin [BAN]) is a synthetic pyrethroid with **INSECTICIDAL** properties.
alletorphine [BAN, INN] (M 218; R 218M) is an oripavine derivative, an **OPIOID RECEPTOR AGONIST** with **OPIOID ANALGESIC** activity.
allicin is a sulphinothioate derivative isolated from garlic (*Allium sativum*). It shows **ANTIBACTERIAL** and **ANTICANCER** activity, and also has limited activity as a **PLATELET AGGREGATION INHIBITOR**. It has been investigated for **ANTIHYPERLIPIDAEMIC** activity. It also inhibits cholesterol synthesis *in vitro* and possesses **INSECTICIDAL** properties.
allitridin ➡ **allyl trisulfide**.
Alloferin™ ➡ **alcuronium chloride**.
allopurinol [BAN, INN, JAN, USAN] (BW 56 158; NSC 1390; Caplenal™; Cosuric™; Lopurin™; Rimapurinol™; Xanthomax™; Zyloprim™; Zyloric™) is an analogue of **hypoxanthine**. It is a **XANTHINE-OXIDASE INHIBITOR** acting as a competitive substrate. It is used in long-term antigout treatment, acting not as a uricosuric but to decrease synthesis of uric acid. The result of its action is a decrease in blood and tissues of the relatively insoluble xanthates and of xanthic acid, so there is less formation of renal stones, and some reversal of existing crystals in tissues. It is also an inhibitor of ATP synthesis from guanine and of RNA biosynthesis; it has **ANTITHROMBOTIC** and antiparasitic activity.
alloxanthine ➡ **oxypurinol**.
allylbarbital ➡ **butalbital**.
allylcatechol methylene ether ➡ **safrole**.
allylcinchophen is the propenyl ester of **cinchophen** with similar **ANALGESIC** and **ANTIINFLAMMATORY** properties.
allylestrenol ➡ **allyloestrenol**.
allyl isothiocyanate (allyl mustard oil; mustard oil) is the chief constituent of natural mustard oil, and is also found in cooked cabbage, horseradish etc. It is an oil with a very pungent and irritating odour, a **SENSORY IRRITANT** and skin allergen. It has antithyroid (goitrogenic) activity. Clinically, it is used as a **COUNTER-IRRITANT** (rubefacient or topical analgesic) for some painful skin conditions.
allyl mustard oil ➡ **allyl isothiocyanate**.
N-allylnormorphine ➡ **nalorphine**.
allyloestrenol [BAN] (allylestrenol [INN]; SC 6393) is a steroid, a **PROGESTOGEN** structurally related to **progesterone**, and has been used in the treatment of menstrual disorders and in threatened abortion.
allylprodine [BAN, INN] (NIH 7440; Ro 2-7113) is one of the phenylpiperidine series, a (μ) **OPIOID RECEPTOR AGONIST** and **OPIOID ANALGESIC**.
allylthiomethylpenicillin ➡ **almecillin**.
allyl trisulfide (diallyl trisulphide; allitridin) is the volatile component from *Allium sativum, Allium victorialis* and other commercial garlics. It has a range of activities: as a human **PLATELET AGGREGATION INHIBITOR; CALCIUM-CHANNEL BLOCKER; ANTIHYPERLIPIDAEMIC; ANTIHYPERTENSIVE**; and also possesses **INSECTICIDAL** properties.
almagate [INN, USAN] (aluminium magnesium carbonate hydroxide; LAS 3876; Algicon™) is used as a non-systemic **ANTACID** taken orally for the relief of hyperacidity, dyspepsia and indigestion, and as an adjunct in the treatment of peptic ulcers. It is a component of Algicon™, an aluminium hydroxide–magnesium carbonate co-gel, with magnesium alginate, magnesium carbonate, potassium bicarbonate and sucrose.
almasilate [BAN, INN] (magnesium aluminosilicate) is used as a non-systemic **ANTACID** taken orally for the relief of hyperacidity, dyspepsia and indigestion, and as an adjunct in the treatment of peptic ulcers.
almecillin [INN] (allylthiomethylpenicillin; penicillin O) is a (penicillin) **ANTIBIOTIC**. It can be used clinically as an **ANTIBACTERIAL** to treat certain infections.
alminoprofen [INN, JAN] (EB 382) is one of the arylpropionic acid series of **CYCLOOXYGENASE INHIBITORS**, with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity.
almurtide [BAN, INN] (desmethyl muramyl dipeptide; nor MDP) is an N-acetylmuramyl peptide, with (**IMMUNOSTIMULANT**) **IMMUNOMODULATOR** activity, and potentiates cytotoxicity of human monocytes.
aloin [BAN, INN] is a (stimulant) **LAXATIVE** of the anthraquinone group. It is used as a mixture of 10 epimers, and it and derivatives are found in several *Aloe* spp. It is contained in many proprietary laxative preparations.
Alomide™ ➡ **lodoxamide**.
alosetron [BAN, INN] (alosetron hydrochloride [USAN]; GR 68755) is an imidazolylpyridoindolone derivative, a (**5-HT_3**) **5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST**, with potential as an **ANTIPSYCHOTIC** and **ANTIEMETIC**.
alosetron hydrochloride ➡ **alosetron**.
aloxiprin [BAN, INN] is a polymeric condensation product of aluminium oxide and **aspirin**, with similar properties to aspirin: **CYCLOOXYGENASE INHIBITOR, NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC**. It also has inherent **ANTACID** activity. It is a component of Askit™, Migran-eze™ etc.
aloxistatin [INN] (loxistatin; EST; Ep-453) is the more soluble ethyl ester derivative of E-64 and is an oxiranecarboxylic acid derivative. It is a potent (thiol) **PROTEASE INHIBITOR** that has been tested in muscular dystrophy treatment.
Alpha VIII™ ➡ **factor VIII**.
alpha amylase ➡ **α-amylase**.
alpha$_1$-antitrypsin (alpha$_1$-trypsin inhibitor; alpha$_1$-proteinase inhibitor; Prolastin™) is a naturally occurring (serine) **PROTEASE INHIBITOR** which acts in several important sites in the body as an endogenous limiter of enzyme action. Chemically, it is a protein containing 394 amino acid residues. Through an action on the blood coagulation cascade, it has natural **ANTICOAGULANT** activity; in the lung, a deficiency is implicated in certain pathologies. In therapeutics, attempts have been made to administer it (or a 394 amino acid residue protein sequence, **prolastin**, isolated from plasma or serum) as a treatment for cystic fibrosis, pulmonary emphysema and congestive heart disease.
alphacetylmethadol ➡ **dimepheptanol**.
AlphaD™ ➡ **alfacalcidol**.
Alphagan™ ➡ **brimonidine**.
alphameprodine ➡ **meprodine**.
alphamethadol ➡ **dimepheptanol**.
Alphanine™ ➡ **factor IX**.
Alphaparin™ ➡ **certoparin sodium**.
alpha$_1$-proteinase inhibitor ➡ **alpha$_1$-antitrypsin**.
alpha$_1$-trypsin inhibitor ➡ **alpha$_1$-antitrypsin**.
alphaxalone [BAN] (alfaxalone [INN, JAN]) is a semisynthetic steroid produced from 5a-pregnanetrione by incubating with *Saccharomyces cerevisiae*. It is a **GENERAL ANAESTHETIC**. It can be used as a compound with **alfadolone acetate** to enhance solubility.
Alpheron N™ ➡ **interferon α**.
alpiropride [INN] is a benzamide, a **DOPAMINE RECEPTOR ANTAGONIST**, used as an **ANTIMIGRAINE AGENT**.
alprazolam [BAN, INN, JAN, USAN] (Xanax™) is a triazolodiazepine, one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST** and has most of

diazepam's properties. It is a HYPNOTIC, ANTICONVULSANT, (central) SKELETAL MUSCLE RELAXANT with ANXIOLYTIC activity, also reported to have ANTIDEPRESSANT properties. It is mainly administered orally as an anxiolytic. It also has PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST activity.

alprenolol [BAN, INN] (alprenolol hydrochloride [JAN, USAN]) is a β-ADRENOCEPTOR ANTAGONIST, which is relatively lipophilic and is cardioselective. It can be used in antihypertensive and antianginal treatment.

alprenolol hydrochloride ➡ **alprenolol**.

alprostadil [BAN, INN, USAN] (prostaglandin E_1; PGE_1; Caverject™; Prostin V™; Prostin VR™) is a common and biologically active endogenous mammalian prostaglandin. It is a VASODILATOR and PLATELET AGGREGATION INHIBITOR. It can be used by infusion to maintain babies born with congenital heart defects. In men, it is used by direct intracavernosal penile injection to treat erectile dysfunction.

alrestatin [INN, USAN] (alrestatin sodium [USAN]) is an analogue of **tolrestat** and an ALDOSE REDUCTASE INHIBITOR (ARI). These agents have potential for the treatment of peripheral diabetic neuropathies.

alrestatin sodium ➡ **alrestatin**.

Alrheumat™ ➡ **ketoprofen**.

alsactide [INN] (Hoechst 433) is a synthetic peptide, a structural CORTICOTROPHIN ANALOGUE, which has been used as a diagnostic agent for adrenal insufficiency, and clinically for conditions where CORTICOSTEROID treatment is indicated. See also **corticotrophin**.

Altace™ ➡ **ramipril**.

Altacite™ ➡ **hydrotalcite**.

alteplase [BAN, INN, JAN, USAN] (Actilyse™; Activase™) is a FIBRINOLYTIC AGENT of the (tissue-type) plasminogen activator group, forming plasmin which degrades fibrin so breaking up thrombi, thus acting as a THROMBOLYTIC. Chemically, it is a recombinant single-chain protein containing 527 amino acid residues. Therapeutically, its thrombolytic actions are used in the acute treatment of myocardial and pulmonary embolism.

althiazide ➡ **altizide**.

Altimol™ ➡ **nitrefazole**.

altizide [INN] (althiazide [USAN]) is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.

altretamine [BAN, INN, USAN] (hexamethylmelamine; HMM; NSC 13875; ENT 50852; NSC 13875; RB 1515; WR 95704; Hexaalen™) is structurally related to the alkylating ANTICANCER AGENT **tretamine** (though it may act in a different way). It is used in the treatment of ovarian tumours (together with **cisplatin**).

Aludrin™ ➡ **isoprenaline**.

Aludrox™ ➡ **aluminium hydroxide**; **magnesium carbonate**; **magnesium hydroxide**.

aluminium acetate [USAN] (aluminium ethanoate) is used topically as a DERMATOLOGICAL AGENT, ANTISEPTIC and ASTRINGENT.

aluminium acetate hydroxide ➡ **aluminium diacetate monohydroxide**; **aluminium monoacetate dihydroxide**.

aluminium chlorhydroxy allantoinate ➡ **alcloxa**.

aluminium chloride (Anhydrol Forte™; Driclo™) is used topically as a DERMATOLOGICAL AGENT, ASTRINGENT and a powerful ANTIPERSPIRANT, and also to treat hyperhidrosis.

aluminium clofibrate ➡ **clofibrate**.

aluminium diacetate monohydroxide (aluminium acetate hydroxide; aluminium subacetate) can be used topically as a DERMATOLOGICAL AGENT with ANTISEPTIC/ASTRINGENT and ANTIPERSPIRANT/deodorant properties.

aluminium ethanoate ➡ **aluminium acetate**.

aluminium hydroxide [JAN, USAN] is used as an oral non-systemic ANTACID for the relief of hyperacidity, dyspepsia and indigestion, and as an adjunct in treatment of peptic ulcers. Because it is relatively insoluble in water, it has a long duration of action when retained in the stomach. It is also an ASTRINGENT. It can be used to treat hyperphosphataemia. A component of antacid compound preparations (e.g. Aludrox™, Asilone™, Dijex™, Gaviscon™ and Maalox™ among many).

aluminium hydroxide hydrate ➡ **algeldrate**.

aluminium magnesium carbonate hydroxide ➡ **almagate**.

aluminium magnesium carbonate hydroxide hydrate ➡ **hydrotalcite**.

aluminium magnesium hydroxide sulphate ➡ **magaldrate**.

aluminium monoacetate dihydroxide (aluminium acetate hydroxide) is a DERMATOLOGICAL AGENT used as an ANTISEPTIC and ASTRINGENT.

aluminium orthophosphate ➡ **aluminium phosphate**.

aluminium phosphate [USAN] (aluminium orthophosphate) can be used as an oral non-systemic ANTACID.

aluminium subacetate ➡ **aluminium diacetate monohydroxide**.

Alupent™ ➡ **orciprenaline**.

alverine [INN] (alverine citrate [USAN]) is a diphenyldipropylamine compound, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as an ANTISPASMODIC AGENT to treat irritable bowel syndrome.

alverine citrate ➡ **alverine**.

amacid brilliant blue ➡ **indigotin disulfonate sodium**.

amantadine [BAN, INN] (amantadine hydrochloride [JAN, USAN]; Symmetrel™) has ANTIVIRAL properties, and also acts as an ANTIPARKINSONIAN AGENT. Clinically, it can be used as a prophylactic for influenza and in the treatment of herpes. Also, it can be used as an antiparkinsonian agent in symptomatic treatment.

amantadine hydrochloride ➡ **amantadine**.

amantanium bromide [INN] is an ANTIBACTERIAL used as an ANTISEPTIC in dentifrices.

amastatin is a natural tripeptide ANTIBIOTIC complex produced by *Streptomyces* spp., which has ENZYME INHIBITOR activity. It can be used in experimental analytical studies as an AMINOPEPTIDASE INHIBITOR (both aminopeptidase N (EC 3.4.11.2) and aminopeptidase A (EC 3.4.11.7) enzymes. It is also reported to be an ANTICANCER AGENT.

Ambaxin™ ➡ **bacampicillin**.

ambazone [BAN, INN] (thiosemicarbazone) is an ANTIFUNGAL and ANTIMICROBIAL AGENT. It can be used clinically as a topical ANTISEPTIC (as lozenges).

ambenonium chloride [BAN, INN, JAN] (ambestigmin chloride; Win 8077; Mytelase™) is a quaternary ammonium compound, a reversible ANTICHOLINESTERASE, which can be used in the treatment of myesthenia gravis.

ambestigmin chloride ➡ **ambenonium chloride**.

ambicromil [BAN, INN] (probicromil calcium [USAN]; FPL 58668) is a chromone, an ANTIALLERGIC and mediator release inhibitor similar to **cromoglycic acid**, which potentially can be used for prophylaxis of allergic conditions, including for passive cutaneous anaphylaxis and as an ANTIASTHMATIC.

Ambien™ ➡ **zolpidem**.
AmBisome™ ➡ **amphotericin**.
ambuphylline ➡ **bufylline**.
ambroxol [INN] (ambroxol hydrochloride [JAN] and many other names) is a metabolite of **bromhexine**, a MUCOLYTIC and EXPECTORANT, which can be used in treating respiratory disorders characterized by viscous or excessive mucus; it is said to enhance pulmonary surfactant production. It has been investigated for treatment of paraquat poisoning. It also has ANTIOXIDANT properties.
ambroxol hydrochloride ➡ **ambroxol**.
ambucetamide [BAN, INN] is a benzeneacetamide, an ANTISPASMODIC, which can be used to treat dysmenorrhoea.
ambutonium bromide [BAN] is a quaternary ammonium compound, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as an ANTISPASMODIC.
amcinonide [BAN, INN, JAN, USAN] (Cyclocort™) is a potent CORTICOSTEROID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically in the treatment of inflammatory skin disorders, particularly eczema.
amdinocillin ➡ **mecillinam**.
amdinocillin pivoxil ➡ **pivmecillinam**.
Americaine™ ➡ **benzocaine**.
ametantrone [INN] (ametantrone acetate [USAN]; CI 881; NSC 287513) is an (anthracycline group) ANTIBIOTIC of the **adriamycin** group. It is a cytotoxic ANTICANCER AGENT which has been used to treat a range of conditions, including acute leukaemias. It is also reported to possess ANTIVIRAL, ANTIBACTERIAL, ANTIPROTOZOAL and IMMUNOMODULATING properties.
ametantrone acetate ➡ **ametantrone**.
ametazole [BAN] (betazole [INN]) is an (H_2) HISTAMINE RECEPTOR AGONIST, which can be used as a diagnostic agent to stimulate gastric secretion and so test for function.
amethocaine [BAN] (tetracaine [INN, USAN]; Ametop™; Pontocaine™) is an ester series LOCAL ANAESTHETIC used by topical application to treat localized pain and irritation and in ophthalmic treatments.
amethopterin ➡ **methotrexate**.
Ametop™ ➡ **amethocaine**.
amezinium metilsulfate [INN] is a SYMPATHOMIMETIC and hypertensive formerly used in the treatment of hypotensive states.
amfebutamone ➡ **bupropion**.
amfenac [BAN, INN] (amfenac sodium [JAN, USAN]; AHR 5850D) is one of the heteroaryl acetic acid series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.
amfenac sodium ➡ **amfenac**.
amfepramone ➡ **diethylpropion**.
amfetamine ➡ **amphetamine**.
amfetaminil [INN] (amphetaminil; N-cyanobenzylamphetamine; AN1) is an AMPHETAMINE derivative, a CNS STIMULANT and PSYCHOTROPIC.
amfonelic acid [BAN, INN, USAN] (NSC 100638; Win 25978) is a naphthyridinecarboxylic acid derivative, a dopamine UPTAKE INHIBITOR and CNS STIMULANT.
Amias™ ➡ **candesartan cilexetil**.
Amicar™ ➡ **aminocaproic acid**.
amicarbalide [BAN, INN] is a veterinary ANTIPROTOZOAL.
amicycline [INN, USAN] is a (tetracycline) ANTIBIOTIC, which can be used as a broad-spectrum ANTIBACTERIAL.
amidefrine mesilate ➡ **amidephrine**.
amidephrine [BAN] (amidephrine mesylate [USAN]; amidefrine mesilate [INN]) is a phenylethylamine derivative, a (selective α_1-subtype) α-ADRENOCEPTOR AGONIST and a VASOCONSTRICTOR which can be used as a topical nasal DECONGESTANT.
amidephrine mesylate ➡ **amidephrine**.
Amidone™ ➡ **methadone**.
amidopyrine (aminophenazone [INN] and many other names) is one of the pyrazone series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. The risk of agranulocytosis is high and so it is rarely used. It has been used as the cyclamate salt, aminophenazone cyclamate [INN], and the butyl iodide, butopyrammonium iodide [INN].
amifenazole ➡ **amiphenazole**.
amifloxacin [BAN, INN, USAN] (amifloxacin mesylate [USAN]) is a fluoroquinolone derivative with ANTIBACTERIAL properties.
amifloxacin mesylate ➡ **amifloxacin**.
amifostine [BAN, INN, USAN] (Ethiofos™ ; Ethyol™; Fosteamine™) is an organic thiophosphate, a prodrug dephosphorylated *in vivo* by alkaline phosphatases to the active free thiol drug which acts as an ANTIOXIDANT & FREE-RADICAL SCAVENGER. This recently introduced specialist agent is used by injection to reduce neutropenia-related risk of infection involved in treatment of ovarian carcinoma with **cyclophosphamide** or **cisplatin** (reactive metabolites are scavenged). It is also a radioprotective and MUCOLYTIC AGENT, and protects mice against cisplatin-induced nephrotoxicity and myelosuppression.
amikacin [BAN, INN, USAN] (amikacin sulfate [JAN, USAN]; Amikin™) is a semisynthetic (aminoglycoside) ANTIBIOTIC derived from **kanamycin A**. Clinically, it has ANTIBACTERIAL properties against Gram-negative and other bacterial infections, and can be used systemically.
amikacin sulfate ➡ **amikacin**.
Amikin™ ➡ **amikacin**.
amiloride [BAN, INN] (amiloride hydrochloride [USAN]; Berkamil™; Midamor™ etc.) is a (potassium-sparing) DIURETIC which can be used as an ANTIHYPERTENSIVE (often in combination with thiazide diuretics or β-ADRENOCEPTOR ANTAGONISTS).
amiloride hydrochloride ➡ **amiloride**.
aminacrine [BAN] (aminoacridine [INN]; aminacrine hydrochloride [USAN]; 9-aminoacridine; Bonjela™; Medijel™) is a major broad-spectrum (quinoline) ANTIBACTERIAL related to **acridine**. It is also a (voltage-gated) POTASSIUM-CHANNEL BLOCKER.
aminacrine hydrochloride ➡ **aminacrine**.
aminoacetic acid ➡ **glycine**.
aminoacridine ➡ **aminacrine**.
9-aminoacridine ➡ **aminacrine**.
L-N^G-aminoarginine ➡ **L-NNA**.
aminobenzoate ➡ **lisadimate**.
aminobenzoic acid [USAN] (para-aminobenzoic acid; 4-aminobenzoic acid; pABA; PABA; vitamin H') is a VITAMIN produced by yeasts and bacteria. It is a component of **folic acid** and a bacterial growth factor; the sulphonamides and sulphones inhibit the synthesis of folate by competing with *p*-aminobenzoic acid for incorporation (see SULPHONAMIDES). Unrelated to this, it is incorported into topical preparations with other agents as a SUNSCREEN AGENT. A salt, potassium benzoate (Potaba™), is used orally in the treatment of disorders associated with excess fibrous tissue, such as scleroderma and Peyronie's disease.
4-aminobenzoic acid ➡ **aminobenzoic acid**.
4-aminobutanoic acid ➡ **γ-aminobutyric acid**.

γ-aminobutyric acid (GABA, 4-aminobutanoic acid; piperidic acid; piperidinic acid) is an amino acid widely distributed in higher plants and in nervous tissue of animals. It is a natural inhibitory transmitter at synaptic junctions in certain regions of the mammalian brain and spinal cord (see GABA RECEPTOR AGONISTS). Agents that inhibit or mimic its actions are important drugs, e.g. benzodiazepines (see BENZODIAZEPINE BINDING-SITE AGONISTS). GABA administered therapeutically has been claimed to have value in cerebral disorders, and also ANTIHYPERTENSIVE actions.

aminocaproic acid [BAN, INN, USAN] (ε-leucine; Amicar™; Epsikapron™) aminohexanoic acid is an ANTIFIBRINOLYTIC and HAEMOSTATIC. It is used in the treatment and prophylaxis of haemorrhage associated with excessive fibrinolysis.

aminodeoxykanamycin ➡ **bekanamycin**.

2-aminoethanethiol ➡ **cysteamine**.

aminoethylsulphonic acid ➡ **taurine**.

aminoglutethimide [BAN, INN, USAN] (Ba 16038; Ciba 16038; ND 1966; Cytadren™; Orimeten™) is a glutarimide that was originally used as an ANTICONVULSANT, but was withdrawn due to adrenotoxicity. It is now used as a non-steroid AROMATASE INHIBITOR (oestrogen synthetase inhibitor) and by its inhibitory action both on the adrenal cortex (cholesterol to D5-pregnenalone and other biosynthetic steps), and also on peripheral aromatase, blocks the production of adrenal steroids and conversion of androgens to oestrogens. It produces a state of 'chemical adrenalectomy' and is used in ANTICANCER therapy, specifically for treatment of breast cancer in postmenopausal women and sometimes for prostate cancer in men (when it requires corticosteroid supplements). It is also used for the treatment of Cushing's syndrome, secondary hyperaldosteronism and oedema.

aminoguanidine ➡ **pimagedine**.

2-aminoheptane ➡ **tuaminoheptane**.

aminohippurate sodium ➡ **aminohippuric acid**.

aminohippuric acid [USAN] (aminohippurate sodium [USAN]; PAHA) is excreted by the proximal tubular secretion in the kidney. It can be used as a diagnostic agent in measuring renal function.

α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid ➡ **AMPA**.

5-aminomitonafide ➡ **amonafide**.

AMINOPEPTIDASE INHIBITORS act on enzymes that cleave the *N*-terminal residue from oligopeptides or from proteins. They can be divided into classes on the basis of their functional characteristics. These classes are dealt with separately in terms of their alternate names, notable substrates and inhibitors. A number of these enzymes may be inhibited to enhance the action of endogenous peptides, though in most cases this has been achieved only experimentally. However, there is therapeutic interest in potentiating or enhancing some aspects of the action of mediator peptides, though often inhibition of more than one type of peptidase is necessary. For instance, inhibition of degradation of **enkephalin** has been shown to be analgesic, though inhibition of both aminopeptidase N and neutral endopeptidase is required in order to be effective.

Aminopeptidase N (EC 3.4.11.2; aminopeptidase M; CD13) is a zinc-metalloproteinase located in the plasma membrane. Notable neuropeptide substrates include: **leu-enkephalin**, **met-enkephalin**, **β-endorphin** and **γ-endorphin**. Inhibitors include **amastatin** and **actinonin**.

Aminopeptidase A (EC 3.4.11.7; aspartate aminopeptidase; glutamyl aminopeptidase; BPI/6C3 antigen) is a Ca^{2+}-activated zinc-metalloproteinase, which is located in the plasma membrane. Notable neuropeptide substrates include: **angiotensin I**, **angiotensin II** and met-enkephalin. Inhibitors include amastatin.

Aminopeptidase B (EC 3.4.11.6; aminopeptidase M1) is thought to be a chloride-activated-thiolproteinase. Substrates of interest include leu-enkephalin, met-enkephalin and **bradykinin**. Inhibitors include **arphamenine A** and **arphamenine B**.

Aminopeptidase P (EC 3.4.11.9; prolyl aminopeptidase) is located in the plasma membrane and is a zinc-metalloproteinase. Notable neuropeptide substrates include: bradykinin, **substance P**, **neuropeptide Y**, **peptide YY** and **enterostatin**. Inhibitors include **apstatin**.

Dipeptidylpeptidase IV (EC 3.4.11.5; postproline dipeptidyl aminopeptidase; CD26) is a serine protease located in the plasma membrane. Notable neuropeptide substrates include: substance P, neuropeptide Y, peptide YY and enterostatin. Inhibitors include **diprotin A** (Ile-Pro-Ile) and **diprotin B** (Val-Pro-Leu)

Pyroglutamyl aminopeptidase II (TRH degrading hormone) is a zinc-metalloproteinase, located in the plasma membrane. Notable neuropeptide substrates include **thyrotrophin-releasing factor**. There is no specific inhibitor.

Roques, B.P. *et al.* (1990) Neutral endopeptidase-24.11 inhibitors: from analgesics to antihypertensives? *Trends Pharmacol. Sci.*, **11**, 245-249.

Skidgel, R.A. (1992) Bradykinin-degrading enzymes: Structure, function, distribution, and potential roles in cardiovascular pharmacology. *J. Cardiovasc. Pharmacol. Suppl.*, **9**., 20, 4-9.

Turner, A.J. *et al.* (1994) Neuropeptidases: candidate enzymes and techniques for study. *Biochem. Soc. Trans.*, **22**, 122-127.

Lloyd, G.S. *et al.* (1995) Aminopeptidase P: cation activation and inhibitor sensitivity are substrate-dependent. *Biochem. Soc. Trans.*, **23**, 60S.

aminophenazone ➡ **amidopyrine**.

aminophenazone cyclamate ➡ **amidopyrine**.

2-amino-5-phosphonopentanoic acid ➡ **APV**.

aminophylline [BAN, INN, USAN] (theophylline ethylenediamine; Phyllocontin™ etc.) is a compound of **theophylline** with **ethylenediamine**. It acts as a (P1 purinoceptor) ADENOSINE RECEPTOR ANTAGONIST. It has DIURETIC, SMOOTH MUSCLE RELAXANT, CARDIAC STIMULANT and VASODILATOR properties. Clinically, it is mainly used as a BRONCHODILATOR in treating obstructive airways disease including as an ANTIASTHMATIC in acute attacks.

aminopromazine ➡ **proquamezine**.

3-aminopropanoic acid ➡ **β-alanine**.

6-aminopurine ➡ **adenine**.

aminorex [BAN, INN, USAN] is a phenyloxazole derivative, formerly used orally as an APPETITE SUPPRESSANT. It has been withdrawn because of association with primary pulmonary hypertension.

4-aminopyridine (fampridine [INN]; 4-AP; 4-pyridinamine; γ-pyridylamine) is a POTASSIUM-CHANNEL BLOCKER and NEUROTRANSMITTER-RELEASE-MODIFYING AGENT, which can enhance release of acetylcholine from nerve terminals, and has been used in treatment of certain skeletal muscle weakness disorders. It has been used to reverse the effects of *competitive* NEUROMUSCULAR BLOCKING AGENTS used in anaesthesia.

aminosalicylate sodium [USAN] (pamisyl sodium) is a derivative of 4-aminosalicylic acid and is an ANTIBACTERIAL and ANTITUBERCULAR AGENT.

aminosalicylate sodium ➡ **aminosalicylic acid**.

aminosalicylic acid [USAN] (4-aminosalicylic acid; PAS; aminosalicylate sodium [USAN]; phenyl ester = phenylaminosalicylate [BAN, USAN]; fenamisal [INN]) is an ANTIBACTERIAL used as an ANTITUBERCULAR, often in the form of the sodium, potassium or calcium salt.

4-aminosalicylic acid ➡ **aminosalicylic acid.**
5-aminosalicylic acid ➡ **mesalazine.**
[L-α-aminosuberic acid^{7,23}]-β-AMP7-28 ➡ **[Asu^{7,23}]-β-ANP(7-28).**
aminosuccinic acid ➡ **aspartic acid.**
aminosultopride ➡ **amisulpride.**
amiodarone [BAN, INN, USAN] (Cordarone™) is a benzofuran derivative, a (Class III) **ANTIARRHYTHMIC** used mainly to treat ventricular arrhythmias.
amiphenazole [BAN, INN] (DHA 245; amifenazole) is a phenylthiazole and has similar properties as **doxapram** as a **CNS STIMULANT** and **RESPIRATORY STIMULANT**. It was previously used intramuscularly to treat barbiturate and other **CNS DEPRESSANT** overdose.
amiprilose [INN] (amiprilose hydrochloride [USAN]; SM 1213) is a glucofuranose derivative, an **IMMUNOMODULATOR, ANTIINFLAMMATORY** and **ANTIVIRAL AGENT**. It exhibits antipsoriatic activity, and has been tried in the treatment of rheumatoid arthritis.
amiprilose hydrochloride ➡ **amiprilose.**
amisulpride [INN] (aminosultopride; AST; DAN 2163) is one of the substituted benzamides with properties similar to **sulpiride**. It is a (D_2/D_3) **DOPAMINE RECEPTOR ANTAGONIST**. It has **ANTIEMETIC** and **ANTISPASMODIC** actions, and has been used as an **ANTIPSYCHOTIC** and psychotherapeutic for autism.
amitraz [ANSI, BAN, BSI, INN, ISO JMAF, USAN] is a complex amide that has mixed actions, showing **α-ADRENOCEPTOR AGONIST** activity, and also is an agonist at locust neuronal octopamine receptors. It inhibits release of insulin from the pancreas, so is a potential **HYPOGLYCAEMIC**. It is also has **SCABICIDAL** properties and can be used as a veterinary **ACARICIDE**.
amitryptyline [BAN, INN] (amitriptyline hydrochloride [USAN]; Elavil™; Lentizol™; Tryptizol™ among many) is converted to its active metabolite **desipramine**, one of the tricyclic class of monoamine **UPTAKE INHIBITORS**. It is used as an oral **ANTIDEPRESSANT**, with **ANTIMUSCARINIC** and **SEDATIVE** effects when used therapeutically. It can also be used as the N-oxide = amitryptylinoxide [INN].
amitriptyline hydrochloride ➡ **amitryptyline.**
amitryptylinoxide ➡ **amitryptyline.**
amlexanox [INN, JAN, USAN] (AA 673; Solfa™) is a benzopyranopyridine derivative, a **LIPOXYGENASE INHIBITOR**, which interferes with leukotriene synthesis and mediator release, and is a (cAMP type) **PHOSPHODIESTERASE INHIBITOR**. It can be used as an **ANTIALLERGIC** in **ANTIASTHMA** treatment.
amlintide ➡ **amylin.**
amlodipine [BAN, INN] (amlodipine maleate [USAN]; Istin™; Norvasc™) is a dihydropyridine **CALCIUM-CHANNEL BLOCKER**. Clinically, it can be used as an **ANTIANGINAL** and **ANTIHYPERTENSIVE**.
amlodipine maleate ➡ **amlodipine.**
ammonium bituminosulphonate ➡ **ichthammol.**
ammonium carbonate [USAN] (carbonic acid ammonium salt; diammonium carbonate; sal volatile) is actually a variable mixture of ammonium carbamate and ammonium carbonate. It has **EXPECTORANT** properties.
ammonium salicylate is the ammonium salt of **salicylic acid** and is one of the salicylate series of **NSAID ANALGESICS**. It is used topically as a **COUNTER-IRRITANT** (rubefacient or topical analgesic) for symptomatic relief of underlying pain. It is a component of some compound topical preparations, e.g. Aspellin™ and Radian B™.
amobarbital ➡ **amylobarbitone.**
amobarbital sodium ➡ **amylobarbitone.**
amocarzine [INN] is an antifilarial **ANTHELMINTIC**.
amodiaquine [BAN, INN, USAN] is a 4-aminoquinoline **ANTIMALARIAL** agent, an analogue of **amopyroquine**.
AMOEBICIDAL AGENTS (antiamoebic agents; amoebicides) are used to treat or prevent infections caused by amoebic microorganisms, which are small unicellular organisms that prefer damp environments.

Although now classified as part of the kingdom Protista, phylum Rhizopoda, amoebae were originally classified as Protozoa. Consequently, the term antiamoebic agent tends to be used as synonymous with **ANTIPROTOZOAL AGENT**, and a number of agents are effective against both.

One genus of amoebae responsible for a number of diseases are the Entamoeba, found particularly in the gastrointestinal tract of humans. *E. histolytica* invades and destroys the tissues of the gut wall causing amoebic dysentery and ulceration of the gut wall. Infection of the liver by this species causes amoebic hepatitis. *E. gingivalis*, found within the spaces between the teeth, is associated with periodontal disease and gingivitis.

In practice, treatment of amoebiasis can be divided into treatment of bowel lumen amoebiasis, and tissue-invading amoebiasis. The bowel lumen infection, which is usually asymptomatic, may be in trophozoites form (non-infective) or in cysts form (infective); and treatment is directed at eradicating cysts with a luminal amoebicide (e.g. **diloxanide**). The tissue-invading amoebiasis (giving rise to dysentery, hepatic amoebiasis and liver abscess) must be treated with systemically active drugs (systemic amoebicides) active against trophozoites (e.g. **metronidazole, tinidazole**; also, in dangerously ill patients **dehydroemetine** may be used, which is less toxic than the parent **emetine** (derived from ipecacuanha). Sometimes antibiotics (e.g. **tetracycline**) are used concurrently to stop opportunist infections.

Goldsmith, R. *et al.* (eds) (1989) *Tropical Medicine and Parasitology*, Appleton & Lange, Norwalk, Conn.
Cook, G.C. (1990) *Parasitic Disease in Clinical Practice*, Springer-Verlag, Berlin.

amogastrin [INN, JAN] is a pseudopeptide, a (CCK_B or 'gastrin receptor') **CHOLECYSTOKININ RECEPTOR AGONIST**, and is a gastric acid secretion stimulant. It can be used as a diagnostic agent and pharmacological tool.
amonafide [INN] (M-FA 142; NSC 308847; 5-aminomitonafide) is a metabolite of **mitonafide**, a cytotoxic DNA intercalator under evaluation as an **ANTICANCER** and **ANTIVIRAL AGENT**.
amopyroquine [INN] is a 4-aminoquinoline **ANTIMALARIAL** agent, an analogue of **amodiaquine**.
amorolfine [BAN, INN, USAN] (Loceryl™) is an **ANTIFUNGAL** that can be used topically in the treatment of fungal skin and nail infections.
amoscanate [INN] is an **ANTHELMINTIC**.
amosulalol [INN] (amosulalol hydrochloride [JAN]) is a combined **α-ADRENOCEPTOR ANTAGONIST** and **β-ADRENOCEPTOR ANTAGONIST**. It can be used therapeutically as an **ANTIHYPERTENSIVE**.
amosulalol hydrochloride ➡ **amosulalol.**
amoxapine [BAN, INN, JAN, USAN] (Asendis™) is one of the dibenzoxazepines related to the tricyclic class of monoamine **UPTAKE INHIBITORS** and is used as an oral **ANTIDEPRESSANT**.
Amoxil™ ➡ **amoxycillin.**
amoxycillin [BAN] (amoxicillin [INN, JAN, USAN]; Amoxil™) is a (penicillin) **ANTIBIOTIC**, an analogue of **ampicillin**. It can be used clinically as a broad-spectrum **ANTIMICROBIAL** to treat a wide range of infections. It is not penicillinase-resistant, so is commonly combined with the penicillinase **ENZYME INHIBITOR** (**co-amoxclav**).
amoxydramine ➡ **diphenhydramine.**

amoxydramine camsilate ➡ **diphenhydramine**.

AMP ➡ **adenosine phosphate**.

AMPA (α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid) is a selective GLUTAMATE RECEPTOR AGONIST, which is selective for the AMPA subtype (previously called quisqualate receptors). It is bioisostere of **glutamic acid** and an analogue of **ibotenic acid**.

amphetamine [BAN] (amfetamine [INN]; amphetamine sulfate [USAN]; Benzedrine™) is (±)-1-phenyl-2-propylamine. The (*R*)-form is **levamphetamine**; the (*S*)-form is **dextroamphetamine**. The base, amphetamine, is a volatile oil that can be inhaled, whereas the sulphate is water-soluble. It is an (indirect-acting) SYMPATHOMIMETIC with both CNS STIMULANT (less than dextroamphetamine) and peripheral actions (greater than dextroamphetamine). It can be used as an APPETITE SUPPRESSANT, and a VASOCONSTRICTOR as an inhaled nasal DECONGESTANT. It is a drug of abuse on the controlled drug lists; clinical use is largely discontinued.

amphetamine sulfate ➡ **amphetamine**.

amphetaminil ➡ **amfetaminil**.

amphetaminotheophylline ➡ **fenethylline**.

Amphocin™ ➡ **amphotericin**.

amphotalide [INN] is an ANTIFUNGAL and ANTISCHISTOSOMAL AGENT.

amphotericin [BAN] (amphotericin B [INN]; AmBisome™; Amphocin™; Fungilin™; Fungizone™) is a (polyene group) ANTIBIOTIC produced by *Streptomyces nodosus*. It has ANTIFUNGAL properties and clinically it can be used systemically topically in the treatment of many fungal and yeast infections.

amphotericin B ➡ **amphotericin**.

ampicillin [BAN, INN, JAN, USAN] (ampicillin sodium [USAN]; Ampiclox™; Flu-Amp™; Omnipen™; Penbritin™; Totacillin™) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an oral ANTIBACTERIAL to treat Gram-positive and -negative infections.

ampicillin sodium ➡ **ampicillin**.

Ampiclox™ ➡ **ampicillin**.

ampiroxicam [BAN, INN] is a prodrug of **piroxicam**, one of the oxicam series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

amprolium [BAN, INN, USAN] is a methylpyridinium ANTIPROTOZOAL. Clinically, it can be used as an intestinal ANTICOCCIDIAL in human and veterinary practice.

amrinone [BAN, INN, USAN] (Inocor™) is a bipyridine and acts as a (type III) PHOSPHODIESTERASE INHIBITOR, and is similar to **milrinone**. It can be used when other drugs are ineffective as an (inotropic) CARDIAC STIMULANT in short-term HEART FAILURE TREATMENT.

amsacrine [BAN, INN, USAN] (Amsidine™) is a cytotoxic (DNA-polymerase inhibitor) agent with ANTICANCER and ANTIVIRAL activity.

Amsidine™ ➡ **amsacrine**.

amthamine is a substituted methylthiazole derivative, an (H_2) HISTAMINE RECEPTOR AGONIST.

α-amylase (alpha amylase [USAN]; THC 250) is an **enzyme** preparation, a concentrate of amylolytic enzymes of bacterial or animal origin. It is reported to have ANTIINFLAMMATORY activity. It can be used in enzyme-replacement therapy, as a digestive agent. But, supplementation of amylase activity is normally achieved by the administration of **pancreatin**, which has both amylase and protease activity.

amylin (islet amyloid polypeptide; IAPP; amlintide [USAN]; islet amyloid polypeptide, islet-associated polypeptide; insuloma polypeptide; diabetes associated peptide; DAP) is a 37 amino acid residue peptide with one intramolecular disulphide bridge. The structures of amylins from several mammalian species are known, showing high sequence homology. Amylin is a peptide component of amyloid deposits found in the pancreas of patients with non-insulin dependent (type 2) diabetes mellitus. It is a pancreatic islet hormone, co-stored and secreted with insulin, whose functions include regulation of glucose homeostasis. It is deficient in insulin dependent (type 1) and late stage type 2 diabetes. Its potential for treating diabetes is limited due to amyloidogenic properties (tendency to aggregate and poor solubility), though analogues with improved profile are under development. It is an AMYLIN RECEPTOR AGONIST, though some of its actions (e.g. vasodilatation) are due to it acting as a CALCITONIN GENE-RELATED PEPTIDE RECEPTOR AGONIST, or as a CALCITONIN RECEPTOR AGONIST.

AMYLIN RECEPTOR AGONISTS activate receptors of a seven-transmembrane G-protein-coupled receptor superfamily, which couple positively to the adenylyl cyclase (G_s) pathway recognizing **amylin** (islet amyloid polypeptide; IAPP; amlintide, islet amyloid polypeptide, islet-associated polypeptide; insuloma polypeptide; diabetes associated peptide; DAP). Amylin is a peptide pancreatic islet hormone, co-stored and secreted with insulin, whose functions include several aspects of regulation of glucose homeostasis. There is an interest in developing stable agonists to treat diabetes and possibly obesity. Some actions of amylin (e.g. vasodilatation) are not due to amylin receptor activation, but rather cross-talk and act as a CALCITONIN GENE-RELATED PEPTIDE RECEPTOR AGONIST or a CALCITONIN RECEPTOR AGONIST.

Rink, T.J. *et al.* (1993) Structure and biology of amylin. *Trends Pharmacol. Sci.*, **14**, 113-118.

Cooper, G.J.S. (1994) Amylin compared with calcitonin gene-related peptide: Structure, biology, and relevance to metabolic disease. *Endocr. Rev.*, **15**, 163-201.

Wimalawansa, S.J. (1997) Amylin, calcitonin gene-related peptide, calcitonin, and adrenomedullin: a peptide superfamily. *Crit. Rev. Neurobiol.*, **11**, 167-239.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci.*, Suppl., **19**, 1-98.

amyl nitrite [USAN] (isopentyl nitrite) is a nitric oxide (NO) donor, so is a NITRERGIC STIMULANT. It is a coronary VASODILATOR that may be used as an ANTIANGINAL. It is also an ANTIDOTE for cyanide poisoning (along with sodium nitrite and sodium thiosulphate).

AMYLIN RECEPTOR ANTAGONISTS inhibit the actions of agonists at receptors recognizing **amylin**. There are no selective agents; however, an analogue of calcitonin, **AC 187 (acetyl-[Asn^{30},Tyr^{32}]-salmon calcitonin$_{8-32}$)** acts mainly as an amylin receptor antagonist and inhibits several metabolic actions of amylin. Amylin$_{8-37}$ also acts as an antagonist.

Young, A.A. *et al.* (1994) Selective amylin antagonist suppresses rise in plasma lactate after intravenous glucose in the rat: Evidence for a metabolic role of endogenous amylin. *FEBS Lett.*, **343**, 237-241.

amylobarbitone [BAN] (amobarbital [INN, USAN]; amobarbital sodium [USAN]; Amytal™; Amytal Sodium™; Sodium Amital™) is a barbiturate with non-specific CNS DEPRESSANT, general HYPNOTIC/SEDATIVE properties. It is used both as an oral or injected hypnotic for insomnia, and as a sedative for anxiety. It is sometimes used as an ANTICONVULSANT/ANTIEPILEPTIC for acute episodes. Tuinal™ is a hypnotic mixture of amylobarbitone sodium and **quinalbarbitone sodium**.

amylocaine [BAN] is an ester series LOCAL ANAESTHETIC used topically for the local relief of pain.

Amytal™ ➡ **amylobarbitone**.

Amytal Sodium™ ➡ **amylobarbitone**.

AN 148 ➡ **methadone**.

AN1 ➡ **amfetaminil**.

AN 448 ➡ **mazindol**.

ANABOLIC AGENTS promote tissue growth by increasing metabolic processes involving protein synthesis. Most anabolic agents are androgens with a modified structure to enhance anabolic effects, and minimize others. Many have been produced. **Stanozolol** is a steroid which can be used to treat hereditary angio-oedema. **Oxymetholone** is used to treat aplastic anaemia. **Nandrolone** is similar to testosterone (though with far fewer masculinizing effects), and can be used to treat osteoporosis and aplastic anaemia. Some other agents with anabolic–androgenic steroid activity are **danazol**, **fluoxymesterone**, **metandienone**, **methyltestosterone** and **oxandrolone**.

Anabolic steroids are also used, usually illegally, by some athletes as an ergogenic aid (a technique or substance used for the purpose of enhancing performance). The doses used for these purposes are many times the therapeutic dose, and some products may be used that are licensed only as 'growth-promoters' in cattle rearing. The health risks are considerable and well documented.

A number of different agents are used as growth promoters, and use and licensing varies greatly between countries. In the USA, the Food and Drug Administration has allowed **androsterone**, **estradiol**, **progesterone**, **trenbolone** and **zeranol** to be registered.

Editorial (1982) Anabolics in meat production. *Lancet*, **1**, 721-722.

Hallagan, J.B. *et al.* (1989) Anabolic androgen steroid abuse in athletes. *N. Engl. J. Med.*, **321**, 1042-1046.

Farber, T.M. (1991) Anabolics: the approach taken in the USA. *Ann. Rech. Vet.*, **22**, 295-298.

Lukas, S.E. (1993) Current perspectives on anabolic-androgenic steroid abuse. *Trends Pharmacol. Sci.*, **14**, 61-68.

Anafranil™ ➡ **clomipramine**.

anagrelide [INN] (BL 4162A) is an imidazoquinazolinone, a **PLATELET AGGREGATION INHIBITOR** and **ANTITHROMBOTIC**, which has been tried in the treatment of thrombocytosis and primary thrombocythaemia.

anakinra [USAN] (rec interleukin-1 receptor antagonists (human); recIL-1ra (human); IL-1 inhibitor; N^2-L-methionylinterleukin I receptor antagonist (human isoform x reduced); IL-1ra; I RAP) is a recombinant nonglycosylated human **INTERLEUKIN RECEPTOR ANTAGONIST** active against IL-1. IL-1 inhibitor itself was isolated from the urine of patients with monocytic leukaemia, and acts as an inhibitor of the actions of IL-1. Recombinant IL-1ra is the non-glycosylated form of the naturally occurring protein (MW *c.* 17 kD) cloned and expressed in *E. coli*. The inhibitor action appears to result from competition with IL-1 for binding to cell-surface receptors; i.e. it is a **CYTOKINE RECEPTOR ANTAGONIST**. Clinical investigations are in progress to evaluate potential therapeutic use in the treatment of sepsis, chronic myelogenous leukaemia and rheumatoid arthritis.

ANALGESICS are drugs that relieve the sensation of pain. Because pain is a subjective experience, arising from many causes, there are many ways that drugs can be used to relieve it. However, the term analgesic is best restricted, from a pharmacological point of view, to two main classes of drugs.

(1) *Narcotic analgesics* or *opioid analgesics*, typified by **morphine**, have powerful actions on the CNS, and act to alter the perception of pain. Because of the numerous possible side-effects, crucially dependence (habituation, 'addiction'), this class is usually used under strict medical supervision and are only available on prescription or OTC in very low doses.

(2) *Non-narcotic analgesics* (NSAIDs), typified by **aspirin**, which have no tendency to produce dependence, but are by no means free of side-effects. This class is referred to by many names, most commonly *non-steroidal antiinflammatory drugs* (NSAIDs). The latter term refers to the valuable antiinflammatory action of some members of the class. This class is used for a variety of purposes, such as treating mild aches and pains, for fever (see **ANTIPYRETICS**) and rheumatoid arthritis (at higher dosages), see **ANTIINFLAMMATORY AGENTS**.

Apart from these two main classes, there are other drugs that are sometimes referred to as analgesic because of their ability to relieve pain (e.g. local anaesthetics are sometimes referred to as local analgesics in the USA). Also, **COUNTER-IRRITANTS** (rubefacients) may be called analgesics, though their exact mechanism of action is not clear. Some specific sorts of pain respond to unusual agents not normally classified as analgesics; e.g. **carbamazepine** in the treatment of trigeminal neuralgia. Many other mechanisms of analgesic action are theoretically, or experimentally, possible. See also **NSAID ANALGESIC**; **OPIOID ANALGESIC**.

anandamide (arachidonylethanolamide) is an eicosanoid (an amide of **arachidonic acid**) which has been isolated from porcine brain. It is a **CANNABINOID RECEPTOR AGONIST**, and produces short-lived cannabinoid-like actions. It is a putative endogenous ligand at cannabinoid receptors.

Anaprox™ ➡ **naproxen**.

anaritide [BAN, INN] (anaritide acetate [USAN]) is a synthetic 25-residue peptide version of the endogenous **HYPOTENSIVE** atrial natriuretic peptide, an **ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONIST**. It has **ANTIHYPERTENSIVE** and **DIURETIC** properties, though its clinical application is not established.

anaritide acetate ➡ **anaritide**.

anastrozole [BAN, USAN] (ZD 1033; ICI D1033; Arimidex™) is a non-steroid with selective **AROMATASE INHIBITOR** (oestrogen synthetase inhibitor) activity. It is used as an **ANTICANCER AGENT** for oral treatment of breast cancer.

anaxirone [INN] (NSC 332488; triglycidylurazole) has been investigated as an **ANTICANCER AGENT** and as a possible adjunct for bone marrow transplant therapy.

ancarolol [INN] is a **β-ADRENOCEPTOR ANTAGONIST** which can be used therapeutically as an **ANTIHYPERTENSIVE**.

Ancef™ ➡ **cephazolin**.

anchoic acid ➡ **azelaic acid**.

ancitabine [INN] (ancytabine; NSC 129220) is converted to **cytarabine** *in vivo*, and has been used as an **ANTICANCER AGENT** with **ANTIVIRAL** activity.

Ancobon™ ➡ **flucytosine**.

ancrod [BAN, INN, USAN] (Arvin™) chemically is an **ENZYME** derived from a protease constituent of the venom of the Malaysian pit viper (*Agkistrodon rhodostoma*). It is an **ANTICOAGULANT** that works by being an **ANTIFIBRINOGEN** that depletes fibrinogen. It can be used in the treatment of deep-vein thrombosis.

ancytabine ➡ **ancitabine**.

Andrews™ ➡ **calcium carbonate**; **magnesium carbonate**.

Andrews Salts™ ➡ **sodium bicarbonate**.

Androcur™ ➡ **cyproterone**.

ANDROGENS are predominantly male steroid sex hormones that act directly to stimulate the development of male sex organs, and male secondary sexual characteristics, by acting at receptors on target tissues. Production is under the control of the pituitary hormone, **corticotrophin**. In men, androgenic steroids are produced primarily by the testes, and the main form is **testosterone**. However, in both men and women, androgens are also produced by the adrenal glands, and in women small quantities are also secreted by

the ovaries. An excessive amount in women causes masculinization. There are also a number of synthetic androgens as well as natural hormones, used in medicine. They can be administered to make up hormonal deficiency (e.g. delayed puberty); for HRT (hormone replacement therapy) in menopausal women, and may also be used as anticancer treatment for sex-hormone-linked cancers (e.g. breast cancer in women). See ANTICANCER AGENTS.

Feminizing actions, particularly gynaecomastia, can occur in men receiving high doses of anabolic androgens. Androgens also have anabolic actions which promote tissue growth by increasing metabolic processes involving protein synthesis. Most anabolics are androgens with modified structure to enhance anabolic effects and minimize others. See ANABOLIC AGENTS.

Androgen antagonists are drugs that directly inhibit the actions of androgens, or indirectly inhibit production of androgens, and are also used in medicine. See ANTIANDROGENS; AROMATASE INHIBITORS.

Mooradian, A.D. *et al.* (1987) Biological actions of androgens. *Endocr. Rev.*, **8**, 1-28.
Swain, S.M., *et al.* (1990) Endocrine therapies of cancer, in *Cancer Chemotherapy: Principles and Practice*, (eds B.A. Chabner *et al.*), Lippincott, Philadelphia, pp. 59-109.

Android-10™ ➡ **methyltestosterone**.

Andropatch™ ➡ **testosterone**.

androstanolone ➡ **stanolone**.

androstanolone enanthate ➡ **stanolone**.

androstanolone propionate ➡ **stanolone**.

androstenediol dipropionate is a steroid, an ANABOLIC AGENT.

androstenedione is a steroid that occurs in numerous tissues as a hormonal metabolite, and is a constituent of urine. It is a natural precursor in the biosynthesis of OESTROGENS and the ANDROGEN **testosterone**. Its conversion to oestrogens is by the enzyme aromatase (oestrogen synthetase), which may be inhibited by AROMATASE INHIBITORS, and this latter class of agent is used in the treatment of oestrogen-dependent disorders, especially in ANTICANCER therapy.

androsterone is a steroid that can be isolated from male urine, and is also found in the form of glycosides. It is a secondary sex hormone, an ANDROGEN. In veterinary practice it is used as a growth promoter.

Androtest™ ➡ **testosterone**.

Anectine™ ➡ **suxamethonium chloride**.

aneurine ➡ **thiamine**.

Anexate™ ➡ **flumazenil**.

ANF ➡ **atrial natriuretic peptides**.

'Angel Dust' ➡ **phencyclidine**.

angiotensin I is a decapeptide formed from a precursor molecule angiotensinogen (a blood α_2-globulin) by the action of renin, an (aspartyl) protease enzyme. Mammalian angiotensin I exists in two forms with differing fifth amino acid residues according to species. A variant [Ile^5]angiotensin I ([Ile^5]AI) can be formed by renin from human, horse and hog plasma globulin, whereas [Val^5]angiotensin I ([Val^5]AI) is formed similarly from ox globulin. As ANGIOTENSIN RECEPTOR AGONISTS these forms of angiotensin I are biologically virtually inactive, but are quickly converted in the blood circulation to corresponding octapeptides, **angiotensin II**, through the C-terminal deletion of two residues by angiotensin-converting enzyme (ACE). Angiotensin I can be used as a pharmacological tool in experimental studies.

[Ile^5]angiotensin I ➡ ***angiotensin* I**.

[Val^5]angiotensin I ➡ **angiotensin I**.

angiotensin II [INN] ([Ile^5]AII) is an octapeptide formed physiologically from the (biologically inactive) decapeptide precursor **angiotensin I** by angiotensin-converting enzyme (ACE). As an ANGIOTENSIN RECEPTOR AGONIST it has potent actions on smooth muscle, is one of the most potent vasoconstrictor agents known, and is a hypertensive and CARDIAC STIMULANT. It also stimulates the release of aldosterone from the adrenal gland. Different species produce peptides differing in the fifth amino acid residue ([Val^5]AII or [Ile^5]AII) (see angiotensin I); both show similar biological activity and experimentally tend to be used interchangeably.

[Ile^5]angiotensin II ➡ **angiotensin II**.

[Val^5]angiotensin II ➡ **angiotensin II**.

angiotensin II$_{2-8}$ ➡ **angiotensin III**.

angiotensin III (angiotensin II$_{2-8}$; AII$_{2-8}$) is a heptapeptide formed naturally from **angiotensin II** on N-terminal deletion of two residues by blood-borne aminopeptidases. As an ANGIOTENSIN RECEPTOR AGONIST it has a different pharmacological spectrum, notably in stimulating aldosterone secretion, and in effecting some CNS processes. Its precise physiological role remains to be elucidated.

[des-Phe^8]angiotensin II ➡ **angiotensin1-7**.

angiotensin IV (AII$_{3-8}$) is thought to be a natural metabolite of the angiotensin degradation pathway. As an ANGIOTENSIN RECEPTOR AGONIST, it is a pharmacological tool, and has been hypothesized to have a distinct receptor.

angiotensin$_{1-7}$ ([des-Phe^8]AII) is formed naturally on C-terminal deletion of **angiotensin I** by endopeptidases (EC 3.4.24.15 and 24.11; 24.26). The truncated sequence [des-Asp^1]-AI (i.e. AI$_{2-10}$) may be formed by aminopeptidases, and so allow formation of angiotensin1-7 via ACE degradation. As an ANGIOTENSIN RECEPTOR AGONIST it has a distinct pharmacology; it does not cause vasoconstriction, aldosterone release etc., but does release vasopressin and stimulates prostaglandin production; may have its own receptors.

angiotensinamide [BAN, INN] (Hypertensin™) is the [Asp^1]-amide derivative of **angiotensin II**. It is an ANGIOTENSIN RECEPTOR AGONIST, and is preferred for pharmacological and clinical investigations, showing identical activity to the parent compound. It is a VASOCONSTRICTOR and hypertensive.

ANGIOTENSIN RECEPTOR AGONISTS are a family of potent agents with notable actions on the cardiovascular system and electrolyte balance, but have many other possible pathophysiological functions, including a putative central neurotransmitter role.

The peptides are normally formed from a precursor molecule – angiotensinogen – an α_2-globulin in the blood, by the action of a 340 amino acid glycoprotein called renin, which acts as an aspartyl protease enzyme (see RENIN INHIBITORS). Renin, and its precursor protein, are both stored in the juxtaglomerular cells of the kidney, and release is controlled by three different pathways within the kidney sensitive to Na^+-transport, blood vessel stretch and β_1-adrenoceptor activation, respectively. Overall, activation of the renin–angiotensin systems is hypertensive, but serves to increase renal perfusion.

The relationships and actions of the members of the angiotensin peptides formed within the body pathways is complex. Cleavage of angiotensinogen initially forms the decapeptide **angiotensin I** (AI), which has little cardiovascular potency, but is immediately converted to an octapeptide, **angiotensin II**, through the C-terminal deletion of two residues, by angiotensin-converting enzyme (ACE) (EC 3.4.15.1, kininase II, dipeptidyl carboxypeptidase A).

This proteolytic enzyme is found in plasma and elsewhere, but is particularly associated with the vascular endothelium within the lungs; and conversion takes place to a major extent on a single passage of blood through the lungs. ACE is a polymorphic enzyme, where genotypic humans variants are thought to be associated with increased propensity to myocardial infarction and certain other disease states. Drugs that are ACE inhibitors are used in the treatment of hypertension and heart failure, and are discussed under another heading, **ACE INHIBITORS**.

Angiotensin II (AII) is one of the most potent vasoconstrictors known, and accounts for most of the endogenous activity of the angiotensin peptide family, including vasoconstriction in cutaneous, splanchnic and renal beds. It has few actions on other smooth muscle, but increases the rate and force of the heart. It has actions within the CNS that suggest a role in control of thirst and appetite for salt.

Angiotensin III (AII_{2-8}) is a heptapeptide formed from angiotensin II on N-terminal deletion by blood-borne aminopeptidases. It has a different pharmacological spectrum, notably in stimulating aldosterone secretion, and in effecting some CNS processes.

Angiotensin$_{1-7}$ (or [des-Phe^8]-AII) is formed on C-terminal deletion of AI by endopeptidases (24.15; 24.11; 24.26), has a distinct pharmacology and may have its own receptors. **Angiotensin IV** (AII_{3-8}) seems to show preferred binding at certain sites.

Angiotensin peptides act at two main receptor types called AT_1 and AT_2. In the rat and mouse, AT_{1A} and AT_{1B} receptors have been cloned and, though the product of different genes, have 94% homology, with small pharmacological and insignificant *functional*, differences. All these receptors are of the 7-transmembrane G-protein-coupled type.

The AT_1 receptors are activated by angiotensin II (AII) at much lower concentrations than AIII. There are no really selective agonists, but there are many selective antagonists – a number in clinical development or use (see **ANGIOTENSIN RECEPTOR ANTAGONISTS**). Coupling of this receptor type is to the $InsP_3$/DAG system. The main effects of angiotensin II in the body are mediated via this receptor type.

The AT_2 receptors have only about 32% homology with AT_1 receptors, and much less is known about their function. Here, AIII and AII are approximately equipotent, and the peptide derivative CGP 42112A has a selective agonist action at low concentrations (though it may inhibit at higher concentrations). There are some selective antagonists (e.g. **PD 123319**) (see **ANGIOTENSIN RECEPTOR ANTAGONISTS**). There are peculiarities about the coupling of this receptor that need to be resolved. A number of ion channels can be modulated, and there are some suggestions of effects linked through tyrosine phosphorylation of endogenous proteins. Regarding a role, the receptor is expressed at a very high level in the developing foetus. In the adult, expression is in the adrenals, uterus, ovary, heart and certain nuclei of the brain. The significance of this is not clear.

There appear to be other angiotensin binding sites, including the 'atypical' (tentatively named 'AT_3') sites in neuroblastoma cells, where it is associated with a nitric oxide-dependent rise in cGMP (these have a high affinity for **saralasin**, but low affinity for **losartan** and **PD 123177**) and also the **AIV**(AII_{3-8}) binding site (also called AT_4) associated with increased renal and cerebral blood flow (the latter possibly enhancing cognition).

Griendling, K.K. *et al.* (1994) Angiotensin II receptor pharmacology. *Adv. Pharmacol.*, **28**, 269-306.

de Gasparo, M. *et al.* (1995) Proposed update of angiotensin receptor nomenclature. *Hypertension*, **25**, 924-927.

Nahmias, C. *et al.* (1995) The angiotensin AT2 receptor: Searching for signal-transduction pathways and physiological function. *Trends Pharmacol. Sci.*, **16**, 223-225.

Hunyady, L. *et al.* (1996) The ligand binding site of the angiotensin AT_1 receptor. *Trends Pharmacol. Sci.*, **17**, 135-140.

ANGIOTENSIN RECEPTOR ANTAGONISTS act principally at the AT_1 and/or AT_2 receptors (see **ANGIOTENSIN RECEPTOR AGONISTS**). The first antagonists were derived in the early 1970s by substitutions within the angiotensin sequence. **Saralasin** ([Sar^1,Ala^8]-AII) blocks at both AT_1 and AT_2 receptors, and is quite active experimentally, but is not stable in the body and was not used clinically. The first nonpeptide antagonists, announced in the early 1980s, were imidazole-5-acetic acid derivatives (e.g. S 8307 and S 8308), and acted as lead compounds from which stepwise modifications (through EXP 6155, EXP 6803, EXP 7711) led to orally active agents. The first of these registered for clinical usage (in 1995 in the UK and USA) was **losartan**, which can be used as an **ANTIHYPERTENSIVE**. This, and several other nonpeptide antagonists under clinical development, are more active at AT_1 receptors. Examples include **candesartan**, **eprosartan**, **irbesartan**, **telmisartan**, **valsartan** and **zolasartan**.

There is currently little incentive to develop drugs that work by blocking angiotensin AT_2 receptors since the role of these in body function is not clear. Nevertheless, there are experimental agents that act at both receptors (e.g. **saralasin** and others that are selective for the AT_2 subtype (e.g. **PD 123319** and **PD 123177**).

The use of angiotensin receptor antagonists to treat hypertension is an obvious application. In fact, losartan also has a significant uricosuric effect with a decrease in plasma levels of uric acid that, in principle, could be harnessed therapeutically (e.g. in the treatment of gout). Also, there are trials in progress for its actions in left ventricular dysfunction and progressive renal impairment. One advantage of angiotensin receptor antagonists over ACE inhibitors seems to be an absence of propensity for causing an irritating cough. There may be future roles in modifying CNS function.

Timmermans, P.B.M.W.M. *et al.* (1993) Angiotensin II receptors and angiotensin II receptor antagonists. *Pharmacol. Rev.*, **45**, 205-251.

Edmunds, J.J., *et al.* (1994) Medicinal chemistry of AT_2 receptors, in *Angiotensin Receptors*, (eds J.M. Saavedra and P.B. Timmermans), Plenum Press, New York, pp. 1-16.

Johnston, C.I. (1995) Angiotensin receptor antagonists: focus on losartan. *Lancet*, **346**, 1403-1407.

Goodfriend, T.L. *et al.* (1996) Angiotensin receptors and their antagonists. *N. Engl. J. Med.*, **334**, 1649-1654.

Anhydrol Forte™ ➡ **aluminium chloride**.

Anidox™ ➡ **diphenylpyraline**; **phenylpropanolamine**.

anileridine [BAN, INN, USAN] (anileridine hydrochloride [USAN]; MK 89) is one of the phenylpiperidine series, a (μ) **OPIOID RECEPTOR AGONIST** and **OPIOID ANALGESIC**.

anileridine hydrochloride ➡ **anileridine**.

anilopam [INN] (anilopam hydrochloride [USAN]; PR 786-723) is a benzazepine, an **OPIOID RECEPTOR AGONIST** and **OPIOID ANALGESIC**.

anilopam hydrochloride ➡ **anilopam**.

anipamil [INN] a bicyclic compound, a **CALCIUM-CHANNEL BLOCKER**. It has been investigated for use as an **ANTIHYPERTENSIVE** and (coronary) **VASODILATOR**.

aniracetam [INN, USAN] (Ro 13-5057) is one of a group related to **piracetam**, and has been used as a **NOOTROPIC AGENT** (cognition enhancer).

anirolac [INN, USAN] is one of the heteroaryl acetic acid series of **CYCLOOXYGENASE INHIBITORS** with **NSAID ANALGESIC**, **ANTIINFLAMMATORY** and **ANTIPYRETIC** activity.

anisodine (daturamine; α-hydroxyscopolamine) is an

ester of scopine with the unusual acid anisodinic acid. It is a minor alkaloid from *Datura sanguinea* (Solanaceae), an impurity in commercial **scopolamine**, and is present in many Chinese plants. It is a MUSCARINIC CHOLINOCEPTOR ANTAGONIST with ANTISPASMODIC properties.

anistreplase [BAN, INN, USAN] (Eminase™; Iminase™) is an ENZYME, a FIBRINOLYTIC of the plasminogen activator group, forming plasmin which degrades fibrin so breaking up thrombi, thus acting as a THROMBOLYTIC. Chemically, it is a *p*-anisoyl derivative of a complex of (human) plasminogen with (bacterial) streptokinase, which is converted in the blood to active enzyme by removal of the *p*-anisoyl group. Therapeutically, its thrombolytic actions are used in the acute treatment of myocardial infarction.

ANP ➡ **atrial natriuretic peptides**.

ANP 235 ➡ **meclofenoxate**.

ANP 3401 ➡ **cinametic acid**.

[Asu^{7,23}]-β-ANP(7-28) ([L-α-aminosuberic acid^{7,23}]-β-AMP$_{7-28}$) is reported to be an ATRIAL NATRIURETIC PEPTIDE RECEPTOR ANTAGONIST selective for the type A (ANP$_A$) receptor subtype.

Anquil™ ➡ **benperidol**.

Antabuse™ ➡ **disulfiram**.

ANTACIDS are agents used to neutralize gastric acid, so raising gastric pH. This inhibits peptic enzyme activity, which is greatly inhibited above pH 5. Antacids are useful for some sorts of hyperacidity causing the symptoms of dyspepsia, exacerbated by alcohol and NSAID drugs. Although antacids give symptomatic relief of the dyspepsia, gastritis and oesophagitis, there is little objective evidence of accelerated healing of peptic ulcers (gastric or duodenal). Antacids taken alone effectively reduce acidity, but are commonly combined with other drugs, e.g. GASTRIC SECRETION INHIBITORS, demulcents and antifoaming agents (see CARMINATIVES). Antacids themselves have some side-effects such as uncomfortable flatulence, diarrhoea or constipation: bicarbonates and carbonates tend to cause flatulence; some aluminium-containing antacids cause constipation; whereas magnesium-containing antacids can cause diarrhoea (so different types are often used in combination). Examples include **aluminium hydroxide**, **calcium carbonate**, **magnesium carbonate**, **magnesium hydroxide**, **magnesium trisilicate** and **sodium bicarbonate**.

Colin-Jones, D.G. (1990) Acid suppression: how much is needed? *Br. Med. J.*, **301**, 564-565.

Hersey, S.J. *et al.* (1995) Gastric acid secretion. *Physiol. Rev.*, **75**, 155-190.

antalarmin is a synthetic non-peptide CORTICOTROPHIN-RELEASING FACTOR RECEPTOR ANTAGONIST which is more active at the CRF$_1$ subtype. It is used as a pharmacological tool.

antazoline [BAN, INN] (antazoline phosphate [USAN]; antazoline sulphate; imidazolamine; phenazoline; Antistin™ and many others) is an imidazoline, one of the ethylenediamine series of HISTAMINE H$_1$-RECEPTOR ANTAGONISTS. It is used topically for inflammation and allergic conjunctivitis, as eye-drops containing antazoline sulphate (together with the VASOCONSTRICTOR **xylometazoline hydrochloride** as Otrivine-Antistin™).

antazoline phosphate ➡ **antazoline**.

antazoline sulphate ➡ **antazoline**.

Antepsin™ ➡ **sucralfate**.

ANTHELMINTICS (anthelminthic drugs) are used to treat infections by parasitic organisms of the helminths family (*helminthos*, a worm). A large proportion of humankind harbours helminths of one species or another. In some cases there may only be minor discomfort, but in many cases there is serious morbidity. The form of treatment depends in part on the form of the infection. Intestinal forms include infection by tapeworms, including *Taenia* species. Tissue forms include *Trematodes* or flukes (genus *Schistosoma*, class Trematoda, phylum Platyhelminthes) cause schistosomiasis – or bilharziasis. The drugs that treat fluke infection by *Schistosoma mansoni*, *S. japonicum* and *S. haematobium* are called ANTISCHISTOSOMES. In all cases there is a complicated life cycle in which hosts other than humans are utilized. Treatment varies with the stage of the life cycle. Anthelmintic drugs, in order to act, must be capable of penetrating the cuticle of the worm or pass into its alimentary tract. They work in a variety of ways to damage the worm, causing paralysis, narcosis, or damaging its cuticle and so allowing partial digestion. Some drugs interfere with the metabolism, which may be very species-dependent.

Benzimidazoles include **albendazole**, **mebendazole** and **thiabendazole** and constitute a major class of broad-spectrum anthelmintics. They work through an effect on helminth microtubular function, with considerable selectivity in this respect for worms as compared to humans. Mebendazole is much used, and is usually the drug of choice, and is relatively free of side-effects. Albendazole is a more recent agent that is better absorbed. These agents can be used for most worm infections, but not for flukes.

Praziquantel is a broad-spectrum anthelmintic, and used in schistosomiasis (bilharziasis) infection by all three fluke species; and as a taenicide against tapeworm infection, including cysticercosis. It acts by altering calcium homeostasis in the parasites, which affects muscle in such a way that they are paralysed and die. Praziquantel is toxic to both adult and immature (cercaria) forms of flukes, and it is the latter that infects humans by penetrating the skin. This drug is remarkably free of serious unwanted effects in humans, and adverse effects at normal dose are due to reaction to dead organisms where infection has been extensive. **Metriphonate** is the drug of first choice for *Schistosoma haematobium* species. **Piperazine** can be used orally for roundworm (*Ascarius lumbricoides*) and threadworm (*Enterobius vermicularis*) infections. It paralyses the worm (possibly through acting as a GABA-mimetic) which is then expelled. It is particularly free of side-effects, and is an established drug that is inexpensive and available without prescription in many countries. However, it has been largely superseded by the benzimidazoles. **Diethylcarbamazine** is a piperazine derivative that can be used against filarial infections by *Wuchereria bancroft* or *Loa loa*. It is thought to work by altering the parasite in such a way as to enhance the host's immune reaction. **Levamisole** is used orally for infection by the roundworm (*Ascarius lumbricoides*), which it paralyses. **Niclosamide** was the drug of choice for tapeworm, but praziquantel is now preferred. The drug causes separation of the head and body of the mature worm, and a purgative is required to pass the body parts before ova are released. **Oxamniquine** is used orally to treat schistosomiasis, and affects both mature and immature forms of *Schistosoma mansoni*. The parasite concentrates the drug which affects DNA intercalation. It has fairly obtrusive side-effects, including gastrointestinal disturbances in a significant proportion of patients, and some unwanted CNS effects. Metriphonate is the drug of choice to treat schistosomiasis of the *Schistosoma haematobium* species only. It is a prodrug that gives rise to the active form **dichlorvos** *in vivo*. It is thought to be an anticholinesterase in the parasite, causing paralysis. **Pyrantel** is a broad-spectrum anthelmintic that seems to paralyse the parasite by neuromuscular blockade,

and is a relatively safe drug effective by mouth. **Ivermectin** is a semisynthetic derivative of the avermectins (macrolide antibiotics from *Streptomyces avermitilis*). It is the drug of choice for onchocerciasis (*Onchocerca volvulus*), which causes 'river-blindness', and may be used against *Wuchereria bancrofti*, which causes elephantiasis. It is thought to act by causing paralysis through chloride channel opening.

Moodley, M. *et al.* (1989) Treatment of neurocysticercosis: is praziquantel the new hope? *Lancet*, **1**, 262-263.
Cook, G.C. (1991) Anthelminthic agents: some recent developments and their clinical application. *Postgrad. Med. J.*, **67**, 16-22.
Fisher, M.H. *et al.* (1992) The chemistry and pharmacology of avermectins. Annu. *Rev. Pharmacol. Toxicol.*, **32**, 537-553.
Tanowitz, H.B. *et al.* (1993) Diagnosis and treatment of intestinal helminths. I. Common intestinal cestodes. *Gastroenterologist.*, **1**, 265-273.

anthiolimine [INN] is an ANTISCHISTOSOMAL AGENT.

Anthisan™ ➡ **mepyramine**.

ANTIAGEING AGENTS have yet to be discovered. However, many factors involved in physical deterioration have been identified, and some palliative measures to slow these processes, particularly in relation to cardiovascular disease, are well known, such as dietary restriction, exercise etc. There have been many investigations of the effects of placental extracts and other hormonal treatments but the results are unconvincing. More recently, there have been hopeful results from studies of antioxidants, superoxide dismutase modifiers and free-radical scavengers. Increasingly, gene-expression factors are recognized to form a vital role in the rate of ageing. Treatments in relation to age-related neurodegenerative diseases (e.g. Alzheimer's disease and Parkinson's disease) are of obvious importance, though more in relation to quality of life.

Knook, D.L. (1992) Antiaging strategies. *Ann. N. Y. Acad. Sci.*, **663**, 372-375.
Smith, M.A. *et al.* (1995) Radical ageing in Alzheimer's disease. *Trends Neurosci.*, **18**, 172-176.

ANTIALLERGIC AGENTS relieve the symptoms of the allergic reaction that follows exposure to specific substances to which the patient is allergic. These substances may be endogenous or exogenous. Because allergic reactions generally cause release of the natural local hormone **histamine**, within the body, antihistamines are often very effective for the symptomatic relief of allergic reactions (see HISTAMINE H_1-RECEPTOR ANTAGONISTS). For instance, allergic skin reactions to foreign proteins, contact-dermatitis, and insect stings and bites, show characteristic symptoms – including pruritus and erythaema – and these often respond well to treatment with antihistamines (including local application as a cream). On the other hand, some allergic reactions may cause marked inflammatory symptoms and here antihistamines may be insufficiently effective, and CORTICOSTEROIDS may be required. For example, in the treatment of atopic (allergic) bronchial asthma, long-term inhalation of corticosteroids may prevent asthma attacks and the associated bronchoconstriction and airways congestion. Similar antiinflammatory protection from the symptoms of allergic asthma may be achieved by chronic inhalation of one of a group of cromoglycate-related antiinflammatory substances which work by a mechanism that is not entirely clear – though they appear to prevent the release of histamine and other mediators. Examples are **sodium cromoglycate** and **nedocromil sodium**. Because allergic responses have an inflammatory component, ANTIINFLAMMATORY AGENTS may be used as adjuncts in antiallergic treatment. See also NSAID ANALGESICS.

ANTIANAEMIC AGENTS are used to treat anaemia; a deficiency in the oxygen-carrying capacity of the blood. This deficiency in the haemopoietic system can have several causes, and treatment depends on the cause. There may be a deficiency of factors necessary for formation of red blood cells (iron, folic acid, vitamin B_{12}), an excessive destruction of red blood cells (haemolytic anaemia due to autoimmune disease or where red cells are defective), or depression of the bone marrow (aplastic anaemia after exposure to radiation or certain drugs, and after certain infections).

Iron supplements are often used to treat iron-deficient anaemia. This might occur through severe haemorrhage, dietary deficiency or malabsorption of iron and in pregnancy. Supplements are usually salts of iron. Iron supplements may be administered orally, or sometimes by injection, in the form of **ferrous fumarate**, **ferrous gluconate**, **ferrous glycine sulphate** and **ferrous sulphate**.

Vitamin B_{12} (cyanocobalamin; extrinsic factor) is required in folate metabolism for DNA synthesis, and a deficiency leads to pernicious anaemia. It is used to supplement the diet after certain operations that remove the site of production of intrinsic factor, such as total gastrectomy. Deficiency causes megaloblastic haemopoiesis in which there is a marked disorder of formation of erythroblasts, and can be rectified by giving **hydroxocobalamin**.

Folic acid, or its various equivalents, is used to treat megaloblastic anaemia due to deficiency, which may be due to poor diet, malabsorption syndrome or to the use of certain drugs (e.g. methotrexate or antiepileptics). It is given prophylactically to pregnant women, neonates and in chronic haemolytic anaemia, including sickle-cell anaemia. In the treatment of deficiency, **calcium folinate**, **folinic acid** and folic acid are usually taken orally.

Erythropoietin (**epoietin alpha** and **epoietin beta** are recombinant forms) is a factor produced by the kidney that stimulates erythrocyte production and various other cells to produce haemopoietic growth factors – **colony-stimulating factors** (**mirimostim** and **sargramostim** are different recombinant forms) – which regulate the production of platelets, leucocytes and other blood cell types. Colony-stimulating factors (CSFs) stimulate blood cell progenitor cells to proliferate and differentiate. **Granulocyte-colony-stimulating factors** (**G-CSF**; **filgrastim**, **lenograstim**, **molgramostim** and **regramostim** are different recombinant forms) are produced by many cell types and are important in the development of all types of blood cells.

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ANTIANDROGENS (androgen antagonists) are a class of drugs that are hormone antagonists. Some drugs act directly to prevent the actions of the male sex hormone, **testosterone**, at receptors on its target tissues (e.g. **cyproterone**). Others act indirectly by preventing the formation of androgens by inhibiting the enzyme 5α-reductase (e.g. **flutamide**). Finally, some agents act indirectly by inhibiting the release of androgens (e.g. **buserelin**).

Cyproterone is used in high doses as an ANTICANCER AGENT for cancer of the prostate gland. It is also used in relatively moderate doses, for the treatment of precocious puberty in males, and for hypersexuality or sexual deviation in men (in whom the drug causes a condition of reversible sterility through a reduction in the production of sperm and a decrease in libido). It works by being a derivative of

progesterone with weak progestogenic activity. Thus it is a partial agonist at androgen receptors, competing with dihydrotestosterone for receptors in androgen-sensitive target tissues. By an effect on the hypothalamus it decreases the synthesis of gonadotrophins. It can also be used (orally at low dose, and in a preparation containing oestrogen) to treat acne, and excess body hair (hirsutism) in women. **Flutamide** is used orally as an anticancer agent for the treatment of prostate cancer. It inhibits the enzyme 5α-reductase, which converts 4-ene-oxysteroids (e.g. testosterone) irreversibly to the corresponding 5α-3-oxysterone *in vivo* (e.g. **dihydrotestosterone**). The latter has a greater affinity for androgen receptors, which then regulate specific gene expression. Inhibitors such as **finasteride**, which inhibit this enzyme, do not themselves bind to androgen receptors or have any direct hormonal actions, and do not inhibit the formation of other steroids, and so do not affect spermatogenesis. The main use of 5α-reductase inhibitors in men is to treat benign prostatic hyperplasia (BPH). In women they may have a role in treating hirsutism, male-pattern baldness and acne. Trials are now being conducted to examine a possible role in prophylaxis against prostate cancer. See **5α-REDUCTASE INHIBITORS**.

Buserelin is an analogue of the hypothalamic hormone, gonadotrophin-releasing hormone (**gonadorelin**). In chronic use it reduces pituitary secretion of gonadotrophin, which results in reduced secretion of sex hormones by the ovaries or testes. Buserelin is used to treat endometriosis, and also as an anticancer agent for cancer of the prostate gland. It is also used prior to *in vitro* fertilization.

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ANTIANGINAL AGENTS are used to relieve angina pectoris, an intense pain due to cardiac ischaemia, which is especially pronounced in exercise angina. The disease state often results from atheroma; a degeneration of the lining of the arteries of the heart due to build-up of fatty deposits. The objective is to relieve the heart of work, and to prevent spasm or to dilate coronary arteries. Unloading can be achieved by stopping exercise, preventing the speeding of the heart and by dilating the coronary arteries.

Beta-blockers, by inhibiting the effect of **adrenaline** and **noradrenaline** on the heart, prevent the normal increase in heart rate, and are very effective in preventing exercise angina. Examples of beta-blockers used for this purpose include **acebutolol**, **atenolol**, **metoprolol**, **nadolol**, **oxprenolol**, **pindolol**, **propranolol**, **sotalol** and **timolol**. See **β-ADRENOCEPTOR ANTAGONISTS**.

Many **VASODILATORS** act directly to relax vascular smooth muscle, so dilating blood vessels and thereby increasing blood flow (see **SMOOTH MUSCLE RELAXANTS**). For the acute treatment of anginal pain (and to a lesser extent in preventing angina attacks) the *nitrates* are widely used, e.g. **glyceryl trinitrate**, **isosorbide dinitrate**, **isosorbide mononitrate** and **pentaerythritol tetranitrate**. **CALCIUM-CHANNEL BLOCKERS** have more recently been introduced for the treatment of angina. They dilate the coronary arteries and peripheral small arteries, which helps reduce load on the heart. Examples include **amlodipine**, **diltiazem**, **nicardipine**, **nifedipine** and **verapamil**.

ANTIARRHYTHMIC AGENTS (antidysrhythmic agents) are used to treat a number of heart conditions characterized by irregularities of heart beat. They have been classified under the Vaughan Williams Scheme, though not all clinically used agents neatly fit these classes.

Class I (which has a number of subtypes) is mainly used to treat atrial and ventricular tachycardias, and contains a number of **SODIUM-CHANNEL BLOCKERS**, e.g. **disopyramide**, **flecainide**, **lignocaine**, **procainamide** and **quinidine**.

Class II, which is valuable for stress-induced tachycardias, contains **β-ADRENOCEPTOR ANTAGONISTS**, e.g. **metoprolol**, **propranolol**.

Class III, which is used for certain tachycardia syndromes, includes **amiodarone** (whose mechanism of action is not clear), **POTASSIUM-CHANNEL BLOCKERS** and the atypical β-blocker **sotalol**.

Class IV is used for atrial tachyarrhythmias and contains certain **CALCIUM-CHANNEL BLOCKERS**, e.g. **diltiazem** and **verapamil**.

In addition to drugs in these classes, others may be used for certain arrhythmias. **Digoxin** may be used for treatment of atrial fibrillation, **adrenaline** for asystolic cardiac arrest, **atropine** for sinus bradycardia, **methacholine** (rarely) for supraventricular tachycardia, **magnesium** salts for ventricular arrhythmias, and **calcium** salts for ventricular arrhythmia due to hyperkalaemia.

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ANTIASTHMATIC AGENTS relieve the symptoms of bronchial asthma or prevent recurrent attacks. The symptoms of asthma include bronchoconstriction (obstructive airways disease), often with over-secretion of fluid within the bronchioles and other breathing difficulties. Two main types of drugs are used: the first to treat acute attacks; and the second as prophylactics to prevent attacks

BRONCHODILATORS, which are **SMOOTH MUSCLE RELAXANTS**, work by dilating and relaxing the bronchioles. The most commonly used are the β-receptor stimulant drugs (which are **SYMPATHOMIMETICS**), notable examples include **salbutamol** and **terbutaline**. See also **β-ADRENOCEPTOR AGONISTS**. The β-adrenoceptor agonists are most commonly given by inhalation, and are mainly used for treating acute attacks (or immediately before exertion in exercise asthma), and are largely of the β_2-adrenoceptor agonist type. Other bronchodilator drugs, which work directly on the bronchioles, include **theophylline**.

The second group of antiasthmatics are **ANTIINFLAMMATORY** or **ANTIALLERGIC AGENTS**, such as the **CORTICOSTEROIDS** and **sodium cromoglycate**. These drugs prevent the release of local inflammatory mediators, which contribute to attacks, so preventing asthma attacks, and also provide symptomatic relief.

There are some other drugs, such as **ketotifen** (a drug that blocks a number of receptor types) and **ipratropium bromide** (an anticholinergic agent – a **MUSCARINIC CHOLINOCEPTOR ANTAGONIST**) that may occasionally be used (for instance, when the other types of drug are ineffective for some reason). **LIPOXYGENASE INHIBITORS** (e.g **zileutin**) represent a new type of antiinflammatory agent and are under clinical development, and in trials have shown improved pulmonary function.

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ANTIBACTERIAL AGENTS are a subset of ANTIMICROBIAL AGENTS normally used to treat infections caused by bacteria, on which they have a selective toxic action. A distinction can be made between 'bacteriostatic' agents that act primarily by arresting bacterial growth (e.g. sulphonamides, tetracycline antibiotics, **chloramphenicol**), as compared to the 'bactericidal' agents, which act primarily by killing bacteria (e.g. penicillin antibiotics, cephalosporin antibiotics, aminoglycoside antibiotics, **isoniazid**, **rifampicin**). See ANTIBIOTICS; ANTISEPTICS; SULPHONAMIDES.

antibiotic 3123L ➡ **puromycin**.
antibiotic AY 22989 ➡ **sirolimus**.
antibiotic CL 13900 ➡ **puromycin**.
antibiotic CL 16536 ➡ **puromycin**.
antibiotic FK 506 ➡ **tacrolimus**.
antibiotic FR 900506 ➡ **tacrolimus**.
antibiotic HBF 386 ➡ **actinomycin C**.
antibiotic L 154803 ➡ **lovastatin**.
antibiotic MA 144A1 ➡ **aclarubicin**.
antibiotic MB 530B ➡ **lovastatin**.
antibiotic ML 236B ➡ **mevastatin**.
antibiotic MSD 803 ➡ **lovastatin**.
antibiotic P 638 ➡ **puromycin**.
antibiotic Ro 09-1450 ➡ **vinaxanthone**.
antibiotic S-67 ➡ **actinomycin C**.
antibiotic SIPI 8915 ➡ **mevastatin**.

ANTIBIOTICS are, strictly speaking, natural products secreted by microorganisms into their environment, where they inhibit the growth of competing microorganisms of different species. In common usage, the term is generally applied to a wide range of chemicals, whether directly isolated from mould ferments, their semisynthetic derivatives, or synthetic chemicals showing some structural similarities. Also, in everyday language the term is used to denote drugs with a selectively toxic action on bacteria or similar non-nucleated single-celled microorganisms (including chlamydia, rickettsia and mycoplasma), though such drugs have no effect on viruses. In this loose parlance even the sulphonamides may, incorrectly, be referred to as antibiotics because they are antimicrobial.

More confusing is the fact that a number of antibiotics are used as cytotoxic agents in cancer chemotherapy (e.g. **bleomycin**): see ANTICANCER AGENTS. Further, partly because of the recent development of high-throughput screens for lead chemicals, a number of new drug chemical classes have arisen from antibiotic leads (e.g. the CCK antagonist **asperlicin** and derivatives, from *Aspergillus* spp.).

The antimicrobial antibiotics have a selectively toxic action on invading bacteria, by virtue of exploiting differences in cellular characteristics between microorganisms and their human host cells. Major target sites are the bacterial cell wall located outside the cell membrane (animal cells have only a cell membrane), and the bacterial ribosome – the protein-synthesizing organelle within its cell – which is different between bacteria and animal cells. Viruses lack both cell walls and ribosomes and so are resistant to these and other similar antibiotics. A classification of therapeutically used antibiotics can be attempted on the basis of these mechanisms.

Antibiotics attacking the bacterial cell wall (by interfering with the synthesis of the bacterial cell wall peptidoglycan) include the beta-lactam antibiotics. These are comprised of the penicillin antibiotics (e.g. **amoxycillin**, **ampicillin**, **methicillin**) and the cephalosporin antibiotics (e.g. **cefaclor**, **ceftazidime**), together with newer synthetic classes such as the carbapenems (e.g. **imipenem**) and monobactams (e.g. **aztreonam**), which all share a common lactam-ring structure. Glycopeptide antibiotics (e.g. **vancomycin**, **teicoplanin**, **ramoplanin**, **decaplanin**) also inhibit cell wall synthesis. Polymixin antibiotics (e.g. **polymixin B**, **colistin**) have cationic detergent properties and disrupt the structure of the membrane by interaction with phospholipids. Bacitracin is a polypeptide antibiotic with an action similar to penicillin, but is too toxic to use systemically.

Examples of antibiotics that attack bacteria by inhibiting protein synthesis at the ribosomal level include the following: tetracycline antibiotics (e.g. **chlortetracycline**); aminoglycoside antibiotics (e.g. **neomycin**, **streptomycin**); macrolide antibiotics (e.g. **erythromycin**, **clarithromycin**, **azithromycin**); also **chloramphenicol**, **fusidic acid** and lincosamides (e.g. **clindamycin**).

Antibiotic-related agents that work by inhibiting DNA gyrase (topoisomerase II), the enzyme that maintains the helical twists of DNA, and are bactericidal, include the quinolones (e.g. **nalidixic acid**, **ciprofloxacin**, **crosoxacin**, **cinoxacin**, **norfloxacin** and **ofloxacin** – all but the first-named are fluoroquinolones). Such agents are entirely synthetic.

Antifungal antibiotics include the polyene agent **amphoterocin**, which interferes with the permeability and transport of fungal membrane, allowing K^+-loss; and is active systemically, but only against certain fungi and not bacteria. **Nystatin** is a polyene macrolide antibiotic used to treat fungal infections of the skin and gastrointestinal tract. **Griseofulvin** was isolated from cultures of *Penicillium griseofulvum* and was eventually developed as a narrow-spectrum antifungal with fungistatic properties, which works through a number of mechanisms, including impairment of microtubule function, and transport of material from cytoplasm to the periphery.

Anticancer antibiotics used in cancer chemotherapy are antimitotic cytotoxic agents (see ANTICANCER AGENTS). These include the anthracycline antibiotics, **doxorubicin**, **epirubicin**, **aclarubicin**, **idarubicin** and **mitozantrone** (mitoxantrone, USA). Some metal-chelating glycopeptides can degrade DNA (e.g. **bleomycin**). **Mitomycin** is an alkylating agent acting against guanine. **Dactinomycin** is a *Steptomyces* antibiotic with a complex mode of action.

In conclusion, even with the proliferation of new antibiotics effective against specific types of target microorganisms, the biggest current problem with the continuing widespread use of antibiotics is the development of resistance to antibiotics that were formerly effective against them (e.g. MRSA – methicillin-resistant *Staphylococcus aureus*). One mechanism is by bacteria developing enzymes that degrade penicillins and some other β-lactams (see β-LACTAMASE INHIBITORS). Another problem is the occurrence of 'superinfections' in which the use of a broad-spectrum antibiotic disturbs the normal, harmless, bacterial population in the body, as well as the pathogenic ones. In mild cases this may allow, for example, an existing but latent oral or vaginal thrush infection to become worse, or mild diarrhoea to develop. In rare cases the superinfection that develops is more serious than the disorder for which the antibiotic was administered.

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ANTICANCER AGENTS are commonly referred to as antineoplastic agents, however, by strict definition, antineoplastic agents are used to treat a 'neoplasm' (meaning a 'new growth'). Neoplasms that have only the characteristic of localized growth are classified as benign. Neoplasms with the additional characteristic of invasiveness, and/or the capacity to metastasise, are classified as malignant. The term 'cancer' is usually applied only to the latter group. Similarly, the word tumour (meaning literally 'a local swelling') tends to be used in association with cancer, and 'antineoplastic agent' is commonly interchangeable with 'anticancer'.

There are a number of approaches to the chemotherapy of cancer, and most can be regarded as complementary or additional to radiotherapy and surgery. Direct approaches to cancer mostly use cytotoxic agents: these work by interfering with cell replication or production, so preventing the growth of new cancerous tissue. Inevitably, this means that normal cell production is also affected, causing serious side-effects. There are many cytotoxic agents with diverse modes of action, but these can be divided into groups on the basis of their mechanisms of action.

Alkylating agents and related compounds act by forming covalent bonds with DNA, thus impeding DNA replication. They can be divided into five subgroups: (i) nitrogen mustards (e.g. **chlorambucil**, **cyclophosphamide**, **melphalan** and **mustine**; (ii) platinum drugs (coordination complexes of platinum) (e.g. **cisplatin** and **carboplatin**); (iii) nitrosoureas (e.g. **carmustine**, **lomustine**, **semustine** and **streptozocin**); (iv) **busulfan**-like agents; (v) other alkylating agents, e.g. **ethoglucid**, **thiotepa** and **treosulfan**.

Antimetabolites block or subvert pathways in DNA synthesis in various ways, and can be divided as follows: (i) folate antagonists (e.g. **methotrexate**); (ii) pyrimidine analogues: **fluorouracil** and **cytarabine** (cytosine arabinoside); (iii) purine analogues (e.g. **mercaptopurine**, **thioguanine** and **pentostatin**). Some other purines are used for non-malignant conditions, e.g. **azathioprine** and **allopurinol**. Also some of these agents (e.g. methotrexate) act through being DIHYDROFOLATE REDUCTASE INHIBITORS.

Cytotoxic antibiotics produce their effect mainly by direct action on DNA. Anthracyclines include the important drugs **doxorubicin**, **aclarubicin** and **idarubicin**. Related compounds are **mitozantrone** and **epirubicin**. Some others are the *Streptomyces* antibiotic **dactinomycin**, and the metal-chelating glycopeptides especially **bleomycins**. **Mitomycin** effectively is a prodrug that is converted in the body to an alkylating agent.

Plant derivatives are from several sources. Vinca alkaloids, including **vincristine**, **vinblastine** and **vindesine**, are from the periwinkle *Vinca rosea*, and act by binding to tubulin. **Etoposide** is a derivative from mandrake root (*Podophyllum peltatum*), which may work by inhibiting mitochondrial function. **Paclitaxel** and related 'taxane' compounds, such as **docetaxel**, are developed from a compound in Western yew (*Taxus brevifolia*) tree bark, and work by interfering with microtubule function.

Miscellaneous agents. **Crisantaspase** is a preparation of the enzyme asparaginase, which breaks down asparagine to aspartic acid and ammonia. When crisantaspase is given intravenously, it is toxic in tumour cells that have lost the capacity to synthesize asparagine (e.g. in acute lymphoblastic leukaemia cells). **Hydroxyurea** is a urea analogue that interferes with ribonucleotide reductase catalysed conversions. **Amsacrine** acts similarly to doxorubicin. **Mitotane** interferes with the synthesis of adrenocortico-steroids, having an eventual cytotoxic action on the adrenal cortex, and so can be used for tumours of these cells.

Indirectly acting anticancer agents are not cytotoxic, though their use can be very effective, and often less toxic than direct approaches. CORTICOSTEROIDS (e.g. **prednisone**) are also used in the treatment of the lymphatic cancer Hodgkin's disease and other forms of lymphoma, and may be helpful additionally in halting the progress of hormone-linked breast cancer. In cases where the growth of a tumour is linked to the presence of a sex hormone (as with some cases of breast cancer or cancer of the prostate gland) treatment with sex hormones opposite to the patient's own can be extremely beneficial. Examples are oestrogens, such as **fosfestrol**, which can be used to block the effects of androgens in androgen-dependent prostatic tumours. Progestogens such as **megestrol** and **medroxyprogesterone** have been used in endometrial neoplasms and hypernephromas. The antioestrogen **tamoxifen** has extensive use in treating hormone-dependent breast cancers, and may also have a role in preventing them. Some agents act indirectly to alter sex hormone production, and these include analogues of gonadotrophin-releasing hormone (e.g. **goserelin**), or the antiandrogen **cyproterone**. Also, **octreotide**, a somatostatin analogue, can be used for the relief of symptoms originating from the release of hormones from carcinoid tumours of the endocrine system, including VIPomas and glucagonomas (see SOMATOSTATIN RECEPTOR AGONISTS). Radiopharmaceutical agents deliver toxic radioisotopes to their sites of action, e.g. ^{131}I in treating thyrotoxicosis. There are a number of other approaches to the treatment of cancer, especially involving molecular biology techniques such as antisense oligonucleotides, vaccination approaches, and also the use of immune reaction modifiers. See ANTIANDROGENS; AROMATASE INHIBITORS; IMMUNOMODULATORS; OESTROGENS; 5α-REDUCTASE INHIBITORS.

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ANTICHOLINESTERASES are agents that inhibit cholinesterases, enzymes that fall into two main families – acetylcholinesterases (AChE) and butyrylcholinesterases (BChE). These enzymes are of related molecular structures but have different distributions, genes and substrate preferences. The enzymes have globular catalytic subunits that are the soluble form of the esterases (as in plasma or CSF), or they can be attached via long collagen tails to the cell membrane.

Acetylcholinesterase (AChE) (also termed 'true cholinesterase') is found in the synaptic cleft of cholinergic synapses, and is of undoubted importance in regulation of neurotransmission by rapid hydrolysis of released endogenous acetylcholine (ACh). AChE is also found in erythrocytes and in the CSF, and can be present in soluble form in cholinergic nerve terminals, but its function at these sites is not clear. AChE is specific for substrates that include **acetylcholine** and the agents **methacholine** and **acetylthiocholine**, but it has little activity with other esters. It has a maximum turnover rate at very low concentrations of AChE (and is inhibited by high concentrations).

Butyrylcholinesterase (BChE) (also termed 'pseudocholinesterase') has a wide distribution, including blood plasma, smooth muscle, brain, skin and liver. It hydrolyses butyrylcholinesterase more readily than acetylcholinesterase, as well as a number of other ester drugs, including **benzoylcholine**, **suxamethonium chloride** and **procaine**. Although its action is of practical importance in metabolizing such drugs, the physiological role of this enzyme is not clear. Genetic polymorphism of this enzyme is well recognized and of clinical importance: for instance, individuals who are slow hydrolysers of suxamethonium suffer neuromuscular block lasting far longer than the normal few minutes, and this can be a therapeutic problem

Both *AChE* and *BChE* are of the serine hydrolase class, which includes proteases such as **trypsin** (see **PROTEASE INHIBITORS**). Characteristically, such enzymes can be inhibited through covalent linkage of constituent parts of irreversible anticholinesterases such as **dyflos** (DFP, diisopropylfluorophosphonate). The active site of the enzyme contains a catalytic triad with a glutamate residue, a serine residue and a histidine imidazole ring. The mechanism of the catalysis of break down of AChE has been characterized, and the reaction progresses at a very fast rate.

Anticholinesterases are agents that are inhibitors of either or both AChE and BChE enzymes. For experimental purposes, agents are available that are selective for one or the other. However, most clinically important drugs inhibit both, though commonly the effects mediated via AChE are the more important. For clinical purposes it is convenient to divide anticholinesterases according to their duration of action, and this also reflects their mechanisms of action. *Short-acting agents* include **edrophonium**, a quaternary ammonium compound that binds, forming a reversible bond. Its duration of action is brief. **Tacrine** is similar, but crosses the blood–brain barrier and has a longer duration of action. *Medium-duration agents* include the synthetic quaternary ammonium compounds **neostigmine** and **pyridostigmine**, which are used clinically. Experimentally, the plant alkaloid **physostigmine** (eserine) has been subject to extensive human and animal experimentation relating to cholinergic neurotransmission. These agents act by carbaminating the serine residue, and recovery, by hydrolysis of this intermediate, is over a time-course of hours. *Irreversible anticholinesterases* are phosphorus-containing compounds with a labile fluoride group (e.g. in dyflos) or organic leaving-groups (e.g. in **parathion** and **ecothiopate**). Such compounds, after formation of intermediates, leave a residue covalently linked through the phosphorus atom to the serine of the enzyme. Although this process is essentially permanent since there is only extremely slow hydrolysis of this linkage, for a short period **CHOLINESTERASE REACTIVATORS** (e.g. **pralidoxime** and **obidoxime**) can be used to reverse the inactivation. Such agents have been developed for this purpose to treat poisoning.

Clinical uses of anticholinesterases are diverse. The short-acting agent **edrophonium** is mainly used in the diagnosis of the muscle weakness disease myasthenia gravis, where it causes a transient improvement of muscle weakness. Tacrine (and a newer agent **suronacrine**) crosses the blood–brain barrier, and is being tried for the treatment of memory defects, particularly Alzheimer's disease. **Distigmine**, neostigmine, pyridostigmine can be used as parasympathomimetics for a number of purposes, including stimulation of the bladder (in urinary retention), the intestine (in paralytic ileus) and in the eye (on local application in glaucoma treatment). At the neuromuscular junction, these agents can be used to treat myasthenia gravis. Routinely, at the end of surgical operations using competitive (non-depolarizing) **NEUROMUSCULAR BLOCKING AGENTS**, the anaesthetist is able to reverse muscle paralysis by injecting an anticholinesterase. Organophosphates can be used in medicine; e.g. **ecothiopate** and dyflos are used in the treatment of glaucoma.

A number of organophosphorus anticholinesterases have been developed for use in warfare, or are used extensively as insecticides. Agents such as these are loosely referred to as 'nerve gases' (an inappropriate name as they are not generally gases, rather volatile liquids, nor do they act principally on nerves), including **tabun**, dyflos, **sarin** and **soman**. **INSECTICIDES** derived from these archetypes include **TEPP** (early agent), **dimpylate**, **fenthion**, **paraoxon** (active metabolite of parathion), **parathion** and **malathion**.

Chatonnet, A. *et al.* (1989) Comparison of butyrylcholinesterase and acetylcholinesterase. *Biochem. J.*, **260**, 625-634.
Marrs, T.C. (1993) Organophosphate poisoning. *Pharmacol. Ther.*, **58**, 51-66.
Massoulie, J. *et al.* (1993) Molecular and cellular biology of cholinesterases. *Prog. Neurobiol.*, **41**, 31-91.
Taylor, P. *et al.* (1994) The cholinesterases: from genes to proteins. *Annu. Rev. Pharmacol. Toxicol.*, **34**, 281-320.

ANTICOAGULANT ANTAGONISTS are used to reverse the actions of **ANTICOAGULANTS**. As outlined at that entry, there are distinct classes of anticoagulants differentiated on mechanistic grounds. The action of most of these, when used in therapeutics, needs to be controlled on occasion through the use of anticoagulant antagonists. **Protamine** is the main anticoagulant antagonist used to control acute heparin overdose and uncontrollable bleeding. It is a mixture of basic peptides that is prepared from the sperm or testes of suitable species of fish (usually *Salmonidae* or *Clupeidae*). Injected or infused, protamine acts as a physical antagonist to heparin by binding to it, and works immediately by forming an inactive complex. Protamine has a weak anticoagulant action itself, and can cause rebound bleeding. More importantly, there can be adverse hypersensitivity reactions of an allergic nature. Also, antidotes to the newer heparin fragments are being evaluated, including smaller forms of the protamine molecule. **Vitamin K** in one form or another is used as an

antidote to treat overactivity of **dicoumarin** anticoagulants. However, the effects of warfarin and related substances is prolonged (as a consequence of the mechanism of action) and it may take some days for the effect of vitamin K analogues to reverse the anticoagulant effects. The duration of action of agents such as **hirudin**, **argatroban** and **ancrod** is sufficiently short that antagonists are not normally necessary.

Wakefield, T.W. *et al.* (1994) Reversal of low-molecular-weight heparin anticoagulation by synthetic protamine analogues. *J. Surg. Res.*, **56**, 586-593.
Harrell, C.C. *et al.* (1995) Oral vitamin K_1: an option to reduce warfarin's activity. *Ann. Pharmacother.*, **29**, 1228-1232.
Wakefield, T.W. *et al.* (1996) Effects of differing rates of protamine reversal of heparin anticoagulation. *Surgery*, **119**, 123-128.

ANTICOAGULANTS are agents that prevent the clotting of blood. Blood coagulation involves the conversion of fluid blood to a solid gel or a clot. The formation of a clot contributes to the process of haemostasis (see **HAEMOSTATICS**). The formation of fibrin filament, together with the adhesion and activation of platelets, helps form the haemostatic plug, which serves to block the damaged blood vessel wall. The actual elements of the clot, insoluble strands of fibrin, are the end-product of a cascade largely involving serine protease enzymes, notably **thrombin**, and blood-borne proteins. A thrombus is the generally unwanted formation of a haemostatic plug or thrombus within blood vessels, often within the veins or arteries of the heart, commonly in pathological conditions associated with arterial disease or where there is stasis. The formation of a thrombus occurs only *in vivo* (unlike blood clots which can form *in vitro*). Pieces of the thrombus may break off and form an embolism, which may lodge in vessels in the lungs or brain, causing damage to the tissues supplied. Thrombolytic drugs are able to dissolve thrombi (see **FIBRINOLYTIC AGENTS**), whereas antiplatelet drugs are not thrombolytic drugs but diminish the adhesion of platelets and their contribution to thrombus formation (see **PLATELET AGGREGATION INHIBITING AGENTS**). In some situations, e.g. myocardial infarction, the three classes of drug – anticoagulants, antiplatelets and thrombolytics – may be used in concert.

Heparins. Normally, the processes leading to coagulation, and those inhibiting it, are in balance. A natural anticoagulant found in the body is the basic glycosaminoglycan heparin (actually a family of sulphated mucopolysaccharides in a range of molecular weights from 3000 to 40,000). In tissues, heparin is found in mast cells (as polymers of MW 750,000), and also in the blood and the endothelium of blood vessels. Commercially, for medical use, it is extracted from bovine lung or porcine intestinal mucosa. It must be injected or used by infusion. The mechanism of action of heparin is complex, but it is sometimes referred to as an indirect-acting antithrombin, in as much as it works to inhibit the action of thrombin in the coagulation cascade by enhancing the action of the naturally occurring inhibitor **antithrombin III**. Heparin also modifies platelet aggregation, which is an important part of the coagulation process. A related glycosaminoglycan, heparan sulphate, occurs extracellularly in several tissues, including the endothelium of blood vessels. Like heparin, it acts along with factor II, and is thought to be an important anticoagulant in the microcirculation. Low-molecular weight heparins (LMWHs) are now available in fragments of different sizes (range 4000–15,000), with slightly different anticoagulant activity (e.g. **certoparin**, **dalteparin**, **enoxaparin** and **tinzaparin**). Further, heparinoids (e.g. **danaparoid**) are under investigation.

Antithrombin-III-independent anticoagulants. All the heparins need to be given by injection, so there is considerable interest in new classes of anticoagulants effective when given orally. The first such agent, arose from the original observation of bleeding disease in cattle fed on bruised clover. A number of analogues, *bishydroxycoumarins*, have been developed, most notably **warfarin**. These agents work by interfering with post-translational γ-carboxylation of glutamic acid residues in clotting factors II, VII, IX, and X. They do this by preventing the reduction of vitamin K, which is necessary for its action as a cofactor of the decarboxylase. Thus they act essentially as vitamin K antagonists, preventing its role in the formation of clotting factors. The effect of these drugs on fibrin formation takes several days to develop. Related anticoagulants such as **nicoumalone** and **phenindione** are now rarely used.

Directly acting antithrombins. A number of agents work directly as antithrombins, rather than indirectly like heparin and warfarin (see **ANTITHROMBINS**). An anticoagulant found in the medicinal leech, **hirudin**, works by direct interaction with both the catalytic site and the fibrinogen recognition site on thrombin. It is now made by recombinant DNA techniques. Unlike heparin, it causes little bleeding at clinically effective doses, but it does have to be given by injection. **Hirugen** is a synthetic dodecapeptide, an analogue of hirudin; it binds to thrombin and blocks access of substrates. **Argatroban** is a weak competitive inhibitor of thrombin.

Ancrod is an effective anticoagulant, and is a protease obtained from the venom of the Malaysian pit viper. It works by acting directly on fibrinogen to produce an unstable form that is cleared from the blood, resulting in depletion of fibrinogen. Its therapeutic use, by intravenous injection, is in the treatment of deep-vein thrombosis, especially the sort that occurs following surgery, or to prevent thrombosis. It is no longer commonly used.

Because calcium ions are required for several stages of the clotting process, agents that bind or chelate Ca^{2+} are effective anticoagulants. This approach is not used clinically *in vivo* in humans because of the vital importance of Ca^{2+} in all bodily processes, but *in vitro*, agents such as **sodium citrate** or **sodium oxalate** are routinely added as anticoagulants to prevent clotting of blood specimens.

Hirsh, J. (1991) Oral anticoagulant drugs. *N. Engl. J. Med.*, **324**, 1865-1875.
Salzman, E.W. (1992) Low-molecular-weight heparin and other new antithrombotic drugs. *N. Engl. J. Med.*, **326**, 1017-1019.
Green, D. *et al.* (1994) Low molecular weight heparin: a critical analysis of clinical trials. *Pharmacol. Rev.*, **46**, 89-109.
Linhardt, R.J. *et al.* (1995) Dermatan sulfate as a potential therapeutic agent. *Gen. Pharmacol.*, **26**, 443-451.

ANTICOCCIDIAL AGENTS are **ANTIPROTOZOALS** used to treat infections by *Coccidia*, commonly in the form of gut infections in domesticated animals, especially chickens. One species, *Isospora hominis*, occasionally infects humans. Agents used in veterinary practice (sometimes as a poultry feed additive, and some in human practice) include **aklomide**, **amprolium**, **decoquinate**, **diaveridine**, **dinitolmide**, **lasalocid**, **narasin**, **robenidine**, **semduramicin**, **sulfabenz**, **sulfaquinoxaline**.

ANTICOLITIS AGENTS are used to treat inflammation of the colon. This inflammation can be due to many things, and is usually characterized by pain in the lower bowel, diarrhoea, sometimes with mucus and blood in the faeces. The treatment depends on diagnosis and severity.

Aminosalicylates contain a 5-aminosalicylic acid component and these drugs are used primarily to treat active Crohn's disease, and to induce and maintain remission of the symptoms of ulcerative colitis. Drugs in this group include

mesalazine (which is **5-aminosalicylic acid** itself), **olsalazine sodium** (which links two molecules of 5-aminosalicylic acid), **balsalazide** (a prodrug of mesalazine) and **sulfasalazine** (which chemically combines 5-aminosalicylic acid with the antibacterial sulphonamide **sulfapyridine**). Antiinflammatory CORTICOSTEROIDS, especially **prednisolone**, are also effective in the treatment of ulcerative colitis, inflammatory bowel disease, Crohn's disease, rectal or anal inflammation and haemorrhoids. **Azathioprine** is a powerful cytotoxic agent, an IMMUNOSUPPRESSANT used to treat ulcerative colitis and other autoimmune diseases. Administration is oral or by injection.

Colitis may result from various gut infections, especially amoebic colitis. **Clindamycin**, **vancomycin** or **metronidazole** may be used in treatment. The diarrhoea of colitis states may be treated with normal ANTIDIARRHOEALS, e.g. the opioids **codeine**, **morphine**, **diphenoxylate** and **loperamide**. The colic may respond to ANTISPASMODICS, e.g. the anticholinergics **atropine**, **hyoscine**, **dicyclomine**, **propantheline**. **Mebeverine** is a direct-acting antispasmodic effective in some types of gut colic.

Hanauer, S.B. *et al.* (1995) The management of ulcerative colitis. *Annu. Rev. Med.*, **46**, 497-505.

Kornbluth, A. *et al.* (1995) How effective is current medical therapy for severe ulcerative and Crohn's colitis? An analytic review of selected trials. *J. Clin. Gastroenterol.*, **20**, 280-284.

Nilsson, Å. *et al.* (1995) Olsalazine versus sulfasalazine for relapse prevention in ulcerative colitis: A multicenter study. *Am. J. Gastroenterol.*, **90**, 381-387.

Primatesta, P. *et al.* (1995) Crohn's disease and ulcerative colitis in England and the Oxford Record Linkage Study area: A profile of hospitalized morbidity. *Int. J. Epidemiol.*, **24**, 922-928.

ANTICONVULSANTS are drugs used to treat convulsions of various types, for instance, in drug or chemical poisoning, e.g. **chlorpromazine**, **diazepam**. However, these anticonvulsants are not necessarily effective or suitable for epilepsy.

In practice, the antiepileptic drugs are the more used, especially for prolonged treatment, and these agents have extensive usage in preventing the occurrence of epileptic seizures. The drug of choice depends on the type and severity of the epilepsy. For tonic-clonic seizures (Grand Mal) as part of a syndrome of primary generalized epilepsy the drugs of choice are **carbamazepine** and **phenytoin**. For absence seizures (Petit Mal), **sodium valproate** and **ethosuximide**. For myoclonic seizures, sodium valproate, **clonazepam** and ethosuximide. For other types of seizure, such as atypical absence, atonic and tonic seizures (often in childhood), phenytoin, sodium valproate, clonazepam, **phenobarbitone**, or ethosuximide are valuable. These all appear to work by stabilizing membranes and decreasing excitability, though with differing profiles of activity and mechanisms of action.

Phenobarbitone, though a barbiturate, is more of an anticonvulsant than expected from its sedative actions, and it resembles phenytoin. They appear to work by an interaction with the modulatory site of the $GABA_A$ receptor and thereby enhance GABA's neuronal inhibitory action. Carbamazepine has an interesting, but a little understood mechanism of action, whereby it stabilizes unstable neurons (working, for instance, against trigeminal neuralgia).

Vigabatrin is an analogue of GABA that irreversibly inhibits the enzyme GABA transaminase which degrades endogenous GABA, thereby having an inhibitory action within the brain. It may be effective in generalized clonic-tonic seizures unresponsive to other drugs. Sodium valproate seems to have a number of actions, such as inhibition of GABA transaminase, it may induce glutamic acid decarboxylase, and some actions in closing sodium channels.

Laidlaw, J. *et al.* (1988) *Textbook of Epilepsy*, Churchill Livingstone, Edinburgh.

Vajda, F.J.E. (1992) New anticonvulsants. *Curr. Opin. Neurol. Neurosurg.*, **5**, 519-525.

Ramsay, R.E. (1993) Advances in the pharmacotherapy of epilepsy. *Epilepsia, Suppl.*, **34**, 9-16.

Upton, N. (1994) Mechanisms of action of new antiepileptic drugs: Rational design and serendipitous findings. *Trends Pharmacol. Sci.*, **15**, 456-463.

ANTIDEPRESSANTS are used to relieve the symptoms of depressive illness, an affective disorder. There are three main groups of drugs used for the purpose. All interfere with the function of monoamine neurotransmitters, and the considerable delay before antidepressants become effective is taken as evidence of a down-regulation of noradrenergic or serotonergic systems (rather than the opposite, as advanced in Schildkraut's original amine theory of depression).

Tricyclic antidepressants are the oldest group (named after the chemical structure of the original members), e.g. **imipramine**. They act principally as CNS monoamine (re-) UPTAKE INHIBITORS. Although far from ideal, this is still the most-used antidepressant group. Chemically, they have gone through transformations from the dibenzazepines (e.g. imipramine, **desipramine**), to dibenzcycloheptenes (e.g. **amitriptyline**, **nortryptyline**), dibenzoxepines (e.g. **doxepin**) and some recent members are not strictly tricyclics. They are effective in alleviating a number of depressive symptoms, though they have troublesome anticholinergic and other side-effects. Most drugs of this class also have sedative properties, which is more pronounced in some, especially amitriptyline, which may be beneficial in some anxious and agitated patients.

Monoamine-oxidase inhibitors (MAOIs) make up the second group and include, **isocarboxazid**, **tranylcypromine** and **phenelzine**, which are now used less commonly due to severe side-effects, especially through a potentially dangerous interaction with foodstuffs. A newer agent, **moclobemide** (a RIMA, reversible, selective type A monoamine-oxidase inhibitor) is said to give less dangerous interactions with foodstuffs. See MONOAMINE-OXIDASE INHIBITORS.

SSRIs are the most recent class, named after the drugs' mechanisms of action (Selective Serotonin Reuptake Inhibitors), of which **fluoxetine** is the archytype. Other examples include **cianopramine**, **citalopram**, **fluvoxamine**, **mirtazapine** and **paroxetine**. Later members, such as **venlafaxine**, differ in being serotonin (re) UPTAKE INHIBITORS that also inhibit noradrenaline reuptake (but are weaker against dopamine uptake). The SSRIs show less side-effects, particularly less sedative actions, than the other classes.

Lastly, given the uncertainty about how antidepressants actually work, there is a group of drugs that seem to be of value, but do not readily fit into any of the above categories. These include **nomifensine** (now withdrawn), which blocks dopamine uptake (see uptake inhibitors), and the amino acid **tryptophan**, which is sometimes used where other classes of antidepressant have not been effective.

In manic-depressive and related illnesses, lithium (e.g. **lithium carbonate**) is the normal treatment for dealing with the manic phase (see ANTIMANIC AGENTS), and for preventing certain types of recurrent depression.

ANTIPSYCHOTICS (e.g. **flupenthixol**) may also be used, at a much lower dose, as antidepressants.

Hollister, L.E. *et al.* (1993) New antidepressants. *Annu. Rev. Pharmacol. Toxicol.*, **32**, 165-177.

Song, F. *et al.* (1993) Selective serotonin reuptake inhibitors: meta-analysis of efficacy and acceptability. *Br. Med. J.*, **306**, 683-687.

Wong, D.T. *et al.* (1995) Prozac (fluoxetine, Lilly 110140), the first selective serotonin uptake inhibitor and an antidepressant drug: Twenty years since its first publication. *Life Sci.*, **57**, 411-441.

Stanford, S.C. (1996) Prozac: panacea or puzzle? *Trends Pharmacol. Sci.*, **17**, 150-154.

ANTIDIABETIC AGENTS have a number of mechanisms of action. The most frequently used drugs are essentially

antihyperglycaemic agents; often called hypoglycaemics. These are used principally in the treatment of diabetes mellitus. Such drugs are quite distinct from those used to treat diabetes insipidus (see ANTIDIURETIC AGENTS). There are several types of antidiabetic treatment for diabetes mellitus.

Firstly, **insulin**, which is used mainly in Type 1 diabetes (insulin-dependent diabetes mellitus; IDDM; juvenile-onset diabetes) cannot be taken by mouth and must be injected. Insulin is a protein hormone produced and secreted by the β-cells of the Islets of Langerhans within the pancreas. It has the effect of reducing the level of glucose in the blood, and is part of a balancing mechanism with the opposing hormone **glucagon**, which increases blood glucose. Its deficiency disorder – diabetes mellitus – therefore can result in hyperglycaemia, which can rapidly lead to severe symptoms, and potentially coma and death. There are many insulin preparations available, of both human and animal sequences, differing mainly in their duration of action.

Secondly, oral hypoglycaemics are synthetic agents taken by mouth to reduce the levels of blood glucose, and are used mainly in the treatment of Type 2 diabetes (non-insulin-dependent diabetes mellitus; NIDDM; maturity-onset diabetes) when there is still some residual capacity in the pancreas for the production of insulin (but often with insulin-resistance developing at insulin receptors). The major types are sulphonylureas (e.g. **chlorpropamide**, **glibenclamide**, **glipizide** and **tolbutamide**) and biguanide drugs (e.g. **metformin**). The major mechanism of action of the sulphonylureas is to increase insulin secretion from the β-cells by acting on certain ATP-sensitive K^+-channels (see POTASSIUM-CHANNEL BLOCKERS).

Acarbose inhibits the enzymatic conversion in the intestine of starch and sucrose to glucose (it is an α-glucosidase inhibitor). It has recently been introduced for the treatment of Type 2 diabetes. Lastly, there are a number of other directions being considered in diabetic diagnosis and treatment, including analogues of **amylin** (islet amyloid polypeptide): see AMYLIN RECEPTOR AGONISTS. There are a number of new oral hypoglycaemic drugs under development, such as the thiazolidinediones (e.g. the thiazole **troglitazone**), which enhance the response of tissues to insulin. New types of drug action may be used to treat diabetes: inhibitors of fatty acid oxidation; β_3-adrenoceptor agonists may be useful (see β-ADRENOCEPTOR AGONISTS); and reintroduction of vanadium salts is now being advocated (as **vanadyl sulphate**, **sodium orthovanadate** and **sodium metavanadate**) and clinical trial successes are reported.

MacPherson, J.N. *et al.* (1990) Insulin. *Br. Med. J.*, **300**, 731-736.
Williams, G. (1994) Management of non-insulin-dependent diabetes mellitus. *Lancet*, **343**, 95-100.
Reaven, G.M. (1995) Pathophysiology of insulin resistance in human disease. *Physiol. Rev.*, **75**, 473-486.
Zimmet, P.Z. (1995) The pathogenesis and prevention of diabetes in adults. Genes, autoimmunity, and demography. *Diabetes Care*, **18**, 1050-1064.

ANTIDIARRHOEAL AGENTS are drugs used to prevent the onset of diarrhoea, or assist in treating it if the symptom is already present. The main medical treatment while diarrhoea lasts should be the replacement of lost fluid and electrolytes. OPIOID RECEPTOR AGONISTS, such as **codeine**, **morphine**, **diphenoxylate** and **loperamide**, are efficient as antidiarrhoeals: they are essentially antimotility agents, reducing peristalsis of the intestine, which slows down the movement of faecal material and also promote reabsorption of electrolytes and water. Other agents are adsorbent materials that work in to bind faecal material into solid masses. Such mixtures include those containing **kaolin** or **methylcellulose**; preparations which may also be useful in controlling faecal consistency for patients who have undergone colostomy or ileostomy.

Diarrhoea is also part of some inflammatory disorders, such as irritable bowel syndrome, ulcerative colitis and Crohn's disease. These may best be relieved by treatment with corticosteroids and aminosalicylates. Diarrhoea is commonly associated with bacterial or other pathogenic infections (e.g. food poisoning) and these may require treatment with antibiotics or other antimicrobials.

Megens, A.A.H.P *et al.* (1990) Normalization of small intestinal propulsion with loperamide-like antidiarrhoeals in rats. *Eur. J. Pharmacol.*, **178**, 357-364.
Dupont, H.L. *et al.* (1993) Prevention and treatment of traveller's diarrhoea. *N. Engl. J. Med.*, **328**, 1821-1827.
Farthing, M.J.G. (1993) Travellers diarrhoea: mostly due to bacteria and difficult to prevent. *Br. Med. J.*, **306**, 1425-1426.
de Luca, A. *et al.* (1996) Insights into opioid action in the intestinal tract. *Pharmacol. Ther.*, **69**, 103-115.

ANTIDIURETIC AGENTS are used principally in the treatment of pituitary-originated ('cranial') *diabetes insipidus*, where they are used to counteract the underproduction of antidiuretic hormone (ADH; also called **vasopressin**), which is characteristic of this disease. This is a cyclic nonapeptide hormone secreted by the posterior pituitary gland, and occurs in mammals in two main forms. In most mammals including humans, the form is **arginine vasopressin** (**argipressin**), which can be used by injection. The porcine form is **lysine vasopressin** (**lypressin**; Lys^8-vasopressin), which can be used in a nasal spray, as it can be absorbed by the nasal mucosa. **Desmopressin** is a synthetic analogue of arginine vasopressin that can be used as a nasal spray and by mouth. **Terlipressin** is a triglycyl derivative of lysine vasopressin, and can be used by injection (it is an inactive prodrug converted *in vivo* to lypressin). These are all (V subtype) VASOPRESSIN RECEPTOR AGONISTS, and the required antidiuretic activity is mediated principally at the V_2-receptors of the kidney, rather than the V_1-receptors that cause a vasopressor effect. See PITUITARY HORMONES.

antidiuretic hormone ➡ **lypressin**; **vasopressin**.

ANTIDOTES are agents used to counteract the effects of toxic substances or overdose with drugs. They are used in a wide variety of circumstances and can work in many ways.

First, where the poison works by stimulating, or over-stimulating, a distinct set of pharmacological receptors, treatment is normally straightforward since the use of an appropriate receptor antagonist can be used to reduce or completely block the effects of the poison. For example, **naloxone** is an OPIOID RECEPTOR ANTAGONIST and can be used as an antidote to an overdose by a wide range of a opioid receptor agonists, including the narcotic analgesics **diamorphine** (heroin), **morphine**, **methadone** and **pethidine**. It is quick-acting and effectively reverses the respiratory depression, coma or convulsions that result from such an overdose; also, it can be used at the end of operations to reverse respiratory depression caused by narcotic analgesics and in newborn babies.

Second, poisoning by some toxic substances is effectively counteracted by an antidote that binds to the poison, rendering it relatively inert and facilitating its excretion. For example, a CHELATING AGENT can be used as an antidote to metal poisoning, where it has a high affinity for those particular metallic ions. Chelating agents are used to treat too high levels of metals of external origin (accidental or environmental), abnormal metabolism (e.g. high levels of copper in Wilson's disease; iron-overload in β-thalassaemia), or in disease (rheumatoid arthritis). Examples of useful chelating agents include **desferrioxamine** (iron overload),

dicobalt edetate (cyanide poisoning), **dimercaprol** (As, Au, Hg; also Lewisite) and **sodium calcium edetate** (Pb), and **penicillamine** (Cu, Pb; useful in rheumatoid arthritis and Wilson's disease).

An overdose with **paracetamol** can be treated with **acetylcysteine** and **methionine**, which act as antidotes to prevent the delayed serious toxic effect on the liver due to active metabolites. A different principle is used in treating ANTICHOLINESTERASE poisoning (insecticides or in chemical warfare). Here **pralidoxime** is an antidote that acts as a cholinesterase reactivator, and is highly effective (taken with **atropine**) in preventing irreversible changes to the cholinesterase enzymes. An antivenom is an antidote to the poison in a snakebite, a scorpion's sting or a bite from any other poisonous creature. Normally, a specific antiserum is used by injection. Similarly, in cardiac glycoside overdose (e.g. digoxin) the proprietary agent **Digibind**™, which comprises antibody fragments that react with the glycosides, can be used in emergency treatment.

ANTIEMETICS are used to prevent vomiting. They are thus related to antinauseant drugs which are used to reduce or prevent the feeling of nausea that very often precedes the physical process of vomiting (emesis). Commonly, the terms are used synonymously, though it is usually an antinauseant action that is being sought. The type of antinauseant drugs used, and the likelihood of success, depends on the mechanism and origin of the nauseous sensation, and there are a number of ways it can be triggered. Motion sickness (travel sickness) can often be prevented by taking antinauseant drugs before travelling, e.g. the antihistamines **meclozine** and **dimenhydrinate**, and the anticholinergic **hyoscine**. Probably all these drugs act as central MUSCARINIC CHOLINOCEPTOR ANTAGONISTS. Similar drugs may be used to treat nausea and some other symptoms of labyrinthine disease (where the vestibular balance mechanisms of the inner ear are disturbed, e.g. in Ménière's disease), though other antinauseant drugs may also be necessary, e.g. **cinnarizine** or phenothiazine derivatives such as **chlorpromazine** and **prochlorperazine**. Steroids, such as **dexamethasone** and **methylprednisolone**, are effective antiemetics that work by an undefined mechanism. In view of their marked side-effects they are for emergency use only.

Antiemetics include the *prokinetic drugs*, which are used to enhance the strength of oesophageal sphincter contraction, stimulate gastric emptying and facilitating small intestine transit; e.g., to help reduce the vomiting that accompanies radiotherapy and chemotherapy: e.g. **cisapride**, **domperidone** and **metoclopramide** (see GASTRIC MOTILITY STIMULANTS).

A number of chemicals and drugs induce nausea and vomiting by an action involving the so-called chemoreceptor trigger zone (CTZ) within the area postrema of the brain. For instance, opioid analgesic drugs, e.g. **morphine**, cause nausea as a very frequent side-effect, and this may be reduced by giving it in combination with an antinauseant such as cinnarizine. The nausea component that precedes the vomiting that commonly accompanies radiotherapy and chemotherapy, can be difficult to treat, though some recently developed drugs of the 5-HT_3 antagonists type are proving to be valuable, e.g. **granisetron**, **ondansetron**, **tropisetron** (see 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONISTS). Also, the cannabis derivative **nabilone** may be tried in difficult cases (see CANNABINOID RECEPTOR AGONISTS).

Sanger, G.J. (1990) New antiemetic drugs. *Can. J. Physiol. Pharmacol.*, **68**, 314–324.
McVie, J.G. *et al.* (1992) Methodology of antiemetic trials. *Drugs, Suppl. 3*, **43**, 1–5.
Mitchelson, F. (1992) Pharmacological agents affecting emesis. A review (Part I). *Drugs*, **43**, 295–315.
Mitchelson, F. (1992) Pharmacological agents affecting emesis. A review (Part II). *Drugs*, **43**, 443–463.

ANTIEPILEPTIC AGENTS are ANTICONVULSANTS specifically used to treat one or more of the different forms of epilepsy. Not all drugs used to treat epilepsy have general anticonvulsant actions, nor are all anticonvulsants necessarily of use in treating epilepsy. But, there is considerable overlap in relevant agents, and for convenience all such agents are discussed under anticonvulsants.

ANTIFIBRINOGENS are agents that change the properties of fibrinogen to make it unavailable as a substrate for the coagulation cascade and therefore should act as ANTICOAGULANTS. In practice, few anticoagulants have been developed that take this path. The only one in current use, **ancrod**, is a protease derived from snake venom. It acts directly on fibrinogen to produce an unstable form that is cleared from the blood, resulting in depletion of fibrinogen.

ANTIFIBRINOLYTIC AGENTS are used as haemostatic agents when there is excessive bleeding or risk of bleeding. There are few drugs of this type. **Tranexamic acid** is an inhibitor of plasminogen activation, and so reduces fibrinolysis. It may be useful, injected or by mouth, when haemorrhage cannot easily be staunched, and may also be useful in streptokinase overdose. **Aprotinin** inhibits many proteolytic enzymes, and by virtue of its antiplasmin activity and inhibition of plasminogen, is used for life-threatening haemorrhage due to hyperplastinaemia, and as a haemostatic agent during open-heart surgery. **Ethamsylate** works by an uncertain mechanism, but reduces capillary bleeding in the presence of normal platelet numbers, possibly correcting impaired platelet adhesion. It is used by injection or mouth, particularly in menorrhagia. **Aminocaproic acid** is an antifibrinolytic drug used by mouth or intravenous infusion in the treatment and prophylaxis of haemorrhage associated with excessive fibrinolysis.

Vere, M.F. *et al.* (1979) Use of ethamsylate in vaginal surgery and deep-vein thrombosis. *Br. Med. J.*, **2**, 528
Pilbrant, A. *et al.* (1981) Pharmacokinetics and bioavailability of tranexamic acid. *Eur. J. Clin. Pharmacol.*, **20**, 65–72.
Hunt, B.S. *et al.* (1991) Aprotinin and cardiac surgery. *BMJ.*, **303**, 660–661.

ANTIFUNGAL AGENTS are antimicrobial drugs used to treat infections caused by fungal microorganisms. They may be antibiotics produced naturally, or purely synthetic. Fungal infections are not usually a major problem in healthy, well-nourished individuals. But, superficial, localized infections, such as thrush (caused by *Candida albicans*), and athlete's foot and ringworm (caused by *Tinea* fungi of the *dermatomycoses* group), are common. These can readily be treated with topical application of antifungals. Severe infections occur most frequently where the host's immunity is low, e.g. following immunosuppression for transplant surgery or in AIDS. Unfortunately, the most potent antifungal drugs taken systemically tend to be toxic.

Amphotericin is a complex amphoteric polyene ANTIBIOTIC that binds to cell membranes and forms a pore through which ions can pass, with consequences that include loss of potassium ions from within the cell. Since the antibiotic binds more readily to fungal cell membranes than mammalian, its action is relatively selective. It can potentiate the action of certain other antifungals, and it may be used with **flucytosine**. Also, it confers antifungal activity on **rifampicin** (normally antibacterial). As it has an appreciable renal toxicity, it needs to be used with caution in some patients. **Nystatin** is a polyene antibiotic similar in structure to amphotericin, often used for local treatment.

Griseofulvin is a narrow-spectrum antifungal antibiotic with fungistatic properties, which is mainly used for large-scale ringworm (dermatophytic) infections of the skin, nails, scalp and hair.

Imidazole (azole) antimicrobials are a large group of synthetic broad-spectrum drugs, many with antifungal activity, such as **clotrimazole**, **econazole**, **isoconazole**, **ketoconazole** and **miconazole**. They work by blocking the synthesis of ergosterol, a major constituent of the fungal membrane, and are active against most fungi and yeasts. They can be used to treat infections of the skin and mucous membranes, the hair and nails, including candidiasis and thrush. Some may be used systemically, though there may be hepatotoxicity (e.g. miconazole, isoconazole and ketoconazole).

Terbinafine is an allylamine active against a wide range of fungal pathogens. It interferes with an enzyme, squalene epoxidase, involved in fungal cell wall synthesis. It is painted onto the skin and taken up rapidly. **Flucytosine** is a synthetic agent used for systemic fungal infections of the yeast type.

Davey, P.G. (1990) New antiviral and antifungal drugs. *Br. Med. J.*, **300**, 793-798.
Polak, A. *et al.* (1991) Antifungal chemotherapy – are we winning? *Prog. Drug Res.*, **37**, 181-269.
Smith, D. *et al.* (1992) The pharmacokinetics of oral itraconazole in AIDS patients. *J. Pharm. Pharmacol.*, **44**, 618-619.
Como, J.A. *et al.* (1994) Oral azole drugs as systemic antifungal therapy. *N. Engl. J. Med.*, **330**, 263-272.

ANTIGLAUCOMA TREATMENT involves the use of drugs to lower the raised intraocular pressure, glaucoma, characteristic of the group of eye conditions which, if untreated, can lead to optic nerve or other damage to vision within the eye. Various types of drug help reduce this pressure, and which one is used depends on what sort of glaucoma is being treated (e.g. simple, open-angle, closed-angle).

β-Blockers are effective in most cases, e.g. **betaxolol**, **brimonidine**, **carteolol**, **esmolol** and **timolol** (see **β-ADRENOCEPTOR ANTAGONISTS**). A variety of sympathomimetics can be used, **adrenaline**, **dipivefrine** (a prodrug converted within the eye into adrenaline), and the α_2-selective agent **apraclonidine** (see **α-ADRENOCEPTOR AGONISTS**). In specialist use to reverse iatrogenic mydriasis (which can contribute to glaucoma) the α_1-adrenoceptor antagonist **dapiprazole** can be used (see **α-ADRENOCEPTOR ANTAGONISTS**); also **guanethidine** (see **ADRENERGIC NEURON BLOCKING AGENTS**).

A number of types of parasympathomimetics are used. Muscarinic agonists used include **carbachol** and **pilocarpine** (see **MUSCARINIC CHOLINOCEPTOR AGONISTS**); **ANTICHOLINESTERASES** include **demecarium bromide**, **dyflos**, **ecothiopate iodide**, **physostigmine sulphate** and **pyridostigmine bromide**.

A number of carbonic anhydrase inhibitors have been used topically, including **dichlorphenamide** (diclofenamide) and **methazolamide**. These are **DIURETICS** used systemically, and the diuretic **mannitol** is sometimes used in emergencies.

A new initiative is a prostaglandin analogue **latanoprost**, a synthetic derivative of $PGF_{2\alpha}$, used topically in open-angle glaucoma and ocular hypertension in patients unresponsive to other drugs (see **PROSTANOID RECEPTOR AGONIST**).

antihaemophilic factor ➡ **factor VIII**.

antihemophilic globulin ➡ **factor VIII**.

ANTI-HIV AGENTS are used to treat infection with the HIV virus (strictly two viruses, HIV-1 and HIV-2), which results in the acquired immune deficiency syndrome (AIDS). Treatment of AIDS is in two overlapping areas: chemotherapy against the HIV-1 virus itself; and treatment of the opportunist infections that are associated with the immunocompromised status of the subjects.

The sites at which anti-HIV drugs may, in principle, act, are dealt with in detail under a main heading (see **ANTIVIRAL AGENTS**). In summary, currently, of the drugs actually in use, a number are reverse transcriptase (enzyme) inhibitors (RTIs). Examples of nucleoside RTIs include **zidovudine**, **didanosine** and **zalcitabine**. Some non-nucleoside RTIs include **foscarnet sodium**, **nevirapine**, carbovir and TIBO analogues (some of these are at trial stage only).

Inhibitors of HIV-1 protease, agents that capitalize on a small difference in the virion and mammalian aspartyl proteinase, offer potential chemotherapeutic benefit. Clinically available agents include **saquinavir**, **ritinavir** and **indinavir**. See **PROTEASE INHIBITORS**.

Hirsch, M.S. *et al.* (1993) Therapy for human immunodeficiency virus infection. *N. Engl. J. Med.*, **328**, 1686-1695.
Levy, J.A. (1993) Pathogenesis of human immunodeficiency virus infection. *Microbiol. Rev.*, **57**, 183-289.
Richman, D.D. (1993) HIV drug resistance. *Annu. Rev. Pharmacol. Toxicol.*, **33**, 149-164.
Yarchoan, R. *et al.* (1993) Challenges in the therapy of HIV infection. *Trends Pharmacol. Sci.*, **14**, 196-202.

ANTIHYPERGLYCAEMIC AGENTS lower blood glucose, i.e. they are hypoglycaemic agents. Most drugs with this type of action are used in stabilizing blood glucose levels in diabetes, so are **ANTIDIABETIC AGENTS**.

ANTIHYPERLIPIDAEMIC AGENTS (lipid-lowering drugs, antihypercholesterolaemic agents, lipid-regulating drugs) are used in clinical conditions of hyperlipidaemia, where there are very high levels of the lipids cholesterol and/or triglycerides in the blood plasma, and more generally in the treatment of coronary heart disease. Medical evidence suggests that if diet or drugs can be used to lower levels of LDL-cholesterol (low-density lipoprotein), whilst raising HDL-cholesterol (high-density lipoprotein), then there may be a regression of the progress of coronary atherosclerosis – a diseased state of the arteries of the heart where plaques of lipid material narrow blood vessels, which contributes to angina pectoris attacks, and to the formation of abnormal clots which go on to cause heart attacks and strokes. The initial use of lipid-lowering drugs was mainly only in familial hyperlipidaemia, or where distinct clinical signs indicate the need for intervention. In most individuals an appropriate type of low fat diet can adequately do what is required, but the agents are now used more in treating a range of cardiovascular diseases. Lipid-lowering drugs work in several ways.

The *polymeric ion-exchange resins* **cholestyramine** and **colestipol** act by binding bile acids, preventing their reabsorption; so promoting hepatic conversion of cholesterol into bile acids. This results in increased LDL-receptor activity of liver cells, which increases the break down of LDL-cholesterol. In this way the compounds effectively reduce LDL-cholesterol (but can aggravate hypertriglyceridaemia).

The *clofibrate group of drugs* (**bezafibrate**, **ciprofibrate**, **clofibrate**, **fenofibrate**, **gemfibrozil** are in use) reduce triglycerides, reduce LDL-cholesterol and raise HDL-cholesterol.

Simvastatin, **pravastatin** and **fluvastatin** have been recently introduced into clinical use. Of fungal origin, they inhibit an enzyme in the liver – HMG-CoA reductase – with the end result that LDL-cholesterol is better cleared from the body. See **HMG-COA REDUCTASE INHIBITORS**.

The *nicotinic acid group* (**acipimox**, **nicotinic acid**) can lower cholesterol and triglyceride levels by an action on enzymes in the liver. The fish oils (e.g. **omega-3 marine triglycerides**) are dietary supplements that may be useful in treating hypertriglyceridaemia. **Probucol** can decrease both LDL-cholesterol and HDL-cholesterol, as well as having other beneficial properties.

Blankenhorn, D.H. *et al.* (1991) Treating serum lipid abnormalities in high-priority patients. *Postgrad. Med.*, **89**, 93-96.
Grundy, S.M. (1992) Cholesterol-lowering drugs as cardioprotective agents. *Am. J. Cardiol.*, **70**, 27I-32I.
Schmitz, G. *et al.* (1994) Lipid-lowering therapy – implications for the prevention of atherosclerosis. *Basic. Res. Cardiol.*, **89 S. 1**, 185-198.
Oki, J.C. (1995) Dyslipidemias in patients with diabetes mellitus: classification and risks and benefits of therapy. *Pharmacotherapy.*, **15**, 317-337.

ANTIHYPERTENSIVE AGENTS are used to reduce high blood pressure when it is raised in disease, though such drugs are not necessarily hypotensive (i.e. they may not lower blood pressure in normotensive subjects). Hypertension is an elevation of arterial blood pressure above the normal range expected in a particular age group, sex etc. It can have several different causes, which to some extent determine the treatment. Above certain values, after making lifestyle corrections, intervention with drug therapy may reduce the risk of heart attacks, kidney failure or a stroke, and may help in the treatment of angina pectoris. There are several large groups of drugs used as antihypertensives, each with a specific mode of action.

DIURETICS are in common use as antihypertensives, and often a mild diuretic may be all that is required: e.g. **amiloride**, **chlorothiazide**, **ethacrynic acid**, **frusemide**, **hydrochlorothiazide**, **spironolactone**, **triamterene**.

Beta-blockers, of which there are many, may be used if further treatment is necessary, with or without simultaneous administration of a diuretic: e.g. **acebutolol**, **oxprenolol**, **propranolol** and **sotalol**. See β-ADRENOCEPTOR ANTAGONISTS.

Other antihypertensive drugs work as antisympathetic agents to reduce sympathetic nervous systems activity, though the α-blockers are now little used because of adverse side-effects: e.g. **indoramin**. See α-ADRENOCEPTOR ANTAGONISTS. Antisympathetic agents effecting blood pressure control in the brain are also used (e.g. **methyldopa**), as do ADRENERGIC NEURON BLOCKING DRUGS (e.g. **debrisoquine**).

VASODILATORS are commonly used in hypertensive treatment, and these direct-acting agents may work via a number of different mechanisms. The CALCIUM-CHANNEL BLOCKERS (e.g. **amlopidine**, **isradipine**, **nicardipine**, **nifedipine**, **verapamil**) are increasingly used. Some new types of vasodilators act by opening potassium channels in the smooth muscle cell membrane: e.g. **nicorandil**. See POTASSIUM-CHANNEL ACTIVATORS. Although the nitrates and nitrites have a profound vasodilator action, they are reserved for acute hypertensive crisis (e.g. **sodium nitroprusside**) or for the treatment of angina (e.g. **glyceryl trinitrate**). **Hydralazine** has acute and long-term uses as a vasodilator: its mode of action is poorly understood. ACE INHIBITORS are now widely used for certain types of hypertension: e.g. **captopril**, **enalapril**, **lisinopril**, **quinapril**, **ramipril**. Antagonists acting at angiotensin AT_1 receptors (e.g. **losartan**) have recently been introduced for the treatment of hypertension and show promise. See ANGIOTENSIN RECEPTOR ANTAGONISTS.

ANTIHYPOGLYCAEMIC AGENTS are used to raise low blood glucose, though are rarely used in medicine. (More commonly, drugs such as **insulin** and the oral ANTIHYPERGLYCAEMICS are used to *lower* blood glucose levels.) However, there are conditions that involve hypoglycaemia needing treatment; e.g. where a pancreatic tumour causes excessive secretion of insulin. Also, there are a number of drug-induced hypoglycaemic states: e.g. β-adrenoceptor-related hypoglycaemia and alcohol-related hypoglycaemia.

Agents that can be used to raise low blood glucose include the hormone **glucagon**, a peptide secreted by the α_2-cells of the Islets of Langerhans in the pancreas, that physiogically normally opposes the action of insulin. In an emergency, it may be administered by injection as an antihypoglycaemic agent. Also, the synthetic drug **diazoxide** may be used by mouth to treat chronic hypoglycaemic conditions. It may act on the pancreas (and as a vasodilator) by opening a subset of potassium channels (see POTASSIUM-CHANNEL ACTIVATORS).

ANTIINFLAMMATORY AGENTS are drugs that are used to reduce inflammatory responses in the body. Although inflammation is essentially a normal defensive mechanism (a reaction to tissue injury, infection, inhalation of foreign proteins), the manifestations may be so serious and inappropriate or involve such discomfort, that treatment with antiinflammatory agents is required. Inflammatory conditions can be acute (as in insect stings) or chronic (chronic asthma, dermatitis and other skin conditions, rheumatoid conditions). A wide range of drugs may be used to treat one or other inflammatory condition, and potential toxicity in relation to the medical condition is an important determinant of choice.

The NSAID ANALGESIC group has the widest antiinflammatory use, and their inhibitory antiinflammatory property is due to their cyclooxygenase activity (see CYCLOOXYGENASE INHIBITORS). Here the associated relief of pain is largely attributable to some degree of correction of the underlying inflammatory condition. Some of this group are relatively non-toxic and are available without prescription for use for relatively trivial complaints, e.g. **aspirin** and **ibuprofen**. (Paracetamol has insufficient antiinflammatory action to be useful here.) Others of this group are reserved for serious inflammatory conditions (notably in rheumatoid arthritis and osteoarthritis – often called antirheumatic or antiarthritic analgesics), e.g. **diclofenac**, **fenoprofen**, **indomethacin**, **mefenamic acid**, **naproxen**, **phenylbutazone** and **piroxicam**.

The CORTICOSTEROIDS are normally used for serious inflammatory conditions, though they are relatively safe when given by local application (skin creams or inhalation into the lungs in the prophylactic treatment of asthma). Local injection can be effective, e.g. into the affected region in tendinitis, or sometimes intrathecally. Systemic administration is normally reserved for short-term use or emergencies, such as anaphylactic shock. Examples of this type include **betamethasone**, **clobetasol**, **cortisone**, **hydrocortisone**, **prednisolone** and **triamcinolone**.

The *chromone group* (e.g. **sodium cromoglycate** and **nedocromil**) are important ANTIALLERGIC and antiinflammatory drugs, as well as ANTIASTHMICS and other uses, though their mode of action is imperfectly understood.

A variety of *antirheumatic drugs* may be used, including gold-containing complexes (e.g. **sodium aurothiomalate**) and chelating agents (e.g. **penicillamine**).

ANTILEISHMANIAL AGENTS are drugs used to treat infection by parasitic protozoans of the genus *Leishmania*, which cause leishmaniasis (a disease common in the tropics and subtropics). There are a number of forms of the disease ranging from a simple skin infection through to visceral leishmaniasis (kala-azar or Dumdum fever). The main drugs used by injection for the visceral form are pentavalent antimony compounds, **sodium stibogluconate** or **meglumine antimoniate**. **Pentamidine** is used in antimony-resistant cases. Other drugs used include **amphotericin** and **metronidazole**.

Cook, G.C. (1990) *Parasitic disease in clinical practice*, Springer-Verlag, Berlin.
Mishra, M. *et al.* (1992) Amphotericin versus pentamidine in antimony-unresponsive kala-azar. *Lancet*, **340**, 1256-1257.

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ANTILEPROTIC AGENTS are ANTIBACTERIAL AGENTS used to treat leprosy (Hansen's disease) caused by the bacterium *Mycobacterium leprae*. There are two types of leprosy: paucibacillary leprosy (where there are few bacteria) is treated for 6 months with **dapsone** and **rifampicin**; multibacillary leprosy (where there are numerous bacilli) is treated for at least 2 years with dapsone, rifampicin and **clofazamine**. It is necessary to use several antibacterials at once to avoid development of resistance, and WHO instigated multidrug treatment regimes in 1982. Dapsone is an antibacterial sulphone, and is an agent related chemically to a sulphonamide and presumed to also work through inhibiting folic acid synthesis (see SULPHONAMIDES). Rifampicin is an antibacterial antibiotic, which also has extensive use in the treatment of tuberculosis. It is used in combination with other drugs. Clofazimine is a red dye of complex structure, thought to work by an action on DNA.

Hastings, R.C. *et al.* (1988) Chemotherapy of leprosy. *Annu. Rev. Pharmacol. Toxicol.*, **28**, 231-245.

Gelber, R.H. (1995) Leprosy (Hansen's disease), in *Mandell, Douglas and Bennett's Principles and Practice on Infectious Diseases*, 4th edn, (eds G.L. Mandell *et al.*), Churchill Livingstone, Inc., New York, pp. 2243-2250.

ANTIMALARIALS are used to treat or prevent malaria. The disease is caused by infection of the red blood cells with a protozoan organism of the genus *Plasmodium*, which is carried by the *Anopheles mosquito*. It is found in certain areas of tropical and subtropical countries, and nearly half of mankind live in areas affected. Attempts to eradicate it (e.g. WHO Malaria Global Eradication Program, 1957), largely through powerful insecticides, have not been successful, and after a period of decline the disease is back to its earlier levels. This is due both to the development of resistance by the insect host to insecticides and to the resistance of the malarial parasite to drugs in the human host. The life cycle of the parasite is complex, and the use of drugs depends on the stage of the cycle. It also depends on which of the four main species of human malarial parasites is being treated (*Plasmodium falciparum*, *P. vivax*, *P. ovale* and *P. maleriae*).

Drugs used to treat an acute attack: Blood schizonticides are used to suppress an acute attack, and the various drugs used include oral **chloroquine**, **mefloquine** or **quinine** plus **pyrimethamine** or **doxycycline** or **halofantrine**.

Drugs effecting a cure: Tissue schizonticides are used to effect a radical cure, and are effective against parasites in the liver. Only 8-aminoquinolines, **primaquine**, have this action.

Drugs used in prophylaxis: These block a stage in the life cycle, e.g. chloroquine, **dapsone**, doxycycline, mefloquine, **proguanil** and pyrimethamine, and often in combinations.

Drugs used to prevent transmission: These destroy the gametocytes, so preventing transmission into the human reservoir of the disease, e.g. primaquine, proguanil and pyrimethamine.

Cook, G.C. (1990) *Parasitic Disease in Clinical Practice*, Springer-Verlag, Berlin.

Bryson, H.M. *et al.* (1992) Halofantrine. A review of antimalarial activity, pharmacokinetic properties and therapeutic potential. *Drugs*, **43**, 236-258.

Bradley, D. (1993) Prophylaxis against malaria for travellers from the United Kingdom. Malaria Reference Laboratory and the Ross Institute. *Br. Med. J.*, **306**, 1247-1252.

Wyler, D.J. (1993) Malaria chemoprophylaxis for the traveler. *N. Engl. J. Med.*, **329**, 31-37.

ANTIMANIC AGENTS are used mainly to treat manic-depressive illness (bipolar disorder), which is characterized by periods of mood normality punctuated by episodes of mania and bouts of depression. The manic phase most often requires acute treatment, and initially ANTIPSYCHOTIC AGENTS, e.g. **phenothiazines**, will usually be given. Thereafter, a very different psychoactive drug, **lithium**, may gradually be substituted in most patients, and this can prevent or reduce the frequency and severity of attacks. Lithium is usually given as **lithium carbonate**, and requires a number of weeks to take effect, and needs continuous monitoring of serum lithium levels to maintain a safe concentration.

Bunney, W.E. *et al.* (1987) Mechanisms of action of lithium in affective illness: basic and clinical implications, in *Psychopharmacology*, ed. H.Y. Meltzer, Raven Press, New York, pp. 553-565.

Ashton, H. (1992) *Brain Systems, Disorders and Psychotropic Drugs*, Blackwell Scientific Publications, Oxford.

ANTIMICROBIAL AGENTS can be used to treat infections by microbes (microorganisms), which include most important classes of pathogenic organisms – viruses, rickettsia, mycoplasma, chlamydia, protozoa, bacteria and fungi (though not helminths). Since bacteria are the largest and most diverse group of pathogenic microorganisms, antibacterials (mainly ANTIBIOTICS) form the major constituent group of antimicrobial agents. See ANTIBACTERIAL AGENTS; ANTIFUNGALS; ANTIPROTOZOALS; ANTIVIRAL AGENTS.

ANTIMIGRAINE DRUGS are used to treat migraine attacks, which constitute a specific clinically recognized form of headache. Attacks vary in form, but common characteristics include: throbbing in the head confined to one side only (unilateral headache), nausea and vomiting, and a forewarning of the attack (an aura) consisting of visual disturbances and weakness or numbness of the limbs. Drugs are used to help migraine sufferers (and the related state called 'cluster headache') in two quite distinct ways.

One group of drugs is given chronically, and helps to prevent attacks (prophylactic use): such as CALCIUM-CHANNEL BLOCKERS, e.g. **nifedipine** and **verapamil**; the β-blockers, e.g. **metoprolol**, **nadolol**, **propranolol** and **timolol** (see β-ADRENOCEPTOR ANTAGONISTS); and also certain vasoactive drugs, including **cyproheptadine** and the ergot alkaloid **methysergide**. All these drugs affect blood vessels. In migraine attacks, cerebral vessels are thought to constrict before an attack, then dilate, causing pain during the attack.

A second group of drugs may be used to treat acute attacks, either at the stage of the prewarning aura, or during the attack stage itself; and here speed of administration and subsequent absorption of the drug into the body is an all-important factor. Drugs that affect blood vessels can also be used at the acute stage, including the time-honoured drug **ergotamine**. The recently introduced **sumatriptan** and **zolmitriptan** (5-$HT_{1B/D}$ partial agonists) can be self-injected (or given intranasally) to achieve a rapid onset of action: see 5-HYDROXYTRYPTAMINE RECEPTOR AGONISTS.

A number of ANALGESICS can be used to offset the pain of the attack, including **aspirin**, **codeine** and **paracetamol**, and these are often incorporated into compound preparations together with a variety of other drugs and drug types, e.g. **caffeine**, **buclizine**, **doxylamine**, **isometheptene**, **pizotifen**. Sometimes drugs with antinauseant or ANTIEMETIC properties are included, e.g. **cyclizine** and **metoclopramide**.

New initiatives in developing migraine treatments include the use of TACHYKININ RECEPTOR ANTAGONISTS and CALCITONIN GENE-RELATED PEPTIDE RECEPTOR ANTAGONISTS.

Edvinsson, L. *et al.* (1990) Extracerebral manifestations in migraine. A peptidergic involvement? *J. Intern. Med.*, **228**, 299-304.

Dechant, K.L. *et al.* (1992) Sumatriptan. A review of its pharmacodynamic and pharmacokinetic properties, and therapeutic efficacy in the acute treatment of migraine and cluster headache. *Drugs*, **43**, 776-798.

Moskowitz, M.A. (1992) Neurogenic versus vascular mechanisms of sumatriptan and ergot alkaloids in migraine. *Trends Pharmacol. Sci.*, **13**, 307-311.

Beattie, D.T. *et al.* (1995) Recent developments in tachykinin NK_1 receptor antagonists: Prospects for the treatment of migraine headache. *Can. J. Physiol. Pharmacol.*, **73**, 871-877.

antimony potassium tartrate ➡ **antimony sodium tartrate**.

antimony sodium tartrate [USAN] (antimony potassium tartrate [USAN]; tartar emetic) is an ANTISCHISTOSOMAL AGENT which also has EMETIC and EXPECTORANT properties.

ANTIOESTROGENS (oestrogen antagonists) usually act directly to prevent the actions of oestrogens at receptors on their target tissues. Others act indirectly to prevent the formation, or inhibit release, of the hormones. Examples of drugs acting by the direct mechanism include **tamoxifen**; and through the indirect mechanism, the AROMATASE INHIBITORS (e.g. **aminoglutethimide** and **formestane**). Tamoxifen can be used in the treatment of infertility in women where the condition is linked to the persistent presence of OESTROGENS and a consequent failure to ovulate. A second, and major use, is as oral ANTICANCER AGENTS for the treatment of existing oestrogen-dependent breast cancer. Of the aromatase inhibitors, aminoglutethimide is an established drug used orally to treat breast cancer, and to treat Cushing's syndrome caused by cancer of the adrenal gland, resulting in excessive release of corticosteroid hormones. More recent agents include **anastrozole**, **formestane** and **letrozole**.

Swain, S.M. *et al.* (1990) Endocrine therapies of cancer, in *Cancer Chemotherapy: Principles and Practice.* Chabner, BA. *et al.*, Lippincott, Philadelphia.

Jordan, V.C. (1995) Tamoxifen: Toxicities and drug resistance during the treatment and prevention of breast cancer. *Annu. Rev. Pharmacol. Toxicol.*, **35**, 195-211.

Howell, A. *et al.* (1996) New endocrine approaches to breast cancer. *Baillieres. Clin. Endocrinol. Metab.*, **4**, 67-84.

ANTIOXIDANTS & FREE-RADICAL SCAVENGERS are grouped here. Antioxidants are used both to prolong the shelf-life and maintain the nutritional quality of lipid-containing foods, and to modulate the consequences of oxidative damage in the human body. The term antioxidant can be defined as a substance that, when present at low concentrations (compared with those of an oxidizable substrate), can significantly delay or prevent oxidation of that substrate. Many substances have been suggested to act as antioxidants *in vivo*, and methods are now available for assessing their effectiveness in physiologically scavenging important biological oxygen-derived species. Oxygen-derived species have been grouped together (Halliwell) and called 'reactive oxygen species' (ROS). They include: superoxide ($O_2^{-\bullet}$) and hydroxyl ($OH^\bullet$) radicals, and also hydrogen peroxide (H_2O_2), hypochlorous acid (HOCl), haem-associated ferryl species, and radicals derived from activated phagocytes, and peroxyl radicals (both lipid-soluble and water-soluble). In practice, interaction and balance between oxygen- and nitrogen-derived reactive species are intimately related, and both play an important and interrelated role in pathophysiology. 'Reactive nitrogen species' include: nitric oxide ($NO^\bullet$) and nitrogen dioxide ($NO^{2\bullet}$) radicals, as well as a number of non-radicals such as nitrous oxide (HNO_2) and peroxynitrites ($ONOO^-$). The role in pathology, particularly of peroxynitrites, is now recognized as being important. The main route of formation of NO is by NO synthase; its role in physiology and pathology, and the properties that interfere with its synthesis, are described in more detail elsewhere. See NEUROPROTECTIVE AGENTS; NITRERGIC STIMULANTS; NITRIC OXIDE SYNTHASE INHIBITORS.

Free-radicals are formed *in vivo*, and an imbalance between production of ROS and antioxidant defence can result in oxidative stress. This may arise either from deficiencies of natural antioxidants (e.g. **glutathione**, **ascorbate** or **α-tocopherol**), and/or from increased formation of ROS. Oxidative stress can result in glutathione depletion, lipid peroxidation, membrane damage and DNA strand breaks; as well as activation of proteases, nucleases and protein kinases. It is now accepted that some degree of oxidative stress occurs in most human diseases, and a major question is whether it makes a significant contribution to the disease pathology. In the case of atherosclerosis, evidence from studies with the chain-breaking antioxidant **probucol**, and from epidemiological work, suggests that oxidative damage does indeed make an important contribution to vascular plaque development Antioxidant defences, both enzymic and nonenzymic, protect the body against oxidative damage, but they are not fully efficient, and so free-radical damage must be constantly repaired. Nonenzymatic antioxidants are frequently added to foods to prevent lipid peroxidation but the effect of such antioxidants on human disease states is not yet well evaluated. A number of antioxidant molecules are being evaluated in disease states, and even the enzyme **superoxide dismutase** (SOD) has been used in experimental studies (as **orgotein**, from bovine liver sources, or a human decombinant technology version of N-acetylsuperoxide dismutase known as **sudismase**).

In terms of generation of free-radicals, nitric oxide has increasingly been a subject of research. NO is emerging as an important regulator of a number of physiological processes. However, under conditions of inappropriate or excessive formation, nitric oxide is also now recognized as an important mediator of pathological nervous tissue damage. The main formation of NO by NO synthase and NO donors is discussed elsewhere (see NITRIC OXIDE SYNTHASE INHIBITORS; NITRERGIC STIMULANTS). NO can exert autocrine or more commonly paracrine effects. At low concentrations, NO mediates effects through activating guanylyl cyclase to elevate cGMP. Such effects are wide-ranging and are normally cytoprotective, generally leading to reduced cellular reaction to intracellular calcium level. Nitric oxide can be produced in $NO^\bullet$ or NO^+ forms, depending on the redox state of the cell. In neurons, the NO^+ form has a negative effect on NMDA receptors, tending to close the channel, so NO is cytoprotective/neuroprotective under such circumstances. It is the $NO^\bullet$ form that activates guanylyl cyclase, leading to generally benign effects on the cell. However, the $NO^\bullet$ form reacts with superoxide anion ($O_2^{-\bullet}$) to form the peroxynitrite radical ($ONOO^-$), a potent oxidant that mediates some of either the protective or cytotoxic effects of NO. The cytotoxic effects can be beneficial when used in host defence (e.g. from activated leucocytes, both neutrophils and monocytes, in host defence against tumour cells, and pathogenic organisms including bacteria, fungi, protozoa and metazoan parasites). However, excessive biosynthesis of NO due to overstimulation of NMDA receptors is excitotoxic, for instance in ischaemic brain damage (stroke), it leads to overproduction of NO which can be cytotoxic. The cytotoxic effects of NO mediated via the peroxynitrite radical include lipid peroxidation, nitrosylation of nucleic acids, and combination with haem-containing enzymes including those involved in cell respiration. Production of peroxynitrite anion is normally limited by the enzyme superoxide dismutase (SOD) which converts it to H_2O_2, and it is then broken down by the enzyme catalase. Another influence tending to offset the effects of NO production is its reaction with haemoglobin.

Inhibition of NO production and effects is dealt with in more detail elsewhere. There are now quite a number of inhibitors of constitutive (eNOS) and inducible (iNOS) forms now known, including **7-nitroindazole**, **TRIM**, L-

unknown.

osteoarthritis A type of arthritis (joint **inflammation**) in which there is degeneration of the cartilage that lines the joints. It is exacerbated by stress, and characterized by creaking joints. Treatment of symptoms is by NSAIDS, CORTICOSTEROIDS or surgery.

osteoporosis A loss of the bone tissue, leading to a tendency to become brittle and fracture. The cause can be infection, injury, as part of Cushing's syndrome, especially in long-term CORTICOSTEROID therapy, or in the elderly and in women following the menopause.

OTC over-the-counter, i.e. non-prescriptionmedicine.

ototoxicity Toxic damage to the inner ear, including drug-induced damage to the nerve serving the inner ear (eighth cranial nerve) the cochlea and semicircular canals, so causing deafness or loss of the sense of balance. This is a common adverse effect seen with the use of the antibiotic NEOMYCIN and related aminoglycosides.

oxytocic An agent that stimulates the rate of childbirth, especially through stimulation of uterine smooth muscle.

P450 cytochrome P450 mixed-function drug metaboling enzyme.

pA_2 Index of potency of antagonists devised by Schild (see **pA_x**). It is the negative $\log_{10}$ of antagonist concentration that gives an agonist **concentration-ratio** (dose-ratio) $x = 2$. The index may have different uses. (i) Where there is simple equilibrium competition between agonist and antagonist for a single site, $pA_2 \equiv pK_B$ ($-\log_{10} K_B$ of the antagonist), and the affinity constant can be calculated from the **Gaddum–Schild equation** or from a **Schild plot**. (ii) Where the antagonism is not competitive, or there is not equilibrium (or it is not known), the index can be used as a simple empirical measure of antagonist potency (with no inference of affinity).

pA_x Logarithmic index of potency of antagonists devised by Schild (1947, 1949). Defined as the negative logarithm of the molar concentration of an antagonist such that the dose of an agonist needs to be increased by a factor of x so as to obtain the same size of response as in the absence of antagonist. In general terms, x is referred to as the **dose-ratio** or concentration-ratio. The indexes pA_2 and pA_{10} are where the ratio, x, is 2 and 10, respectively; and theoretically (pA_2-pA_{10}) = 0.95 for competitive antagonism. The index may be interpreted in two main ways; see **pA_2**.

pacemaker A cell or region of an organ that determines the rate of activity in other cells or organs.

Pacinian body A **sensory receptor** sensitive to pressure.

packed cell volume (haematocrit) The volume of **erythrocytes** in blood expressed as a fraction of the total blood volume.

PAF platelet-activating factor.

PAGB Proprietary Association of Great Britain.

PAGE polyacrylamide gel **electrophoresis**; an experimental technique used to separate large molecules such as proteins or nucleic acid.

paracrine See **local homones**.

paraesthesia (pins and needles) Spontaneously occuring tingling sensations, especially in the extremities. Can be caused by damage to peripheral nerves.

paralytic ileus A condition of the gastrointestinal tract, characterized by a failure of the normal peristaltic contractions and resultant obstruction of the intestine, e.g. following abdominal surgery.

parallel imports Refers to the system whereby drugs are reimported for sale from a country where the drugs are sold at a cheaper price.

parameter A term sometimes used to denote a variable, such as heights or weights of individuals, and sometimes a statistical measurement, such as an average, standard deviation or regression coefficient.

parametric A type of statistical test that assumes an underlying probability distribution, in contrast to distribution-free or **non-parametric tests**. Student's t-test in its various forms is a commonly used parametric test.

parasite A **microbe** or other small creature that lives on (ectoparasite) or in (endoparasite) a host, and which normally derives benefit from the association but contributes nothing to its host's welfare (c.f. **commensual**, **mutualism**, **symbiosis**). Examples in medicine include many viruses, bacteria, fungi, protozoa and worms.

parasiticide An agent that detroys parasites (excluding fungi and bacteria). See also ACARICIDE; ANTHELMINTIC; TRYPANOCIDE.

parasympathetic nervous system See **autonomic nervous system**.

parental Administration by any route other than by mouth. See also **routes of administration of drugs**.

parietal Of or situated on the wall of an organ or other body structure.

pars A part of an organ.

partial agonist See **agonist**; **efficacy**; **intrinsic activity**; **stimulus**.

pascal (Pa) The SI unit of pressure, equal to one newton per square metre.

passive immunity **Immunity** acquired by injection of **antibodies**, or in the foetus by transfer of maternal antibodies through the placenta.

pastille A soft lozenge.

patch clamp A technique used in experimental electrophysiology where a hollow glass patch pipette forms a tight seal with a cell membrane following suction being applied. It can be used to record activity of single ion channels.

patch test A type of skin test where the **antigen** is applied to the surface of the skin. Used, for example, to detect allergy and assist in medical diagnosis.

patents for drugs See **generic drug name**.

pathogen A disease-causing microorganism.

pathogenesis The mechanism or process of development of a disease.

pathogenic Capable of causing a disease.

pathology The science of disease or dysfunction, or the characteristic symptoms and signs of a disease.

-pathy A suffix denoting disease (e.g. neuropathy).

patient information leaflet (PIL or Product Information Leaflet) The technical literature placed by the drug manufacturer in the packaging of medicines, which is intended to be read by the patient or carer. In the case of **OTC** drugs these safety warnings are particularly important.

PC *Pharmaceutical Codex.*

PCD programmed cell death; see **apoptosis**.

PCR **polymerase chain reaction**.

PDE **phosphodiesterase** (enzyme).

PDEI PHOSPHODIESTERASE INHIBITOR.

PDGF platelet-derived growth factor.

PEM prescription event monitoring; see **epidemiology**.

peptic ulcer A disease state characterized by ulceration, initially of the mucosa of the alimentary tract, caused by the action of pepsin and hydrochloric acid. It may be in the body of the stomach (gastric ulcer), the duodenum (duodenal ulcer), jejunum (jejunal ulcer; especially in Zollinger-Ellison syndrome) or of the oesophagus (oesophageal ulcer;

The use of other drugs may be required to control these side-effects (see DOPAMINE RECEPTOR ANTAGONISTS).

Antipsychotics can be divided by chemical class: *phenothiazines*, e.g. **chlorpromazine**, **fluphazine** and **thioridazine**; *butyrophenones*, e.g. **haloperidol**; *thioxanthines*, e.g. **flupenthixol**; *benzamides*, e.g. **sulpiride**; *diphenylbutyl-piperazines*, e.g. **pimozide**; *dibenzazepines*, e.g. **clozapine**. None is entirely selective, but in schizophrenia they act mainly at dopamine D_2 receptors, though clozapine has important actions at D_4 receptors. Those antipsychotics with markedly depressant side-effects are also, somewhat misleadingly, known as major tranquillizers.

Ashton, H. (1992) *Brain Systems, Disorders and Psychotropic Drugs*. Blackwell Scientific Publications, Oxford.

Tricklebank, M.D. *et al.* (1992) Alternative approaches to the discovery of novel antipsychotic agents. *Prog. Drug Res.*, **38**, 299-336.

Lieberman, J.A. *et al.* (1993) Neurochemistry and neuroendocrinology of schizophrenia: a selective review. *Schizophr. Bull.*, **19**, 371-429.

Strange, P.G. *et al.* (1995) D_4 receptors and schizophrenia. *J. Neurochem.* **65**, 2381-2383.

ANTIPYRETICS are drugs used to reduce raised body temperature, as in fever (they do not lower normal body temperature). The aetiology of fever is uncertain, but E-series prostaglandins are potent pyrogens within the hypothalamus, and their release may be mediated via interleukin-1 release from macrophages on infection. Best-known and most-used antipyretics include certain non-narcotic analgesics of the NSAID type. Those used most commonly are members of this class and have relatively few side-effects and are available without prescription, e.g. **aspirin**, **paracetamol** (acetaminophen, USA) and **ibuprofen**. Of these, paracetamol is preferred as, though it has negligible antiinflammatory action, it is an effective and normally safe antipyretic and is suitable for infants and children. See CYCLOOXYGENASE INHIBITORS.

Foreman, J.C. (1994) Pyrogenesis, in *Textbook of Immunopharmacology*, 3th edn. (eds M.M. Dale *et al.*), Blackwell Scientific Publications, London, chapter 21, pp. 242-251.

antipyrine ➡ phenazone.

ANTISCHISTOSOMES are drugs used to treat schistosomiasis (or bilharziasis) a tropical disease caused by blood flukes of the genus *Schistosoma* (class Trematoda of the phylum Platyhelminthes). In their life cycle and the drugs used to treat infection, they are similar to other helminths, and more details of the drugs are to be found at ANTHELMINTICS. Three drugs are used to treat infected humans. **Praziquantel** is a wide-spectrum anthelmintic, and used for all three species. **Metriphonate** is a drug of first choice for *S. haematobium* species only. **Oxamniquine** is used only for *S. mansoni*, and affects both mature and immature forms. The parasites concentrate the drug, where it affects parasite DNA intercalation. **Hycanthone**, **lucanthone**, **niridazole** and **stibocaptate** have now been superseded.

Cook, G.C. (1991) Anthelminthic agents: some recent developments and their clinical application. *Postgrad. Med. J.*, **67**, 16-22.

Hagan, P. *et al.* (1994) Schistosmiasis research and the European Community. *Trop. Geogr. Med.*, **46**, 259-268.

ANTISEPTICS are agents that destroy microorganisms or inhibit their activity to a level such that they are less or no longer harmful to health. Antiseptics may be applied to the skin, burns or wounds to prevent infections and to limit the spread of pathogenic microorganisms. The term is often used synonymously with disinfectant, though the latter term is more appropriate for agents used on inanimate objects (including surgical equipment, catheters etc.). Antiseptics in common use include: **aminacrine hydrochloride**, **benzalkonium chloride**, **cetylpyridinium chloride**, **crystal violet**, **domiphen bromide**, **ethyl alcohol**, **hexachlorophane**, **hexetidine**, **povidone-iodine** and **tyrothricin**. Other agents include: iodine, phenol and sodium hypochlorite.

ANTISICKLING AGENTS (antisickle-cell agents) are drugs that may be used to treat the red blood cell dysfunction seen in sickle-cell disease (drepanocytosis). This condition is due to a genetically determined abnormal haemoglobin, leading to the production of erythrocytes which are more fragile and have a shorter half-life than normal cells, and leads eventually to haemolytic anaemia. In acidosis and anoxia the cells tend to form a characteristic sickle shape and these are more rigid than normal erythrocytes, tending to block small blood vessels and cause tissue damage. There are no very effective remedies for this situation. Apart from blood transfusions and bone-marrow transplants, some manoeuvres thought to be valuable include osmotic manipulation (e.g. with **urea**), diuretics for hyponaturaemia, and antisludging and defibrinating agents. There are programmes to develop agents capable of modifying the properties of the cell membrane and some experimental attempts have been made with a variety of compounds: e.g. **5-bromotryptophan**, **cetiedil**, **tucaresol**, **cyanates**, **cystamine**, **glyceraldehyde** and **velaresol**.

Aluoch, J.R. (1984) The treatment of sickle cell disease. A historical and chronological literature review of the therapies applied since 1910. *Trop. Geogr. Med.*, **36**, S1-26.

Buchanan, G.R. (1993) Sickle cell disease: recent advances. *Curr. Probl. Pediatr.*, **23**, 219-29.

Cho, Y.W. *et al.* (1996) Clinical Pharmacology for Pediatricians. II. Antisickling agents, with special reference to new vasoerythroactive drugs. *J. Clin. Pharmacol.*, **22**, 1-13.

ANTISPASMODICS (spasmolytic drugs) relieve spasm in smooth muscle, e.g. in the intestine, bladder and airways. The term is used in a rather general way in pharmacology and therapeutics, so many drugs can be regarded as antispasmodic, depending on the circumstances. Some drugs used to reduce spasm in smooth muscle are SMOOTH MUSCLE RELAXANTS. If asthma is regarded as a type of spasm of the upper airways (but also with hypersecretion), then BRONCHODILATORS, such as the β-adrenoceptor agonist **salbutamol**, can be regarded as antispasmodics. Where spasm is due to overactivity in the autonomic nervous system, especially colic of the intestine, it is often effective to use appropriate blocking agents, e.g. the anticholinergic **atropine**. **Mebeverine**, which has a direct relaxant action on intestinal smooth muscle, can be effective here.

antisterility vitamin ➡ α-tocopherol.

Antistin™ ➡ antazoline.

ANTISYMPATHETIC AGENTS is a grouping of convenience intended to encompass all agents acting by one of the many mechanisms that lead to a reduction in the actions of the sympathetic nervous system, including those of poorly defined mechanism that are known to have this overall action. Antisympathetics are of particular importance in reducing vasomotor tone, and thence blood pressure. There are many of them and they will be grouped by site and mechanism of action. See also ANTIHYPERTENSIVE AGENTS.

Central mechanisms. Some agents may act within the CNS to modify autonomic control of sympathetic tone and blood pressure. **Clonidine** inhibits release of noradrenaline by an agonist action at the autoinhibitory α_2-adrenoceptors on sympathetic nerve endings. **Methyldopa** is thought to work, at least in part, centrally, acting both as an inhibitory false substrate in the biosynthetic pathway, also producing an active metabolite with actions at α_2-adrenoceptors. Rauwolfia alkaloids, especially **reserpine**, which inhibit the monoamine transporters, were at one time used to treat hypertension, but the side-effects are marked.

Biosynthetic pathway inhibitors. In both the central and periphery nervous systems, the biosynthetic pathways for catecholamines, including the sympathetic nervous system transmitter noradrenaline, involve a number of enzymic conversions that may, in principle, be inhibited. There are several inhibitors known that interfere with catecholamine production (e.g. **carbidopa** or **benzerazide**) and may therefore act as antisympathetic agents. See DOPA DECARBOXYLASE INHIBITORS; DOPAMINE β-HYDROXYLASE INHIBITORS.

Adrenergic neuron blocking drugs. This group of drugs act to prevent the release of noradrenaline from nerves in the central and peripheral divisions of the sympathetic nervous system, and cause an overall fall in blood pressure that is slow to develop, though side-effects limit their use. Examples include **bethanidine**, **bretylium**, **debrisoquine** and **guanethidine**. See ADRENERGIC NEURON BLOCKING AGENTS.

α-Adrenoceptor antagonists. This is a large group that inhibits certain actions of the sympathetic nervous system by preventing the action of **adrenaline** and **noradrenaline**. One use is in lowering blood pressure when it is raised in cardiovascular disease, including in phaeochromocytoma. But a high incidence of side-effects means they are used far less often. See α-ADRENOCEPTOR ANTAGONISTS.

β-Adrenoceptor antagonists. This group is used to lower blood pressure when it is abnormally raised in cardiovascular disease; to correct certain heartbeat irregularities and tachycardias (see ANTIARRHYTHMIC AGENTS); to prevent the pain of angina pectoris during exercise by limiting cardiac stimulation (see ANTIANGINAL AGENTS); to treat myocardial infarction (associated with heart attacks); as prophylaxis to reduce the incidence of migraine attacks (see ANTIMIGRAINE AGENTS); to reduce anxiety, particularly its manifestations such as muscular tremor (see ANXIOLYTIC AGENTS); as a short-term treatment prior to surgical correction of thyrotoxicosis (see ANTITHYROID AGENTS); and as eye-drops to lower raised intraocular pressure in ANTIGLAUCOMA TREATMENT. Side-effects may be minimized by using receptor-subtype-selective β-blockers. Antagonists with similar affinity for β_1-adrenoceptor and β_2-adrenoceptors include **nadolol**, **oxprenolol**, **propranolol** and **timolol**, whereas **acebutolol**, **atenolol**, **esmolol** and **metoprolol** show some β_1-adrenoceptor selectivity, and **butoxamine** is β_2-adrenoceptors preferring. See β-ADRENOCEPTOR ANTAGONISTS.

Rang, H.P. *et al.* (1995) *Pharmacology*. 3rd edn. Churchill Livingstone, Edinburgh.

antithrombin III [BAN, INN] (heparin cofactor; antitrombin; Atnativ™; Trombate™) is a 432 amino acid residue α_2-globulin protein, an endogenous ANTITHROMBIN that inhibits thrombin by binding to this (serine) protease which is a vital constituent of the normal blood coagulation cascade, in effect a naturally occurring ANTICOAGULANT. Also heparin exerts its anticoagulant action by enhancing this reaction. In therapeutics, familial and other deficiencies of antithrombin III can be treated by injection with a preparation of human serum containing this principle.

ANTITHROMBINS are agents that inhibit **thrombin**, which is a serine protease enzyme that has a central role in both thrombosis (the process that forms blood thrombi) and in haemostasis (the control of bleeding from blood vessels). There are a number of ways in which such ANTICOAGULANT agents may act.

Indirect antithrombins. The action of **heparin** is complex, and it is sometimes referred to as an indirect-acting antithrombin, in as much as it works indirectly to inhibit the action of thrombin in the coagulation cascade. **Dicoumarin** anticoagulants, most notably **warfarin**, also act in an indirect manner. They are oral anticoagulants, which lead, after a lag of some days, to the synthesis of an abnormal prothrombin, the thrombin precursor, acting essentially as vitamin K antagonists, preventing its key role in the formation of clotting factors.

Direct-acting antithrombins. Some agents act directly on thrombin to prevent its actions, though they can act at a number of different stages. Examples include the synthetic agents **argatroban** and **bivalirudin**, and some agents of natural origin including **hirudin** and **hirugen**. (These agents are discussed in more details at the anticoagulants entry.)

Note that antithrombin does not mean the same thing as ANTITHROMBOTIC AGENT (though it is used in this wider sense in some medical databases).

ANTITHROMBOTIC AGENTS are, literally, agents of any type that interfere with formation of the blood thrombus (which has both fibrin and platelet components). The two major types of antithrombotics are the ANTICOAGULANTS (which prevent fibrin formation in the clot) and the PLATELET AGGREGATION INHIBITING AGENTS ('antiplatelet drugs', which interfere with the platelet component of the thrombus, but are not anticoagulants).

Antithrombotic therapy, of whatever type, is used where the subject is in danger of forming thrombotic emboli. Thromboembolytic diseases are very common, so there is much use of these drugs. Which anticoagulant to use is largely dictated by whether they need to be given by infusion or injection, or whether they can be given by mouth for chronic use. Antiplatelet drugs, such as low-dose aspirin, are commonly given prophylactically where there is risk of formation of thrombolytic emboli. In the emergency treatment of myocardial infarction, three classes of drugs may be given in concert: anticoagulants, antiplatelets and thrombolytics (FIBRINOLYTICS).

It may be noted that some medical databases refer to antithrombotic agents as ANTITHROMBINS. This is not an exact use of the term as antithrombins, mechanistically, are a subtype of anticoagulants.

ANTITHYROID AGENTS are used in the treatment of overactivity of the thyroid gland – hyperthyroidism, thyrotoxicosis or Graves' disease. In thyrotoxicosis there is excess secretion of the thyroid hormones, thyroxine (T_4) and triiodothyronine (T_3; liothyronine). This excess results in an exaggerated version of the normal activity of the gland, so that there are the symptoms of increased metabolic rate, an increase in body temperature, sweating, increased sensitivity to heat, nervousness, tremor, raised heart rate, tendency to fatigue and sometimes loss of body weight with an increased appetite. The cause of thyrotoxicosis may be simple overactivity of the gland; or toxic nodular goitre where there is secretion from a benign tumour or a carcinoma of the thyroid; or diffuse toxic goitre (Graves' disease; exothalmic goitre) in which there are additional symptoms, including a swelling of the neck (goitre) due to enlargement of the gland, and protrusion of the eyes (exothalmos). How the disease is treated depends on its origin, but one final therapy is surgical removal of part of the gland or, more commonly, treatment of the gland with radioactive iodine to reduce the number of cells. For this purpose ^{131}I is given orally and emits γ-radiation, which has little effect, and β-radiation, which is locally cytotoxic. Hypothyroidism will eventually be produced, but this can be treated (see THYROID HORMONES). Also, ^{131}I can be used for diagnostic purposes. In any event, drugs are used, either to control the symptoms in the long term, or in the short term to prepare the gland for more

radical intervention. β-Blockers are commonly used in the prevention of a number of the signs and symptoms of thyrotoxicosis, by blocking the effects of overstimulation of the release of **adrenaline** and **noradrenaline** by thyroid hormones. β-Blockers used include **metoprolol**, **nadolol**, **propranolol** and **sotalol** (see **β-ADRENOCEPTOR BLOCKERS**). Some other drugs – chemically thionamides (thioureylenes), e.g. **carbimazole**, **methimazole**, **propylthiouracil** – act directly on the thyroid gland to reduce the production of the thyroid hormones, so treating the excess of thyroid hormones in the blood. **Iodine** itself (which is chemically incorporated into the thyroid hormones thyroxine and triiodothyronine), can be given (as aqueous iodine oral solution, or Lugol's solution), to suppress gland activity prior to thyroid surgery.

Feldt-Rasmussen, U. *et al.* (1993) Reassessment of antithyroid drug therapy of Graves' disease. *Annu. Rev. Med.*, **44**, 323-334.

ANTITRICHOMONAL AGENTS are used to treat infection by parasitic flagellated protozoans of the genus *Trichomonas*, e.g. **metronidazole** and **tinidazole**. The strain of most concern in humans is *T. vaginalis* which causes inflammation of the vagina and sometimes the urethra in males. See **ANTIPROTOZOALS**.

antitrombin ➡ antithrombin III.

ANTITRYPANOSOMAL AGENTS are used to treat infection by a genus of parasitic flagellated protozoans of the genus *Trypanosoma*. There are three main species of trypanosome important in relation to disease in humans: *T. rhodesiense* and *T. gambiense*, which cause sleeping sickness in Africa; and *T. cruzi*, responsible for Chagas' disease in South America. In all cases there is a local reaction at the site of infection, and subsequent fever and damage to organs affected by released toxin. Drugs used in the African disease include **suramin**, **pentamidine**, and in the haemolytic stage the arsenical **melarsoprol**. Drugs used against Chagas' disease include **primaquine** and **purinomycin**. For treatment of the acute disease **nifurtimox** and **benznidazole** are used. Suramin is taken up into the parasite by endocytosis, and has a selective antitrypanosomal action. Pentamidine acts on the parasitic DNA. See **ANTIPROTOZOALS**.

ANTITUBERCULAR AGENTS (antituberculous agents) are used to treat tuberculosis (TB), which is a disease caused by *Mycobacter tuberculosis*. In the past, tuberculosis was a major killer, but mortality rates in developing countries showed a steady decline with increasing affluence, and there were dramatic falls in the rates in the 20th Century with the introduction of the BCG vaccination, which was then followed with the development of effective chemotherapy for TB. However, the incidence of TB is now rising and WHO regards treatment as a 'global emergency'. The problem, identified several decades ago, is that of drug resistance. Traditionally, three drugs were combined, usually including **isoniazid** and **streptomycin**. The main drugs currently used include **ethambutol**, isoniazid, **pyrazinamide** and **rifampicin**, with **capreomycin**, **cycloserine** and streptomycin held in reserve. Compound therapy normally involved a first phase using isoniazid, rifampicin, pyrazinamide (and ethambutol if the organism is thought to be resistant). This is followed after two months by a second phase where two drugs are used, usually isoniazid and rifampicin. This is normally successful so long as patients continue the therapy until the disease is truly in remission.

Isoniazid is a bacteriostatic antibacterial that is effective only against *Mycobacteria*. Its mechanism of action is not clear, though it is thought to inhibit bacterial cell wall synthesis. Cross-resistance with other antitubercular drugs does not occur. Rifampicin is an **ANTIBACTERIAL** and **ANTIBIOTIC** which is also used in leprosy. Chemically, it is an unusual antibiotic with a complex macrocyclic structure that works by inhibiting DNA-dependant RNA polymerase in prokaryotic, but not eukaryotic, cells. Ethambutol is active only against *Mycobacteria*. It is rapidly taken up by bacteria and immediately affects their growth. Resistance develops rapidly if the drug is used on its own. Pyrazinamide is active against the tubercular bacillus only at acid pH, and consequently is active against intracellular organisms in macrophages. Resistance develops readily, but it does not show cross-resistance to isoniazid. Capreomycin is an injected peptide antibiotic that shows some cross-resistance with the aminoglycoside antibiotic **kanamycin**. Cycloserine is a broad-spectrum antibiotic that inhibits many bacteria by interfering with cell wall synthesis. Its use is limited to tuberculosis resistant to other drugs.

Davidson, P.T. *et al.* (1992) Drug treatment of tuberculosis – 1992. *Drugs*, **43**, 651-673.

Iseman, M.D. (1993) Treatment of multidrug-resistant tuberculosis. *N. Engl. J. Med.*, **329**, 784-791.

Gelber, R.H. (1995) Leprosy (Hansen's disease), in *Mandell, Douglas and Bennett's Principles and Practice on Infectious Diseases*, 4th edn, (eds G.L. Mandell et al.), Churchill Livingstone, Inc., New York, pp. 2243-2250.

Harries, A.D. (1997) Tuberculosis in Africa: clinical presentation and management. *Pharmacol. Ther.*, **73**, 1-50.

ANTITUSSIVES assist in the treatment of cough. Usually, the term is used to describe only those drugs that pharmacologically suppress coughing, rather than drugs used to treat the cause of coughing. Cough suppressants include opioids which act on the cough centre within the CNS, and to some extent in the periphery, e.g. **codeine**, **dextromethorphan**, **methadone** and **pholcodine** (see **OPIOID RECEPTOR AGONISTS**). Other types of drugs often included in antitussive preparations include **EXPECTORANTS**, which are used to decrease the viscosity of mucus or to increase the secretion of liquid mucus in dry, irritant, unproductive coughs, e.g. **ammonium chloride**, **guaiphenesin** and **ipecacuanha**. **ANTIHISTAMINES** are used to help dry up secretions in the airways.

ANTIULCEROGENIC AGENTS (or ulcer-healing drugs) are used to promote healing of ulceration of gastric and duodenal peptic ulcers. A number of classes of drugs may be used. See also **GASTRIC SECRETION INHIBITORS**.

First, the **HISTAMINE H_2-ANTAGONISTS** are very effective and have considerable usage, e.g. **cimetidine**, **famotidine**, **nizatidine** and **ranitidine**. These agents decrease gastric acid secretion and promote healing and may be used to treat dyspepsia and oesophagitis of a number of etiologies. Acid production is also very effectively reduced by the newer agents, the proton pump inhibitors, e.g. **omeprazole** (see **GASTRIC PROTON PUMP INHIBITORS**).

Anticholinergic drugs are only really suitable in the case of agents that show some gastric-selectivity, e.g. **pirenzepine** and **telenzepine** (see **MUSCARINIC CHOLINOCEPTOR ANTAGONISTS**). They work by reducing the secretion of peptic acid by the stomach mucosa.

Some *prostaglandin analogues* are effective in protecting the mucosa, and are incorporated into some preparations of NSAIDs to offer concurrent protection (though they may cause unacceptable stimulation of the ileum), e.g. **misoprostol**. (see **PROSTANOID RECEPTOR AGONISTS**).

Bismuth-containing antacid preparations have been in use for a long time, but some of the bismuth chelates (e.g. tripotassium dicitratobismuthate) are of proven benefit in ulcer, and, though it is not clear how they work, there is some

evidence of antimicrobial actions against a bacterial infection (*Helicobacter pylori*) associated with peptic ulcers.

Liquorice derivatives have a long history of use, and an extracted principle **carbenoxolone** is of proven value, and, though its mechanism of action is not clear, it is thought to work by effecting cytoprotection protective secretions. Some complexes, e.g. **sucralfate** (**aluminium hydroxide** and **sulphated sucrose**) may be of value.

The treatment of peptic ulcers is increasingly turning towards the eradication of *Helicobacter pylori* infection of the stomach, which is strongly causally associated with the gastric ulcer syndrome, with the objective of long-term alleviation. It is necessary to use a number of drugs in concert, e.g. omeprazole, **metronidazole** and/or **amoxycillin**, and **tripotassium dicitratobismuthate**. Recently, ranitidine bismuth citrate (**ranitidine bismutrex**) has been introduced for such treatment.

Graham, D.Y. (1993) Treatment of peptic ulcers caused by *Helicobacter pylori*. *N. Engl. J. Med.*, **328**, 349-350.

Wallace, J.L. (1994) Mechanisms of nonsteroidal antiinflammatory drug (NSAID) induced gastrointestinal damage – Potential for development of gastrointestinal tract safe NSAIDs. *Can. J. Physiol. Pharmacol.*, **72**, 1493-1498.

Logan, R.P. (1996) The chemotherapeutic effects of H^+/K^+ inhibitors on *Helicobacter pylori* infection. *Pharmacol. Ther.*, **69**, 79-83.

ANTIVIRAL AGENTS There are relatively few drugs that are active against viruses and their effectiveness is often restricted to preventive or disease-limitation treatment. However, some antivirals can be life-savers, especially in immunocompromised patients. Infections due to the herpes viruses (e.g. cold sores, genital herpes, shingles and chickenpox) may be prevented or contained by early treatment with **acyclovir**. Serious cytomegaloviral infections may also be contained by treatment with **ganciclovir**. There are now some HIV treatments that are moderately effective against the virus itself that are used in treating AIDS, these include **zidovudine**. Problems special to HIV-1 are dealt with under another heading, **ANTI-HIV AGENTS**.

Which antiviral drugs work or how the disease is dealt with in terms of public health measures, depends, in part, on the type of virus. The DNA viruses are relatively stable in form since mutations are internally corrected, and here it is often more effective to use vaccination than chemotherapy. By these means smallpox has been eradicated. For some RNA viruses, vaccination is also effective, including poliomyelitis, rubella, measles and mumps, and some rabies strains. Other viruses mutate so rapidly that vaccination is more difficult, e.g. influenza, the common cold, HIV.

Mechanisms of action. In principle, antivirals can act at various stages of the viral replication process, though by no means have all possible mechanisms yet been exploited in terms of finding effective drugs acting in that way. Some of these stages are as follows.

(**1**) Inhibition of attachment to, or penetration of, the host cell by the virus. Viruses use various cell structures for attachment, for instance, AIDS virus to the CD4 molecule on the T lymphocytes, or the rabies virus to the nicotinic cholinoceptor. **Amantadine** inhibits uncoating and is effective against influenza A virus, which is an RNA virus, though is not active against influenza B virus. It has a high success rate when used prophylactically. In a different manner, gamma globulin can be used to give passive immunity against a number of viruses, by neutralizing them so they cannot attach (though there may be other actions). In the case of HIV, where the virus binds to the CD4 molecule on the T lymphocytes, binding might be inhibited with soluble recombinant CD4 (sCD4) or competitive CD4 receptor peptides. Further, toxins (e.g. *Pseudomonas* toxin) may be attached to CD4 as a delivery system. Several of these approaches are under investigation.

(**2**) Inhibition of nucleic acid synthesis. **REVERSE TRANSCRIPTASE INHIBITORS** are used in the treatment of retroviral infections, including AIDS. In RNA retroviruses (e.g. AIDS and T-cell leukaemia), the virion contains a reverse transcriptase enzyme that makes a DNA copy of the viral RNA, and this copy is incorporated into the host genome, and is termed a provirus. The proviral DNA is transcribed into new genomic RNA, and mRNA for translation into viral proteins. Such viruses replicate by a budding process, which does not kill the host cell. In the treatment of AIDS, a number of drugs are being, or have been developed that act at this stage, including zidovudine, **didanosine** and **zalcitabine**. Some others that work somewhat differently are **foscarnet sodium**, **nevirapine**, carbovir and TIBO analogues.

(**3**) Integration of viral DNA into the host genome, or transcription of viral mRNA into viral proteins by host ribosomes are specific processes that may, in principle, be inhibited. Antisense oligonucleotides offer the required selectivity, and are under investigation.

(**4**) Translation of viral mRNA into viral proteins by host ribosome can be affected by myristic acid analogues.

(**5**) Interference with assembly of viral coat proteins and viral RNA into new virus particles. **Interferons** may induce in the ribosomes of the host cells production of enzymes that inhibit translation of viral proteins. Avarol and avarine are thought to interfere with cytoskeletal assembly of virus particles. **PROTEASE INHIBITORS** can prevent the release of reverse transcriptase, and HIV-1 proteinase (e.g. **saquinavir**) are under development or in trial application.

(**6**) Interfering with release of new virus particles by budding from the host cell. This may be inhibited by interferons.

Hence, there are many steps that can, in principle, be manipulated in the treatment of viral diseases.

Hellen, C.U. *et al.* (1992) Viral proteases as targets for chemotherapeutic intervention. *Curr. Opin. Biotechnol.*, **3**, 643-649.

Skehel, J.J. (1992) Influenza virus. Amantadine blocks the channel. *Nature*, **358**, 110-111.

Whitley, R.J. *et al.* (1992) Acyclovir: a decade later. *N. Engl. J. Med.*, **327**, 782-789.

Hirsch, M.S. *et al.* (1993) Therapy for human immunodeficiency virus infection. *N. Engl. J. Med.*, **328**, 1686-1695.

Taylor, G. (1993) Drug design. A rational attack on influenza. *Nature*, **363**, 401-402.

Lipton, S.A. (1994) HIV displays its coat of arms. *Nature*, **367**, 113-114.

Anturan™ ➡ **sulphinpyrazone**.

Anugesic-HC™ ➡ **pramoxine**.

ANXIOLYTIC AGENTS (antianxiety agents) are used to relieve anxiety states, which are prescribed for patients whose anxiety in the face of stress is actually hindering the prospect of its resolution. Also, they are used to relieve acute anxiety, for instance before surgery.

The best-known and most-used anxiolytics are the benzodiazepines, of which those in use include **alprazolam**, **bromazepam**, **chlordiazepoxide**, **clobazam**, **clonazepam**, **diazepam**, **flunitrazepam**, **halazepam**, **loprazolam**, **lorazepam**, **medazepam**, **midazolam**, **oxazepam**, **quazepam**, **temazepam** and **triazolam**. The benzodiazepines work by acting as **BENZODIAZEPINE BINDING-SITE AGONISTS** at a site of the $GABA_A$ receptors.

Another type of anxiolytic is **buspirone**, which appears to work principally as a partial agonist at $5\text{-}HT_{1A}$ receptors (see **5-HYDROXYTRYPTAMINE RECEPTOR AGONISTS**). Examples under development include **tandospirone**, **zalospirone** and **zolmitriptan**.

Older types of anxiolytic, such as **meprobamate** and the

barbiturates, are now largely obsolete. For acute use, some of the tranquillizing ANTIPSYCHOTICS may be used in low dosage, as well as certain ANTIDEPRESSANTS.

β-Blockers (e.g. **oxprenolol**, **propranolol**) are also sometimes administered and work largely through preventing physical symptoms of anxiety (e.g. palpitations of the heart, muscle tremor), which helps prevent the onset of fear and worry (see **β-ADRENOCEPTOR ANTAGONISTS**).

New initiatives in the development of novel anxiolytic agents include the development of antagonists at CCK_B, tachykinin NK_1 and adenosine A_1 receptors.

Woods, J.H. *et al.* (1987) Abuse liability of benzodiazepines. *Pharmacol. Rev.*, **39**, 251-413.

Shader, R.I. *et al.* (1993) Use of benzodiazepines in anxiety disorders. *N. Engl. J. Med.*, **328**, 1398-1405.

4-AP ➡ **4-aminopyridine**.

Ap4A (Ap(4)A; P_1,P_5-diadenosine tetraphosphate) is an endogenous agent used in synthetic form as a pharmacological tool in purine receptor classification studies. It is a **PURINE P2 RECEPTOR AGONIST**, particularly active at the pyrimidine-preferring receptor subtypes.

Ap(4)A ➡ **Ap4A**.

AP 67 ➡ **chlorthenoxazin**.

AP 143 ➡ **cholestyramine**.

AP 880 ➡ **niperotidine**.

apadoline [INN] (RP 60180) is chemically a phenothiazine derivative, a (κ) **OPIOID RECEPTOR AGONIST** which has **OPIOID ANALGESIC** and **ANTIDEPRESSANT** activity.

apafant [INN] (WEB 2086) is a thienotriazolodiazepine, a **PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST**. It is under investigation as a prophylactic antiasthmatic.

apalcillin [INN] (apalcillin sodium [USAN]) is a semisynthetic (penicillin) **ANTIBIOTIC**. It can be used clinically as an **ANTIBACTERIAL** to treat certain infections.

apalcillin sodium ➡ **apalcillin**.

apamin is a peptide from the venom of the honey bee (*Apis mellifera*) and other spp. It is a **NEUROTOXIN** and **POTASSIUM-CHANNEL BLOCKER**, selective for a subset of Ca^{2+}-activated potassium channels. It shows a CNS excitatory effect on intracerebroventricular administration. It is used as a pharmacological tool.

apazone ➡ **azapropazone**.

APD ➡ **pamidronic acid**.

APO ➡ **apolipoprotein A1**.

apoatropine (atropamine; atropyltropein) is an alkaloid from *Atropa*, *Datura* and other spp. (Solanaceae), and is also known as tropine atropate. It is a **MUSCARINIC CHOLINOCEPTOR ANTAGONIST** that can be used as an **ANTISPASMODIC**.

apolipoprotein A1 (APO) is a peptide containing 243 amino acid residues isolated from plasma and serum. It is a major constituent of high-density lipoprotein (HDL), and is an **ANTIHYPERLIPIDAEMIC**.

apomorphine [BAN] (apomorphine hydrochloride [USAN]) is a synthetic **morphine** derivative largely lacking **OPIOID RECEPTOR AGONIST** properties (though in high doses it is a **CNS DEPRESSANT**, and causes respiratory depression that can be reversed with **naloxone**). A **DOPAMINE RECEPTOR AGONIST**, it has been used as an **ANTIPARKINSONIAN AGENT**. As an emetic it can be used by injection to treat oral poisoning.

apomorphine hydrochloride ➡ **apomorphine**.

APPETITE SUPPRESSANTS (also known as anorectic agents) consist of a several types of drugs. The first type has a direct action on the brain, and a number of these are stimulants related to **amphetamine**. Typically, therefore, psychological dependence readily occurs and so most of them are on the controlled drugs list in the UK. Examples include: **dexfenfluramine**, **diethylpropion**, **fenfluramine** and **phentermine**. Some of these drugs have recently been withdrawn because of proposed association with causation of primary pulmonary hypertension. Drugs of this type work by interacting with the release of monoamines within the CNS, and recent evidence suggests that certain **ANTIDEPRESSANTS** of the SSRI group may also be used to treat bulimia, compulsive behaviour and certain eating disorders. Appetite suppressants are intended to assist in the overall medical treatment of obesity, where the primary therapy should be in the form of an appropriate diet.

New initiatives towards the development of anorectic treatments for obesity are centring on satiety mechanisms of some gastrointestinal peptide hormones, especially within the CNS, including amylin, CCK, and bombesin-like peptides. See **AMYLIN RECEPTOR AGONISTS**; **CHOLECYSTOKININ RECEPTOR AGONISTS**; **BOMBESIN RECEPTOR AGONISTS**.

Blundell, J. (1991) Pharmacological approaches to appetite suppression. *Trends Pharmacol. Sci.*, **12**, 147-157.

McTavish, D. *et al.* (1992) Dexfenfluramine. A review of its pharmacological properties and therapeutic potential in obesity. *Drugs*, **43**, 713-733.

Silverstone, T. (1992) Appetite suppressants. A review. *Drugs*, **43**, 820-836.

apraclonidine [BAN, INN] (apraclonidine hydrochloride [USAN]; Iopidine™) is a derivative of **clonidine**, and is also an (α_2-selective) **α-ADRENOCEPTOR AGONIST**. It can be used in **ANTIGLAUCOMA TREATMENT**.

apraclonidine hydrochloride ➡ **apraclonidine**.

apramycin [BAN, INN] is an **ANTIBIOTIC** showing **ANTIBACTERIAL** activity against Gram-positive and Gram-negative organisms (veterinary drug).

Apresoline™ ➡ **hydralazine**.

aprikalim [INN] (Aprim™) is a pyridinylthiopyrancarbothioamide derivative, a ($I_{K(ATP)}$) **POTASSIUM-CHANNEL ACTIVATOR**. It can be used as a **VASODILATOR** and **ANTIHYPERTENSIVE**.

Aprim™ ➡ **aprikalim**.

aprindine [BAN, INN, USAN] (aprindine hydrochloride [USAN]) is an indenylphenyl compound, a (class I) **ANTIARRHYTHMIC**.

aprindine hydrochloride ➡ **aprindine**.

Aprinox™ ➡ **bendrofluazide**.

aprobarbital [INN] is a barbiturate with general **HYPNOTIC/SEDATIVE** and **CNS DEPRESSANT** properties similar to **amylobarbitone**. It has been used as a hypnotic.

aprofene [INN] (aprophenum hydrochloride) is an aminodiphenylpropionate derivative, a **MUSCARINIC CHOLINOCEPTOR ANTAGONIST** and has been used as an **ANTISPASMODIC** anticholinergic agent. It can be used in combination therapies as a prophylactic against (organophosphate group) **ANTICHOLINESTERASE** poisoning.

aprophenum hydrochloride ➡ **aprofene**.

aprotinin [BAN, INN, USAN] (aprotinin solution [JAN]; trypsin inhibitor (ox pancreas basic), basic pancreatic trypsin inhibitor; kallikrein-trypsin inactivator; Bayer A128; Trasylol™) is a 58 residue single-chain peptide (MW 6500) isolated from bovine lung, pancreas or parotid gland. It is a natural endogenous (serine) **PROTEASE INHIBITOR**, which has been prepared by solid-phase and semi-synthesis. It inhibits many proteolytic enzymes, including kallidinogenase, chymotrypsin, plasmin and trypsin. By virtue of its antiplasmin activity and inhibition of plasminogen, it is used as an **ANTIFIBRINOLYTIC** and **HAEMOSTATIC** for life-threatening haemorrhage due to hyperplastinaemia (as in resection of tumours), and as a haemostatic during open-heart surgery, in hyperfibrinolytic haemorrhage, and following thrombolytic therapy. By vitue of kalleikrein inhibition it has been tried clinically to treat acute pancreatitis.

aprotinin solution ➡ **aprotinin**.
Aprovel™ ➡ **irbesartan**.
apstatin is an ENZYME INHIBITOR, a peptide of microbial origin, with AMINOPEPTIDASE INHIBITOR activity against aminopeptidase P (EC 3.4.11.9; prolyl aminopeptidase). It can be used as a pharmacological tool in experimental analytical studies.
APT 574 ➡ **ditazole**.
aptiganel [INN] is a guanidine derivative, a (NMDA) GLUTAMATE RECEPTOR ANTAGONIST with NEUROPROTECTIVE actions. It is used as a pharmacological tool.
APV (2-amino-5-phosphonopentanoic acid) is a competitive (NMDA) GLUTAMATE RECEPTOR ANTAGONIST which has ANTICONVULSANT/ANTIEPILEPTIC actions. It is used as a pharmacological tool.
Ara-A ➡ **vidarabine**.
Ara-Ac ➡ **fazarabine**.
Ara C ➡ **cytarabine**.
arachidonylethanolamide ➡ **anandamide**.
Aralen™ ➡ **chloroquine**.
Aramine™ ➡ **mephentermine**; **metaraminol**.
araregai toxin ➡ **tetrodotoxin**.
arbaprostil [INN] (methyl-PGE_2; U 42842) is a prostaglandin and PROSTANOID RECEPTOR AGONIST, used as a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC AGENT.
arbekacin [INN] is a semisynthetic aminocyclitol ANTIBIOTIC with ANTIBACTERIAL activity.
Arduan™ ➡ **pipecuronium bromide**.
arecoline is an alkaloid from *Areca catechu* (Palmae). It is a MUSCARINIC CHOLINOCEPTOR AGONIST (experimental use), and is HYPOTENSIVE. It has purgative actions and can be used as a vermifuge and taenifuge in veterinary medicine.
Aredia™ ➡ **pamidronic acid**.
argatroban [INN] is a synthetic ENZYME INHIBITOR that acts as a specific reversible ANTITHROMBIN. It has ANTICOAGULANT activity and can be used in thromboembolytic disorders.
arginine [INN, USAN] (R-GENE™) is an aliphatic amino acid essential to life, and can be used as a dietary supplement. Given intravenously, it stimulates the release of **growth hormone** from the pituitary gland, and can be used as a diagnostic agent to test pituitary function and reserve. In the physiological production of nitric oxide (NO) *in vivo*, the nitrogen is derived from the guanidino group of aginine; a number of NITRIC OXIDE SYNTHASE INHIBITORS are derivatives of L-arginine.
8-arginineoxytocin ➡ **argiprestocin**.
arginine vasopressin ➡ **argipressin**; **vasopressin**.
[Δ-Pro⁷]arginine vasopressin ➡ **argipressin**.
arginine vasotocin ➡ **argiprestocin**.
argipressin [BAN, INN] (argipressin tannate [USAN]; arginine vasopressin; Pitressin™) is the form of the cyclic nonapeptide hormone **vasopressin**, which can be obtained from the posterior lobe of mammalian (but not pigs) pituitary (neurohypophysis). Therapeutically, arginine vasopressin is a (V_1 and V_2) vasopressin receptor agonist, with antidiuretic activity and it can be used in pituitary-originated diabetes insipidus treatment. It is a powerful vasoconstrictor and can be used as a haemostatic agent to treat bleeding from varices of the oesophagus.
Many hundred analogues have been synthesized, and some more active as vasopressin receptor agonists than the parent are listed here: desamino[Dab⁸]vasopressin; hydroxy-[Val⁴,DArg⁷]vasopressin; desamino[Thr⁴,DArg⁸]vasopressin; desamino[Asn⁴,DArg⁸]vasopressin; hydroxy-[DArg⁸]vasopressin; deamino[Val⁴,DHomoarginyl⁸]-vasopressin; deamino[Val⁴,DHomolysyl⁸]vasopressin; deamino[Phe²,Δ³-Pro⁷]arginine vasopressin; deamino[Δ³-Pro⁷]arginine vasopressin; [Δ-Pro⁷]arginine vasopressin; hydroxyargininevasopressin; [Ile³]-argininevasopressin.
argipressin tannate ➡ **argipressin**.
argiprestocin [INN] (arginine vasotocin; Arg⁸-oxytocin; 8-argininеoxytocin) is an endogenous neurohypophyseal PITUITARY HORMONE in many nonmammalian vertebrates. It is an octapeptide with OXYTOCIC and VASOCONSTRICTOR actions. Active synthetic or natural analogues include the following: ornipressin; **[Hse⁴]oxytocin**; **hydroxyoxytocin**; ichthyotocin; **isotocin**; **mesotocin**; **nacartocin**.
ARH 11190 ➡ **zacopride**.
arildone [INN, USAN] (Win 38020) is a synthetic ANTIVIRAL.
Aristocort™ ➡ **triamcinolone**.
ARL 66096 (FPL 67156; 2-propylthio-β,γ-difluoromethylene-ATP) is a synthetic analogue of ATP, used as a pharmacological tool in purine receptor classification studies. It is a PURINE P2 RECEPTOR ANTAGONIST with selectivity for the $P2Y_{ADP}$ subtype.
arnolol [INN] is a β-ADRENOCEPTOR ANTAGONIST.
AROMATASE INHIBITORS interfere with the action of the enzyme aromatase and thus are indirect ANTIOESTROGENS. The biosynthesis of oestrogens is catalysed by aromatase, an enzyme localized in the endoplasmic reticulum that consists of two components. This enzyme catalyses a rate-limiting step in the biosynthesis of oestrogens (from androgens), and thus acts as an indirect antioestrogen. These agents have been shown to be effective in patients with advanced breast cancer. Inhibitors include the first-generation agent **aminoglutethimide**, the second-generation steroidal inhibitor **formestane** (irreversible) and non-steroids such as **anastrozole** and **letrozole**. Agents under investigation include **atamestane**, **exemestane**, **fadrozole**, **liarozole**, **minamestane**, **plomestane**, **rogletimide**, **testolactone** and **vorozole**.
Brodie, A.M. (1993) Aromatase, its inhibitors and their use in breast cancer treatment. *Pharmacol. Ther.*, **60**, 501-515.
Vanden Bossche, H.V. *et al.* (1994) Aromatase inhibitors – mechanisms for non-steroidal inhibitors. *Breast Cancer Res. Treat.*, **30**, 43-55.
Ibrahim, N.K. *et al.* (1995) Aromatase inhibitors: current status. *Am. J. Clin. Oncol.*, **18**, 407-417.
Masamura, S. *et al.* (1995) Aromatase inhibitor development for treatment of breast cancer. *Breast Cancer Res. Treat.*, **33**, 19-26.
arotinolol [INN] (arotinolol hydrochloride [JAN]) is a combined β-ADRENOCEPTOR ANTAGONIST and weak α-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically in ANTIHYPERTENSIVE and ANTIARRHYTHMIC treatment.
arotinolol hydrochloride ➡ **arotinolol**.
arphamenine A is an ENZYME INHIBITOR, an ANTIBIOTIC product of *Chromobacterium violaceum*. It can be used in analytical studies as an AMINOPEPTIDASE INHIBITOR active against aminopeptidase B (EC 3.4.11.6); reported to have ANTICANCER and IMMUNOSUPPRESSANT properties.
Arpicolin™ ➡ **procyclidine**.
Arpimycin™ ➡ **erythromycin**.
arprinocid [BAN, INN, USAN] is an ANTICOCCIDIAL AGENT.
arpromidine [INN] (BU E50; HE 90371) is a substituted imidazolylguanidine, a (H_1) histamine receptor antagonist, but a (H_2) HISTAMINE RECEPTOR AGONIST.
Arret™ ➡ **loperamide**.
arsanilic acid [BAN, INN] has antibacterial properties and can be used in the veterinary treatment of enteritis and as a growth promoter and antileukaemic drug.
Artane™ ➡ **benzhexol**.
artemether [INN] is a derivative of **artemisinin**, an ANTIMALARIAL drug.
artemisinin [INN] (Qinghaosu) is a sesquiterpine lactone

isolated from *Artemisia annua* (Qinghaosu) and is an ANTIMALARIAL drug, extensively used in China, which shows advantages for use against drug-resistant malarial strains.

artesunate [INN] (sodium artesunate) is a derivative of **artemisinin**, an ANTIMALARIAL, and can be used in combination with **mefloquine**. It also has IMMUNOMODULATOR properties and is effective in treating allergic contact dermatitis in animal models.

Arthrotec™ ➡ **misoprostol**; **diclofenac**.

articaine [BAN, INN] (carticaine) is an amide series LOCAL ANAESTHETIC, injected for dental and infiltration pain relief.

Artracin™ ➡ **indomethacin**.

Arvin™ ➡ **ancrod**.

Arythmol™ ➡ **propafenone**.

5-ASA ➡ **mesalazine**.

Asacol™ ➡ **mesalazine**.

ascaridole is the active principle of Oil of Chenopodium, and has ANTHELMINTIC properties.

ascorbic acid [BAN, INN, USAN] (vitamin C; hexuronic acid; lyxoascorbic acid; E300; sodium ascorbate [INN]; E301) is a VITAMIN that occurs widely in animals and plants; good sources are citrus fruits and hip berries. It is an ANTIOXIDANT, preservative and urinary acidifier. Clinically, it is a component of numerous preparations. Deficiency eventually leads to scurvy, but before that there is a lowered resistance to infection and other disorders may develop, particularly in the elderly. However, vitamin C supplements are rarely necessary with a normal, well-balanced diet. There have been claims that pharmacological doses help prevent colds and so it is incorporated into a number of cold remedies.

Asendis™ ➡ **amoxapine**.

Aserbine™ ➡ **benzoic acid**.

Asilone™ ➡ **aluminium hydroxide**; **dimethicone**; **magnesium hydroxide**.

Askit™ ➡ **aloxiprin**.

Asp ➡ **aspartic acid**.

asparagic acid ➡ **aspartic acid**.

asparaginase ➡ **crisantaspase**.

L-asparaginase ➡ **crisantaspase**.

asparagine amidohydrolase ➡ **crisantaspase**.

asparaginic acid ➡ **aspartic acid**.

aspartame [USAN] (methyl aspartylphenylalanine; Canderel™; Nutrasweet™) is a synthetic compound with 100-times the sweetness of sucrose. As a DIGESTIVE AGENT and artificial sweetener, it is permitted in foods in EU and USA.

aspartic acid (aminosuccinic acid; asparagic acid; asparaginic acid; Asp) in its (*S*)-(L)-form) is found in proteins/peptides as well as sugar cane and sugar beet molasses. There are high concentrations in mammalian brain, and it is a putative 'fast' neurotransmitter. It acts as a GLUTAMATE RECEPTOR AGONIST, and is used as a pharmacological tool.

Aspellin™ ➡ **ammonium salicylate**.

asperlicin is an ANTIBIOTIC product isolated from *Aspergillus alliaceus* and is a nonpeptide related to the tryptoquivalines. It is a CHOLECYSTOKININ RECEPTOR ANTAGONIST that can be used for treatment of gastrointestinal and CNS disorders. Its hydroxy derivative, **asperlicin B**, is more potent as a cholecystokinin receptor antagonist.

aspirin [BAN, USAN] (acetylsalicylic acid; salicylic acid acetate; Aspro™; Dispirin™; Easprin™ and many others) is a synthetic ester derivative of **salicylic acid**, developed to enhance analgesic activity, whilst reducing the gastric irritation of the parent acid. It was introduced into clinical use by the Bayer company in 1899, at which time Aspirin™ was its trade-name. It is the archetypal member of the salicylate series of CYCLOOXYGENASE INHIBITORS (COX-inhibitor) with NSAID ANALGESIC and ANTIINFLAMMATORY activity. It can be used orally to treat mild to moderate pain, is a useful ANTIPYRETIC, and reduces inflammation in rheumatic disease and other musculoskeletal disorders. It is a PLATELET AGGREGATION INHIBITOR in prophylactic use at a lower dose than for analgesia; an activity that resides in its relatively high activity in irreversibly alkylating the active site of COX-1. It is gastric irritant, so is best used as one of its buffered derivatives, including soluble aspirin (B.P.) and the calcium salt used in combination with urea as **carbaspirin calcium** [USAN]. There are innumerable compound preparations of aspirin together with other NSAID analgesics, OPIOID ANALGESICS, ANTACIDS (e.g. Alka-Seltzer™), and with various other 'cold-cure' components.

Aspirin™ ➡ **aspirin**.

aspoxicillin [INN] is a (ureido) (penicillin) ANTIBIOTIC with ANTIMICROBIAL activity.

Aspro™ ➡ **aspirin**.

AST ➡ **amisulpride**.

Asta 4942 ➡ **ifosfamide**.

astemizole [BAN, INN USAN] (Hismanal™; Pollon-eze™) is a benzimidazolamine, a HISTAMINE H_1-RECEPTOR ANTAGONIST with less sedative side-effects than some of the older antihistamines. It can be used for the symptomatic relief of allergic symptoms, such as hay fever and urticaria. A significant incidence of cardiac arrhythmias in users has led to some restrictions in use.

Astra 1410 ➡ **oxycinchophen**.

Astra 1512 ➡ **prilocaine**.

Astra 2358 ➡ **ketocainol**.

Astramorph™ ➡ **morphine**.

astressin (*cyc*$^{30\text{-}33}$[DPhe^{12},Nle^{21,38},Glu^{30},Lys^{33}]CRF$_{12\text{-}41}$) is a synthetic analogue of CORTICOTROPHIN-RELEASING FACTOR (CRF), which acts as a CORTICOTROPHIN-RELEASING FACTOR RECEPTOR ANTAGONIST. It is used as a pharmacological tool.

ASTRINGENTS are commonly used in lotions to harden and protect skin where there are minor abrasions. They work essentially as protein precipitants. They can also be used in lozenges, mouthwashes, eye-drops and ANTIPERSPIRANTS. Examples include **aluminium acetate**, **aluminium chloride**, **aluminium hydroxide** and **zinc oxide**.

astromicin [JAN, USAN] (astromicin sulfate [JAN, USAN]; fortimicin A) is an (aminoglycoside) ANTIBIOTIC. Clinically, it has ANTIBACTERIAL properties and can be used systemically.

astromicin sulfate ➡ **astromicin**.

AT 327 ➡ **tipepidine**.

AT 877 ➡ **fasudil**.

atamestane [INN] (SH 489; ZK 95639) is a steroid, has AROMATASE INHIBITOR (oestrogen synthetase inhibitor) activity and is under investigation for treatment of benign prostatic hyperplasia and some anticancer applications.

ataprost [INN] is a synthetic prostaglandin, a PROSTANOID RECEPTOR AGONIST with PLATELET AGGREGATION INHIBITOR and peripheral VASODILATOR properties.

Atarax™ ➡ **hydroxyzine**.

atenolol [BAN, INN, JAN, USAN] (Tenormin™ and many others) is a β-ADRENOCEPTOR ANTAGONIST showing β_1-selectivity, and it is relatively water-soluble. It can be used in ANTIHYPERTENSIVE, ANTIANGINAL and ANTIARRHYTHMIC treatment.

Atensine™ ➡ **diazepam**.

atevirdine [INN] (atevirdine mesylate [USAN]) is a synthetic REVERSE TRANSCRIPTASE INHIBITOR, active as an **atevirdine** ANTIVIRAL potentially useful in ANTI-HIV treatment.

atevirdine mesylate ➡ **atevirdine**.

Ativan™ ➡ **lorazepam**.

Atnativ™ ➡ **antithrombin III**.

atosiban [INN, USAN] (ORF 22164; RWJ 22164) is a pseudopeptide analogue of **oxytocin**, which acts as a **VASOPRESSIN RECEPTOR ANTAGONIST**, and inhibits the effects of oxytocin (inhibits uterine contractions) and **vasopressin** *in vitro*.

atovaquone [BAN, INN] (Mepron™; Wellvone™) is an analogue of **ubiquinone**, an antiparasitic which is orally active as an **ANTIPROTOZOAL**. Clinically, it can be used for treatment of AIDS-associated pneumonia.

ATP ➡ **adenosine triphosphate**.

ATPase INHIBITORS are inhibitors of ATP-driven transporter systems in the body, including Na^+/K^+-ATPase, H^+/K^+-ATPase and Ca^{2+}-ATPase. Some are important sites of drug action and will be described from a functional, rather than a biochemical or structural viewpoint.

The Na^+/K^+-ATPase of the cell membrane, which constitutes the Na^+/K^+ pump, is the main site at which cardiac glycosides act. They bind to the K^+-binding site, thus inhibiting the enzyme, and this inhibition, through a series of interrelated actions, eventually affects cardiac rhythm and the force of contraction is increased. These are the principal beneficial actions. Examples include **digoxin**, **digitoxin** and **ouabain**. See **CARDIAC GLYCOSIDES**.

The $Na^+/K^+/2Cl^-$ transport system in the thick ascending loop of Henlé in the kidney is a major site of action of diuretics. Here there is active reabsorption of sodium chloride, not accompanied by water, which reduces the osmolarity of the tubular fluid and makes the interstitial fluid of the medulla hypertonic. Sodium and chloride move into the cell by a cotransport system involving Na^+,K^+,$2Cl^-$, a process driven by the electrochemical gradient for sodium produced by the Na^+/K^+-ATPase in the basolateral membrane. Chloride then passes out of the cell into the circulation, partly through a symport mechanism with potassium, and partly by diffusion through chloride channels. Loop diuretics (e.g. **bumetanide**, **ethacrynic acid**, **frusemide**) inhibit this process. In the distal tubule thiazide diuretics and related agents (e.g. **bendrofluazide**, **benzthiazide**, **chlorthalidone**, **chlorothiazide**, **clopamide**, **cyclopenthiazide**, **hydrochlorothiazide**, **hydroflumethiazide**, **indapamide**, **mefruside**, **metolazone**, **polythiazide** and **xipamide**) have a moderate action in inhibiting sodium reabsorption, entering the cell through the lumen by means of an electroneutral Na^+/Cl^- carrier, driven by the Na^+/K^+-ATPase pump of the basolateral membrane. Aldosterone antagonists (e.g. **potassium canrenoate** and **spironolactone**) work by blocking the action of the hormone aldosterone (a **MINERALOCORTICOID**), which is thought to work through an effect stimulating the Na^+/H^+ exchanger through an action on aldosterone receptors. See **DIURETICS**.

The H^+/K^+-ATPase – the proton pump – is the site of action of the so-called proton pump inhibitors, the first of which was **omeprazole**. Gastric proton pump inhibitors are used to reduce gastric acid secretion in the stomach. They act at the H^+/K^+-ATPase, which is the mechanism through which hydrochloric acid in an isotonic solution (150 mM), with a pH of less than 1, is secreted by the parietal cells of the stomach. The H^+/K^+-ATPase is unique to the parietal cells, and links to Cl^-, Na^+ and HCO_3^- exchange within the apical or basal membranes. With **omeprazole** and **lansoprazole** it is possible to attain a profound antisecretory action, markedly reducing both basal and stimulated gastric acid secretion. The inhibitors are thought to react with sulphydryl groups of the proton pump. They are valuable in the treatment of peptic ulcers resistant to histamine H_2 antagonists, reflux oesophagitis, and are the drugs of choice for Zollinger-Ellison syndrome. See **GASTRIC PROTON PUMP INHIBITORS**.

The Ca^{2+}-ATPase plays an essential role in the pumping of calcium out of cells, and in the control of its cytosolic concentration. In the heart, the role of the pump is minor with respect to that of the sodium-calcium exchanger, but is most probably predominant in skeletal and smooth muscle. The pump is encoded by four independent genes, showing different patterns of tissue-specific expression and alternative splicing of the primary transcripts. The intracellular Ca^{2+} pump proteins from skeletal muscle sarcoplasmic reticulum (SR), cardiac SR and brain microsomes are similar. Thapsigargin is a potent inhibitor, also **lanthanum** salts inhibit the pump at most sites.

Kijima, Y. *et al.* (1991) Drug action of thapsigargin on the Ca^{2+} pump protein of sarcoplasmic reticulum. *J. Biol. Chem.*, **266**, 22912-22918.

Pope, A.J. *et al.* (1993) Reversible inhibitors of the gastric H^+/K^+-transporting ATPase: A new class of anti-secretory agent. *Trends Pharmacol. Sci.*, **14**, 323-325.

Sachs, G. *et al.* (1995) The pharmacology of the gastric acid pump: The H^+,K^+ ATPase. *Annu. Rev. Pharmacol. Toxicol.*, **35**, 277-305.

atracurium besylate [BAN, INN, USAN] (Tracrium™) is a bisquaternary amine, a **NICOTINIC CHOLINOCEPTOR ANTAGONIST** and a (competitive) **NEUROMUSCULAR BLOCKING AGENT**. It is used as a **SKELETAL MUSCLE RELAXANT** in anaesthesia.

atrial natriuretic factor ➡ **atrial natriuretic peptides**.

ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONISTS include ANP itself (also called atrial natriuretic factor (ANF), or atriopeptin), a peptide made up of 28 amino acids and is contained in secretory granules in heart atrial cells. ANP is released in response to stretch in the atria, as occurs with increased central venous pressure, thus signalling volume overload in the circulation. The peptide has an effect on the kidney leading to increased Na^+ and water excretion, vasodilation, increased vascular permeability and modified release of a number of other hormones and neurotransmitters. There are at least three related endogenous peptides: ANP (**atrial natriuretic peptide**), BNP (**brain natriuretic peptide**) and CNP (**type-C natriuretic peptide**). There seem to be two transducing receptors (ANP_A and ANP_B) and also a third 'receptor' (ANPc or NPR-B) that is actually a binding and clearing site.

The ANP_A and ANP_B receptors, formed by two different genes, are coupled in a novel manner via a catalytic unit with guanylyl cyclase activity within the receptor, not involving a G-protein. The effect of this catalytic unit is to generate cGMP within the cell. The third site, ANPc, leads to clearance of the peptides via cellular uptake and degradation by lysosomal enzymes. The potency of the three natural ligands at the ANP_A receptor is ANP > BNP > CNP; whereas at the ANP_B receptors the order is CNP >> ANP = BNP.

Atrial natriuretic peptide has a beneficial local hormone effect on the heart, and, theoretically, agents that mimic or enhance its effects may be useful in heart failure, e.g. **candoxatril**.

Ruskoaho, H. (1992) Atrial natriuretic peptide: synthesis, release and metabolism. *Pharmacol. Rev.*, **44**, 479-602.

Anand-Srivastava, M.B. *et al.* (1993) Atrial natrriuretic factor receptors and signal transduction mechanisms. *Pharmacol. Rev.*, **45**, 455-497.

Gardner, D.G. (1994) Molecular biology of the natriuretic peptides. *Trends Cardiovasc. Med.*, **4**, 159-165.

Hagiwara, H. *et al.* (1995) Natriuretic peptides and their receptors. *Zoolog. Sci.*, **12**, 141-149.

ATRIAL NATRIURETIC PEPTIDE RECEPTOR ANTAGONISTS act at receptors recognizing atrial

natriuretic peptide (ANP) and the related endogenous peptides, BNP (**brain natriuretic peptide**) and CNP (**type-C natriuretic peptide**) which act to exert their actions at ANP_A and ANP_B receptors (see ATRIAL NATRIURETIC PEPTIDE AGONISTS). Few antagonists have yet been develop, but include **[L-α-aminosuberic acid[7,23]]-β-AMP7-28** which acts at ANP_A receptors.

ATRIAL NATRIURETIC PEPTIDES (ANF; ANP; atrial natriuretic factor; atriopeptin; cardiac natriuretic hormone) are members of a family of peptide hormone containing 28 amino acid residues, and showing realtively small species-dependent differences in sequence. They are derived from a larger precursor peptide (cardiodilatin-atrial natriuretic factor precusor), of which there are differing α-, β- and γ-sequences. The human α-sequence is termed **carperitide**. ANP is secreted by granules in the atria of the heart, and acts as an ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONIST. It has a VASODILATOR, HYPOTENSIVE, natriuretic DIURETIC and CARDIAC STIMULANT actions. It also increases vascular permeability and modifies the release of other hormones and neurotransmitters. The biological half-life of the natural analogue is normally too short for clinical use, but co-administration of peptidase inhibitors (e.g. **candoxatrilat**) can prolong its action. **Anaritide** is a synthetic truncated form. Endogenous peptides related to ANP are **BNP** (**brain natriuretic peptide**) and **CNP** (**type-C natriuretic peptide**).

atriopeptin ➡ **atrial natriuretic peptides**; **carperitide**.

atriopeptin (human α-component) ➡ **carperitide**.

atriopeptin 28-(human) ➡ **carperitide**.

Atromid S ➡ **clofibrate**.

atropamine ➡ **apoatropine**.

atropine [INN, USAN] (atropine sulfate [JAN, USAN]; Isopto Atropine™ and many others) is the (±)-form of **tropine tropate**; the (*S*)-form is **hyoscyamine**). It is an alkaloid from *Atropa belladonna* and *Datura stramonium*, *Duboisia*, *Hyoscyamus* and *Scopolia* spp., and several other genera in the Solanaceae. It is a non-subtype selective MUSCARINIC CHOLINOCEPTOR ANTAGONIST with many clinical uses. It is the archetypal anticholinergic with ANTISPASMODIC activity, and can be used to treat intestinal and urinary bladder irritability; also, it is used with ANTIDIARRHOEALS in compound preparations (e.g. **co-phenotrope**). It dries secretion in the airways (used in pre-anaesthetic medication to prevent reflex brachycardia and bronchospasm and to decrease secretions), and is used as a BRONCHODILATOR, ANTIASTHMATIC and antibronchitic. As an ANTIPARKINSONIAN AGENT it reduces rigidity. It can be used topically as a long-lasting MYDRIATIC and cycloplegic. It is an ANTIDOTE to poisoning with PARASYMPATHOMIMETICS, e.g. nerve gases, (organophosphate group) anticholinesterase-type insecticides, and to actions of anticholinesterases used clinically in postoperative recovery. The plant forms can cause accidental poisoning of humans and livestock.

atropine sulfate ➡ **atropine**.

atropyltropein ➡ **apoatropine**.

Atrovent™ ➡ **ipratropium bromide**.

Audax™ ➡ **choline salicylate**.

Audicort™ ➡ **triamcinolone**.

Augmentin™ ➡ **amoxycillin**; **clavulanic acid**; **co-amoxiclav**.

Aulalgan™ ➡ **benzocaine**; **phenazone**.

auranofin [BAN, INN, JAN, USAN] (SKF D-39162; Ridaura™) is a triethylphosphine gold derivative used orally as an ANTIINFLAMMATORY in arthritic and rheumatic treatment.

Aureocort™ ➡ **triamcinolone**.

aureomycin ➡ **chlortetracycline**.

Aureomycin™ ➡ **chlortetracycline**.

Aurolate™ ➡ **gold sodium thiomalate**.

aurothioglucose [INN, USAN] (Solganal™) is an oral ANTIINFLAMMATORY and ANTIARTHRITIC containing gold.

aurothioglycanide [INN] a thiogold derivative used as an ANTIINFLAMMATORY in arthritic and rheumatic treatment.

aurothiosulphate ➡ **sodium aurotiosulfate**.

autohaemophilic factor B ➡ **factor IX**.

autoprothrombin II ➡ **factor IX**.

Avastar™ ➡ **losartan**.

AVC™ ➡ **sulfanilamide**.

Aventyl™ ➡ **nortriptyline**.

Avloclor™ ➡ **chloroquine**.

avobenzone [INN, USAN] is a substituted dibenzoylmethane used by topical application as a SUNSCREEN AGENT.

Avomine™ ➡ **promethazine**.

Avonex™ ➡ **interferon β**.

avoparcin [BAN, INN, USAN] is a (glycopeptide) ANTIBIOTIC complex used as an ANTIBACTERIAL and animal growth promoter.

AVP ➡ **vasopressin**.

avridine [INN, USAN] (CP 20961) is a dioctadecyl-ethanol compound, an (IMMUNOSTIMULANT) IMMUNOMODULATOR that is an immunoenhancing adjuvant with ANTIVIRAL activity. It can induce arthritis in rats. It induces interferon formation.

AW 1151129 ➡ **desipramine**.

Axepim™ ➡ **cefepime**.

axerophthol ➡ **retinol**.

Axid™ ➡ **nizatidine**.

AY 5710 ➡ **magaldrate**.

AY 6608 ➡ **pentagastrin**.

AY 22469 ➡ **deprostil**.

AY 22989 ➡ **sirolimus**.

AY 24031 ➡ **gonadotrophin-releasing hormone**.

AY 24236 ➡ **etodolac**.

AY 24559 ➡ **doxaprost**.

AY 25712 ➡ **acifran**.

AY 27255 ➡ **vinpocetine**.

AY 27773 ➡ **tolrestat**.

AY 61123 ➡ **clofibrate**.

AY 62013 ➡ **ethoglucid**.

AY 62022 ➡ **medrogestone**.

azacitidine [INN, USAN] is a (nucleoside) ANTIBIOTIC isolated from *Streptoverticillium ladakanus* and *Actinoplanes* spp. It is CYTOTOXIC (inhibits pyrimidine biosynthesis) and in ANTICANCER chemotherapy it has been used to treat acute non-lymphoblastic leukaemia. No longer marketed.

azacosterol [INN] (azacosterol hydrochloride [USAN]; DAC; IMD 760; SC 12937) is a steroid cholesterol biosynthesis inhibitor that has been used as an ANTIHYPERLIPIDAEMIC. It also is an avian chemosterilant.

azacosterol hydrochloride ➡ **azacosterol**.

Azactam™ ➡ **aztreonam**.

azalanstat [INN] (RS 21607) is a thiobenzenamine ANTIHYPERLIPIDAEMIC, a selective lanosterol 14a-demethylase inhibitor.

azalomycin [BAN, INN] is a (polyene group) ANTIBIOTIC (a mixture of at least five components), active as an ANTIBACTERIAL against Gram-positive bacteria, mycobacteria, and as an ANTIFUNGAL against yeasts and fungi.

azamethonium bromide [BAN, INN] is a quaterary bisdimethylethanaminium compound GANGLION BLOCKING AGENT, formerly used as an ANTIHYPERTENSIVE.

6-azamianserin ➡ **mirtazapine**.

Azamune™ ➡ **azathioprine**.
Azantac™ ➡ **ranitidine**.
azapetine [BAN] is a benzazepine derivative with α-ADRENOCEPTOR ANTAGONIST and direct VASODILATOR activity.
azapropazone [BAN, INN, JAN] (apazone [USAN]; NSC 102824; Rheumox™ and many others) is a novel pyrazolobenzotriazine with weak CYCLOOXYGENASE INHIBITOR activity and NSAID ANALGESIC, ANTIINFLAMMATORY and antirheumatic properties. It is used orally only to treat serious cases of rheumatoid arthritis and ankylosing spondylitis because of its side-effects. It has uricosuric activity and can be used to treat acute gout.
azaprophen is an azabicyclophenylbenzene derivative that is a potent MUSCARINIC CHOLINOCEPTOR ANTAGONIST.
azaribine [BAN, INN, USAN] (NSC 67239; CB 304) is a pyrimidine antagonist that has been used as an ANTIVIRAL and for psoriasis; it also has ANTICANCER properties.
azaserine [INN, USAN] is an (amino acid) ANTIBIOTIC which inhibits purine biosynthesis and shows activity as an ANTIFUNGAL and ANTICANCER AGENT.
azasetron [INN, USAN] (Y 25130; Serotone™) is an azabicyclobenzoxazine, a selective ($5\text{-}HT_3$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST, with ANTIEMETIC activity against chemotherapy-induced nausea and vomiting.
azatadine [BAN, INN] (azatadine maleate [USAN]; Optimine™) is an analogue of **cyprohepadine**, a HISTAMINE H_1-RECEPTOR ANTAGONIST, also with MUSCARINIC CHOLINOCEPTOR ANTAGONIST, 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST properties and SEDATIVE side-effects. It can be used for the symptomatic relief of allergic symptoms, such as hay fever and urticaria.
azatadine maleate ➡ **azatadine**.
azathioprine [BAN, INN, JAN, USAN] (azathioprine sodium [USAN]; BW 57-322; NSC 39084; Azamune™; Berkaprine™; Immunoprin™; Imuran™) is cleaved *in vivo* to give **mercaptopurine**, a purine analogue that inhibits DNA synthesis. It is an antimetabolite cytotoxic IMMUNOSUPPRESSANT mainly used orally or by injection to reduce tissue rejection in transplant patients, but it can also be used to treat myasthenia gravis, rheumatoid arthritis, ulcerative colitis and several autoimmune diseases. (Note: the abreviation **AZT** has sometimes been used for this drug, but should be reserved for zidovudine).
azathioprine sodium ➡ **azathioprine**.
azelaic acid [INN] (anchoic acid; lepargylic acid; nonanedioic acid; ZK 62498; Skinoren™) is an aliphatic dicarboxylic acid which occurs naturally in rancid fats, and can be isolated from *Lycopodium* spp. and a few higher plants. It is a novel topical DERMATOLOGICAL AGENT with ANTIBACTERIAL activity, which inhibits the division and differentiation of human keratinocytes, and inhibits the generation of pro-inflammatory oxygen derivatives in neutrophils. It is used to treat acne and comedones (blackheads).
azelastine [BAN, INN] (azelastine hydrochloride [JAN, USAN]; A 5610; E 0659; W 2979M; Rhinolast™) is a azepinylphthalazinone, a HISTAMINE H_1-RECEPTOR ANTAGONIST. It is used topically by nasal spray for the symptomatic relief of allergic rhinitis.
azelastine hydrochloride ➡ **azelastine**.
azepexole [BAN, INN] is an oxazoloazepine derivative, an α-ADRENOCEPTOR ANTAGONIST with ANTIHYPERTENSIVE activity.
azidocillin [BAN, INN] is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat certain infections.
azidothymidine ➡ **zidovudine**.
azimexon [INN] (BM 12531) is a substituted cyanoaziridinylaziridinyl compound, with anticancer activity. It has been investigated for the treatment of AIDS.
azintamide [INN] (ST 9067) is a pyridazinylacetamide CHOLERETIC AGENT.
aziridinyl benzoquinone ➡ **diaziquone**.
azithromycin [BAN, INN, USAN] (Zithromax™) is a (macrolide) ANTIBIOTIC. It can be used clinically as an oral or parenteral ANTIBACTERIAL to treat a variety of infections.
Azithromycin ➡ **azithromycin**.
azlocillin [BAN, INN, USAN] (Securopen™) is a semisynthetic (penicillin) ANTIBIOTIC used clinically as an ANTIBACTERIAL to treat certain infections.
azosemide [INN, USAN] is a DIURETIC used in ANTIHYPERTENSIVE therapy.
azovan blue [BAN] (Evans blue [USAN]; chlorazol sky blue FF; C.I. Direct blue 53; diamine sky blue FF; T 1824) is an azo dye used as a diagnostic agent for measurement of blood volume and as a pharmacological tool in measuring plasma extravasation.
AZQ ➡ **diaziquone**.
AZT ➡ **zidovudine**.
aztreonam [BAN, INN, JAN, USAN] (Azactam™) is a synthetic (monobactam / β-lactam) ANTIBIOTIC with ANTIBACTERIAL activity limited to Gram-negative aerobic bacteria.
Azulfidine™ ➡ **sulphasalazine**.

B

B 306 ➡ **flufenamic acid**.
B 577 ➡ **etofenamate**.
B 1420 ➡ **propanidid**.
B3592 ➡ **[Thi^{5,8},DPhe^{7}]-bradykinin**.
B3880 ➡ **[Thi^{5,8},DPhe^{7}]-bradykinin**.
B3926 ➡ **[Thi^{5,8},DPhe^{7}]-bradykinin**.
B 64114 ➡ **bumadizone**.
Ba 16038 ➡ **aminoglutethimide**.
Ba 29038 ➡ **boldenone**.
Ba 29837 ➡ **desferrioxamine**.
Ba 30920 ➡ **tetracosactrin**.
Ba 33112 ➡ **desferrioxamine**.
Ba 34276 ➡ **maprotiline**.
Ba 34647 ➡ **baclofen**.
Ba 41795 ➡ **codactide**.
bacampicillin [BAN, INN] (bacampicillin hydrochloride [JAN, USAN]; Ambaxin™) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as a systemic ANTIBACTERIAL to treat Gram-positive and -negative infections.
bacampicillin hydrochloride ➡ **bacampicillin**.
bacitracin [BAN, INN] is a (cyclic peptide) ANTIBIOTIC elaborated by *Bacillus* spp. It shows broad-spectrum ANTIBACTERIAL activity, and can be used clinically as a topical agent. It is a permitted food additive for animal and human consumption. Commonly used as bacitracin zinc.
bacitracin zinc ➡ **bacitracin**.
baclofen [BAN, INN, JAN, USAN] (Ba 34647; C 34647Ba; Baclospas™; Lioresal™) is a ($GABA_B$) GABA RECEPTOR AGONIST. It is used as a (CNS-acting) SKELETAL MUSCLE RELAXANT for muscles that are in spasm, particularly when caused by an injury to or a disease of the CNS.
α-baclofen (PCPGABA) is a lipophilic GABA analogue, a ($GABA_B$) GABA RECEPTOR AGONIST. See also **baclofen**.
Baclospas™ ➡ **baclofen**.
Bactocill™ ➡ **oxacillin**.
Bactroban™ ➡ **mupirocin**.
baking soda ➡ **sodium bicarbonate**.
BAL ➡ **dimercaprol**.
balsalazide [BAN, INN] (Balsalazine™; Colazide™) is a prodrug of **mesalazine** and is one of the aminosalicylate group. It is used as an ANTIINFLAMMATORY and ANTICOLITIS AGENT for ulcerative colitis. It is an analogue of **ipsalazide**.
Balsalazine™ ➡ **balsalazide**.
BAM-18P (bovine adrenal medulla octadecapeptide) is a 18 amino acid residue peptide isolated from the bovine adrenal medulla, a derivative of proenkephalin A. It is a (μ) OPIOID RECEPTOR AGONIST.
BAM-22P (bovine adrenal medulla docosapeptide) is a 22 amino acid residue peptide isolated from bovine adrenal medulla. It is a derivative of proenkephalin A, and is a **methionine enkephalin** precursor. It acts as a (κ) OPIOID RECEPTOR AGONIST.
bambuterol ➡ **terbutaline**.
bamethan [BAN, INN] (bamethan sulfate [JAN, USAN]; butylnorsynephrine; butyloctopamine) is a phenylethanolamine derivative VASODILATOR used for vascular disorders.
bamethan sulfate ➡ **bamethan**.
bamifylline [BAN, INN] (bamifylline hydrochloride [USAN]) is a **theophylline** derivative with similar properties. It can be used as a BRONCHODILATOR and coronary VASODILATOR.
bamifylline hydrochloride ➡ **bamifylline**.
bamipine [BAN, INN] is a piperidinamine, a HISTAMINE H_1-RECEPTOR ANTAGONIST with SEDATIVE properties. It has been used as an ANTIALLERGIC to treat hypersensitivity reactions.
bamnidazole ➡ **metronidazole**.
banisterine ➡ **harmine**.
baquiloprim [BAN, INN] is a DIHYDROFOLATE REDUCTASE INHIBITOR used as a veterinary ANTIBACTERIAL.
Baratol™ ➡ **indoramin**.
barbital ➡ **barbitone**.
barbital sodium ➡ **barbitone**.
barbitone [BAN] (barbital [INN]; barbital sodium [INN]; barbitone sodium; Veronal™) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone**. It has been used to treat insomnia, and as an ANTICONVULSANT in status epilepticus.
barbitone sodium ➡ **barbitone**.
Barinatrix™ ➡ **batimastat**.
barium sulfate [JAN, USAN] (barium sulphate; $BaSO_4$) is used as a diagnostic agent and as a radiopaque medium.
barium sulphate ➡ **barium sulfate**.
barnidipine [INN] is a dihydropyridine CALCIUM-CHANNEL BLOCKER used as an ANTIHYPERTENSIVE.
barucainide [INN] is a furopyridinyl derivative, a (class 1b) ANTIARRHYTHMIC AGENT under evaluation.
basic aluminium glycinate (dihydroxyaluminium aminoacetate) can be used as an oral non-systemic ANTACID.
basic bismuth gallate ➡ **bismuth subgallate**.
basic pancreatic trypsin inhibitor ➡ **aprotinin**.
$BaSO_4$ ➡ **barium sulfate**.
batimastat [INN] (BB 94; Barinatrix™) is a peptide-mimetic comprised of a peptide backbone with a hydroxamate terminal group (which binds to the zinc atom of the enzyme active site). It is a matrix (metallo) PROTEASE INHIBITOR. It has entered trials as an adjunct in ANTICANCER treatment where, by inhibiting matrix metalloproteinases, it restricts tumour growth.
batrachotoxinin is a complex alkaloid, a toxic principle from skin extracts of Colombian poison-dart frogs *Phyllobates aurotaenia* and *Phyllobates terribilis*, and the hooded pitohui bird (*Pitohui dichrous*). It is a NEUROTOXIN, a SODIUM-CHANNEL ACTIVATOR that binds to Na^+-channels and blocks inactivation and shifts activation to more negative potentials. The overall effect is depolarization, increased excitability and paralysis. It is used as a pharmacological tool.
batroxobin [INN, JAN] (*Bothrops atrox* serine proteinase; Defibrase™) is a peptide of 231 amino acids (MW 25,503), an ENZYME with thrombin-like serine protease properties, isolated from the venom of *Bothrops atrox*, *Bothrops moojeni* and *Bothrops jacaraca*. It acts on fibrinogen to produce a fibrin monomer that can be converted by thrombin to produce a fibrin clot. It can be used at low doses as a HAEMOSTATIC AGENT (usually with **factor X** as a haemocoagulase). At higher doses it can be used as a defibrinogenating agent to produce a hypofibrinogen state. It is used locally or parenterally in treating a variety of peripheral arterial circulatory disorders.
BAX 1515 ➡ **sutilains**.
BAX 1526 ➡ **chymopapain**.

BAX 3084 ➡ **sevoflurane**.
Baxan™ ➡ **cefadroxil**.
Bay 4503 ➡ **propiram**.
Baycron™ ➡ **mefruside**.
Bayer A128 ➡ **aprotinin**.
Bayer 1213 ➡ **methotrimeprazine**.
Bay f 4975 ➡ **acemetacin**.
Bay g 5421 ➡ **acarbose**.
Bay g 6575 ➡ **nafazatrom**.
Bay K 8644 is a dihydropyridine agent of which the (*S*)-form is a CALCIUM-CHANNEL ACTIVATOR, and the (*R*)-form is a CALCIUM-CHANNEL BLOCKER. It is a smooth muscle stimulant.
Bay q 4218 ➡ **butaprost**.
Bay q 7821 ➡ **ipsapirone**.
BB ➡ **bombesin**.
BB 94 ➡ **batimastat**.
BB 99 ➡ **roxadimate**.
BB 882 ➡ **lexipafant**.
BB 2516 ➡ **marimastat**.
BC 48 ➡ **demecarium bromide**.
BC 2627 ➡ **butorphanol**.
B-cell differentiation factor 2 ➡ **interleukin-6**.
B-cell growth factor 1 ➡ **interleukin-4**.
B-cell growth factor 2 ➡ **Interleukin-5**.
B-cell stimulating factor 1 ➡ **interleukin-4**.
B-cell stimulatory factor 2 ➡ **interleukin-6**.
BCGF-1 ➡ **interleukin-4**.
BCGF-II ➡ **interleukin-5**.
BCNU™ ➡ **carmustine**.
BCW59-A ➡ **metkefamide**.
BCX 2600 ➡ **stiripentol**.
BDH 1298 ➡ **megestrol**.
BDPE ➡ **broparestrol**.
beclamide [BAN, INN] is a proprionamide with ANXIOLYTIC properties which also is used as an ANTICONVULSANT.
beclobrate [BAN, INN] (Sgd 24774) is one of the fibrate group and is an ANTIHYPERLIPIDAEMIC AGENT.
beclometasone ➡ **beclomethasone**.
beclometasone dipropionate ➡ **beclomethasone**.
beclometasone valeroacetate ➡ **beclomethasone**.
beclomethasone [BAN] (beclometasone [INN]; beclometasone dipropionate [JAN, USAN]; Beclovent™; Becodisks™; Beconase™; Becotide™; Beclovent™; Bezonase™; Vanceril™ and many others) is a potent CORTICOSTEROID; a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is extensively used: by topical application as an antiinflammatory agent for severe skin inflammation (e.g. eczema and psoriasis); by nasal spray for rhinitis; and (as dipropionate) by inhalation in ANTIASTHMATIC treatment as prophylaxis against attacks.
Beclovent™ ➡ **beclomethasone**.
Becodisks™ ➡ **beclomethasone**.
Beconase™ ➡ **beclomethasone**.
Becotide™ ➡ **beclomethasone**.
befunolol [INN] (befunolol hydrochloride [JAN]) is a β-ADRENOCEPTOR ANTAGONIST showing some intrinsic β-partial agonist activity. It can be used therapeutically in ANTIHYPERTENSIVE and ANTIGLAUCOMA TREATMENT.
befunolol hydrochloride ➡ **befunolol**.
befuraline [INN] is a furanylpiperazine derivative, a PHOSPHODIESTERASE INHIBITOR with reported ANTIDEPRESSANT properties.
bekanamycin [INN] (aminodeoxykanamycin [JAN]; kanendomycin) is an (aminoglycoside) ANTIBIOTIC, a congener of **kanamycin A**. Clinically, it has ANTIBACTERIAL properties and can be used systemically and topically.
BeL 43694A ➡ **granisetron**.
belladonna (extract) [USAN] is an extract obtained from the leaves and root of *Atropa belladonna*. It contains several alkaloids including **atropine**, **hyoscyamine** and **hyoscine**. It acts as a MUSCARINIC CHOLINOCEPTOR ANTAGONIST and can be used as an ANTISPASMODIC.
bemegride [BAN, INN] is a glutarimide with similar properties as **doxapram** as a CNS and RESPIRATORY STIMULANT. It was previously used orally or by injection for treatment of barbiturate and other CNS DEPRESSANT overdose.
bemesetron [INN, USAN] (MDL 72222) is a substituted azabicyclo compound, a selective ($5\text{-}HT_3$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It shows ANTIEMETIC activity against chemotherapy-induced emesis. It has been much used as a pharmacological tool.
bemetizide [BAN, INN] is a (thiazide) DIURETIC used in ANTIHYPERTENSIVE therapy.
bemiparin sodium ➡ **enoxaparin**.
benactyzine [BAN, INN] is a carbamate with mixed MUSCARINIC CHOLINOCEPTOR ANTAGONIST and (NMDA) GLUTAMATE RECEPTOR ANTAGONIST activity. It has peripheral and central anticholinergic actions rather like hyoscine, showing a SEDATIVE/ANXIOLYTIC action.
Benadryl™ ➡ **diphenhydramine**.
benaprizine ➡ **benapryzine**.
benapryzine [BAN] (benaprizine [INN]; benapryzine hydrochloride [USAN]) is a benzilate, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST which has been used as an ANTIPARKINSONIAN AGENT.
benapryzine hydrochloride ➡ **benapryzine**.
benazepril [BAN, INN] (CGS 14824; Cibacen™; Lotensin™) is a benzazepine, an ACE INHIBITOR, and is the (ethyl ester) prodrug of **benazeprilat**. It is a VASODILATOR used therapeutically as an ANTIHYPERTENSIVE.
benazeprilat [INN] is a benzazepine, an ACE INHIBITOR. It acts as a VASODILATOR and is used therapeutically as an ANTIHYPERTENSIVE, in the form of its prodrug **benazepril**.
bencyclane [INN] (bencyclane fumarate [JAN]) is a cycloheptane derivative, an ANTISPASMODIC and VASODILATOR tried in peripheral vascular disease.
bencyclane fumarate ➡ **bencyclane**.
bendacalol [INN] (bendacalol mesylate [USAN]) is a combined α-ADRENOCEPTOR ANTAGONIST and β-ADRENOCEPTOR ANTAGONIST that also shows CALCIUM-CHANNEL BLOCKER activity. It can be used therapeutically in ANTIHYPERTENSIVE and ANTIARRHYTHMIC treatment.
bendacalol mesylate ➡ **bendacalol**.
bendazac [BAN, INN, JAN, USAN] (AF 983) is an indazolacetic acid derivative, an ANTIINFLAMMATORY AGENT that has been used in the treatment of cataracts of the eye.
bendazol [INN] is a benzimidazole derivative with (coronary) VASODILATOR, SMOOTH MUSCLE RELAXANT and ANTIHYPERTENSIVE actions.
bendiocarb [ANSI, BSI, ISO] is a methylcarbamate ANTICHOLINESTERASE used as an agricultural and public health INSECTICIDE.
bendroflуazide [BAN] (bendroflumethiazide [INN]; Aprinox™; Berkozide™ etc.) is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy (often in combination with β-ADRENOCEPTOR ANTAGONISTS).
bendroflumethiazide ➡ **bendroflуazide**.
Benemid™ ➡ **probenecid**.
benethamine penicillin [BAN, INN] is a (penicillin) ANTIBIOTIC, the benzylphenylammonium salt of

benzylpenicillin. It is used as an ANTIBACTERIAL AGENT.
benexate [INN] is a guanidinyl phthalate, a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC AGENT.
benextramine (BHC) is a dithiodiethane hexanediamine derivative, an (irreversible α_1/α_2) α-ADRENOCEPTOR ANTAGONIST. It is also a (noncompetitive Y_1 and Y_2) NEUROPEPTIDE Y RECEPTOR ANTAGONIST.
benfluorex [INN] is an **amphetamine** analogue with SYMPATHOMIMETIC properties. It has APPETITE SUPPRESSANT, and ANTIHYPERLIPIDAEMIC properties and has potential as an (oral) HYPOGLYCAEMIC or ANTIDIABETIC AGENT.
benfosformin [INN] is one of the biguanide group of (oral) HYPOGLYCAEMICS, which (unlike the sulphonylureas) act mainly by decreasing gluconeogenesis and by increasing peripheral utilization of glucose, and is only effective in diabetics with some residual functioning pancreatic islet cells. It can be used as an ANTIDIABETIC in non-insulin-dependent diabetes mellitus (NIDDM).
benfotiamine [INN] is a synthetic VITAMIN, a vitamin B_1 (**thiamine**) replacement, with claimed ANALGESIC properties.
Benoquin ➡ **monobenzone**.
Benoral™ ➡ **benorylate**.
benorilate ➡ **benorylate**.
benorylate [BAN] (benorilate [INN]; paracetamol acetylsalicylate; Benoral™) is an **aspirin-paracetamol** ester, and these two pharmacologically active constituents are released systemically at different rates. It has CYCLOOXYGENASE INHIBITOR, NSAID ANALGESIC, ANTIINFLAMMATORY and antirheumatic activity. It is used orally, particularly to treat the pain of rheumatic disease and other musculoskeletal disorders, as well as to treat fever.
benoxaprofen [BAN, INN, USAN] (Opren™) is one of the propionic acid series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity; also effective for psoriasis. It was withdrawn due to adverse drug reactions.
benoxinate hydrochloride ➡ **oxybuprocaine**.
benperidol [BAN, INN, USAN] (PB 806; R 4584; Anquil™) is a butyrophenone used as an ANTIPSYCHOTIC in treating aberrant behaviour.
benserazide [BAN, INN USAN] (benserazide hydrochloride [JAN]) is a hydrazine derivative of **DOPA**, a peripheral DOPA-DECARBOXYLASE INHIBITOR used as an ANTIPARKINSONIAN AGENT. It prevents **levodopa** being too rapidly broken down into **dopamine** in the periphery so as to increase the amounts reaching the brain. It is normally co-administered with levodopa as an oral compound preparation called co-beneldopa (Madopa™).
bentazepam [INN, USAN] is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST with most properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity.
bentemazole [INN] is an imidazolyltetrazole, an ANALGESIC and URICOSURIC AGENT.
bentiromide [BAN, INN, JAN, USAN] (E 2663; Ro 11-7891; Chymex™) is used as a diagnostic agent for measuring pancreatic function (via rate of *p*-aminobenzoic acid elimination).
benurestat [INN, USAN] (EU 2826) is a benzamide, a UREASE INHIBITOR, which can be used for infected ureolysis.
Benylin™ ➡ **diphenhydramine**.
Benzac™ ➡ **benzoyl peroxide**.
benzalkonium chloride [BAN, INN, JAN, USAN] (Conotrane™; Drapolene™; Roccal™ and many other names) is a cationic surfactant used as a topical ANTISEPTIC and germicide, which has some KERATOLYTIC properties, and can be topically applied to dissolve warts. It can also be used as a preservative in medicines.
benzarone [INN] is a benzofuranyl compound and metabolite of **benzbromarone**. It has been used topically or orally as an antihaemorrhagic HAEMOSTATIC AGENT in a variety of peripheral vascular disorders.
benzathine penicillin [BAN] (benzathine benzylpenicillin [INN]; penicillin G benzathine [USAN]; benzylpenicillin benzathine [JAN]; Bicillin™) is a (penicillin) ANTIBIOTIC, the relatively insoluble dibenzylethylenediammonium salt of **benzylpenicillin**, clinically used as a slow-release ANTIBACTERIAL.
benzatropine ➡ **benztropine**.
benzbromarone [BAN, INN, JAN, USAN] (MJ 10061) is a benzofuranyl compound, a URICOSURIC AGENT.
benzcurine iodide ➡ **gallamine**.
Benzedrine™ ➡ **amphetamine**.
benzestrol benzestrol [BAN, INN] is a synthetic non-steroid OESTROGEN and analogue of **stilboestrol**. It has been used therapeutically to make up hormonal deficiencies, for instance, in HRT.
benzethidine [BAN, INN] (NIH 7574. TA 28) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC.
benzetimide ➡ **dexetimide**.
benzetimide hydrochloride ➡ **dexetimide**.
benzfetamine ➡ **benzphetamine**.
benzhexol [BAN] (trihexyphenidyl [INN]; trihexyphenidyl hydrochloride [USAN]; Artane™; Broflex™) is a substituted piperidine, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as an ANTIPARKINSONIAN AGENT to increase mobility and decrease rigidity, tremor and the tendency to produce an excess of saliva.
benzhydramine ➡ **diphenhydramine**.
benzhydrylsulphinylacetamide ➡ **modafinil**.
benzidamine ➡ **benzydamine**.
benzilonium bromide [BAN, INN, JAN, USAN] is a pyrrolidinium quaternary ammonium compound, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST with peripheral effects similar to those of **atropine**. Its anticholinergic effects have been investigated in the treatment of urinary incontinence.
benzimidazolylpropionic acid ➡ **procodazole**.
benziodarone [BAN, INN, JAN] is a benzofuran derivative, a coronary VASODILATOR.
benznidazole [INN] is a nitroimidazole with ANTIPROTOZOAL and ANTITRICHOMONAL activity. Clinically, it can be used in the treatment of trypanosomiasis.
benzocaine [BAN, INN, USAN] (ethyl aminobenzoate [JAN]; Americaine™; Intralgin™ and many others) is an ester series LOCAL ANAESTHETIC, used by topical application for the local relief of pain.
benzochlorophene ➡ **clorofene**.
BENZODIAZEPINE BINDING-SITE AGONISTS act not at a distinct receptor–effector entity (and cannot be cloned as independent receptors) but rather have a (normally positive) allosteric interaction at 'modulatory' binding-sites on $GABA_A$ receptors. $GABA_A$ receptors are of the heteromeric intrinsic-ion-channel superfamily, and these ligand-gated channels are permeant to chloride ions, so their effect on membrane excitability is normally inhibitory (see CHLORIDE-CHANNEL ACTIVATORS, GABA RECEPTOR AGONISTS). GABA (**γ-aminobutyric acid**) is thought to be the major inhibitory neurotransmitter within the CNS, and GABA receptors have

a wide distribution within the body. The key feature of this benzodiazepines–$GABA_A$ interaction is a positive allosteric modification both of binding and action of GABA at its main 'competitive site' which is concerned with the gating of ion channel opening. Benzodiazepine agonists and GABA, mutually enhance binding at the $GABA_A$ receptors; the former increase the number of channels that are opened by a given concentration of GABA (rather than increasing the average open channel time or channel conductance). The molecular basis of these modulatory interactions of benzodiazepine and the $GABA_A$ receptor is reasonably well understood. A number of subunits of the $GABA_A$ receptors have been demonstrated, and their cDNA is structurally related to that of other receptors of the superfamily, and is a heteromeric pseudo-symmetrical transmembrane structure arranged in pentomers. A number of isoforms exist with different subunits ($\alpha, \beta, \gamma, \delta, \sigma$) which are products of different genes, as the resultant functional $GABA_A$ heterooligomeric receptors can be regarded as a family of receptors rather than a single receptor type. This diversity of receptor form, where subtypes are subject to tissue- and age-dependent transcriptional control, and tissue-dependent functional control at the protein level, raises the possibility of subtype-specific ligands. Which subunits, and what necessary amino acid residues within these subunits are involved in the actions of various classes of benzodiazepines, is increasingly being taken into account in practical drug design. It seems likely that there are different requirements for the action of archetypal benzodiazepines (e.g. **diazepam**) compared to some other agents (e.g. Ro 15-4513 and related imidazobenzodiazepine partial inverse agonists). Also, in operational binding terms, a distinction is made between diazepam-sensitive and diazepam-insensitive sites. A further type designated 'peripheral-type', bears no relation to the usual types found in the CNS. It is located in the mitochondrial membrane, does not involve the $GABA_A$ receptor, but may regulate steroidogenesis both in the periphery and CNS (*vide infra*). It should also be noted that the existance of various endogenous benzodiazepine ligands have been noted; these include diazepam-binding inhibitor and its two major processing products octadecaneuropeptide (ODN) and triacontatetraneuropeptide (TTN).

Chemical classes other than benzodiazepines bind to, and have actions at the various benzodiazepine receptor sites. Notably, there are β-carbolines that have either agonist or inverse agonist actions, with a corresponding pharmacology similar to, or the opposite of typical benzodiazepines (e.g. anxiolytic or anxiogenic actions): see **BENZODIAZEPINE RECEPTOR INVERSE AGONISTS.**

Chemical families acting at benzodiazepine receptors. Since the synthesis in 1961 of the first member of the benzodiazepine group, **chlordiazepoxide**, many thousands have been synthesized, and about 20 are currently clinically available in the UK and USA. These include: **alprazolam**, **bromazepam**, **chlordiazepoxide**, **clonazepam**, **diazepam**, **flunitrazepam**, **flurazepam**, **ketazolam**, **loprazolam**, **lorazepam**, **lormetazepam**, **nitrazepam**, **oxazepam** and **temazepam**. All these drugs include the benzodiazepine ring fused to an aromatic ring, and there are four key substituent positions that determine pharmacological characteristics. These are used for numerous purposes, including as anxiolytics/sedatives/minor tranquillizers, hypnotics, anticonvulsants or antiepileptics, for preoperative use for the enhancement of the action of general anaesthetics, in dental sugery, and as centrally acting skeletal muscle relaxants and for a variety of other uses. Although these members may have different pharmacokinetic characteristics and some minor differences in pharmacological profile, they are in fact largely interchangeable.

Archetypal benzodiazepines contain a 5-aryl substituent ring and a 1,4-diazepine ring, so the term benzodiazepine drug has come to refer to 5-aryl-1,4-benzodiazepine. Various modifications of the ring system have yielded compounds with similar activity. These include 1,5-benzodiazepines (e.g. **clobazam**) and replacement of the fused benzene ring with heteroaromatic systems such as thieno (e.g. **brotizolam**). The substituents at the 1, 2 and 3 positions of the benzodiazepine ring can vary widely and may include imidazolo and triazolo rings fused at positions 1 and 2 (e.g. **alprazolam**, brotizolam, **estazolam**, **midazolam** and **triazolam**). Certain other benzodiazepine agonists developed are based on a 1,4-benzodiazepine ring, e.g. **imidazenil**, which is a new imidazobenzodiazepine with anxiolytic and anticonvulsant properties that acts as a partial agonist. Replacement of the 5-aryl substituent ring with a keto function and a methyl substituent at position 4 results in **flumazenil**, an important competitive antagonist (see **BENZODIAZEPINE BINDING-SITE ANTAGONISTS**). It should be noted that these competitive antagonists are thought to bind to similar subunit positions on the $GABA_A$ receptor as the archetypal benzodiazepine agonists. Some experimental agonists are based on a 2,3-benzodiazepine ring, also called homophthalazines (e.g. girisopam, nerisopam and **tofisopam**), which show strong anxiolytic potency with reduced muscle relaxant and anticonvulsive activity, so differ from e.g. diazepam.

Non-benzodiazepines active at sites of the $GABA_A$ receptor not necessarily identical to those for benzodiazepines, have been sought in attempts to modify the pharmacological profile. These include a number of β-carbolines (i.e. containing an indole nucleus fused to a pyridine ring), that act as inverse agonists at flumazenil-sensitive benzodiazepine receptors, e.g. **DMCM** and β-CCM, and such agents have pro-convulsant, anxiogenic and possibly pro-cognition actions (see **BENZODIAZEPINE RECEPTOR INVERSE AGONISTS**). Other β-carbolines, e.g. abecarnil, have conventional agonist activity with anxiolytic and anticonvulsant properties, but with considerably reduced muscle relaxant effects in comparison with diazepam. Other types are based on imidazopyridines (e.g. **zolpidem**), imidazopyridines, imidazoquinolones and cyclopyrrolones (e.g. **zopiclone**). A number of examples of these with novel pharmacology have partial agonist actions, and may have components of their binding or action insensitive to the archetypal benzodiazepine antagonist flumazenil. The presence of diazepam-insensitive binding sites in the brain was referred to above.

See also **ANTICONVULSANTS; ANXIOLYTIC AGENTS; GABA RECEPTOR ANTAGONISTS; HYPNOTICS; SEDATIVES; SKELETAL MUSCLE RELAXANTS; TRANQUILLIZERS.**

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BENZODIAZEPINE BINDING-SITE ANTAGONISTS

the best-known benzodiazepine receptor selective antagonist

is the (imidazobenzodiazepine) **flumazenil**, which is extensively used clinically. This compound was originally thought to lack effects on behaviour, but was later shown to have some proconvulsant and anxiogenic activity. It is used to treat acute benzodiazepine overdose or to reverse the effects of benzodiazepine receptor agonists used in preoperative medication. The proconvulsant activity is occasionally a problem, particularly in patients receiving tricyclic ANTIDEPRESSANTS. It has further unexpected activity, notably in alleviating CNS depression caused by ethanol and drowsiness sometimes seen in severe liver disease (hepatic encephalopathy). Whether these observations indicate a pathological role for a benzodiazepine-like endogenous mediator is not known. The antagonist **iomazenil** is used in labelled form for visualization of benzodiazepine binding sites in the CNS in experimental studies in humans and animals, and in medical diagnosis. It is used labelled as [^{123}I]-iomazenil, [^{125}I]-iomazenil as a SPECT tracer, or as [^{11}C]-iomazenil in PET studies. There are several diagnostic uses, including in the study of epilepsy, cerebrovascular diseases, degenerative disorders and various affective disorders.

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BENZODIAZEPINE RECEPTOR INVERSE AGONISTS act at the conventional benzodiazepine-binding sites of the $GABA_A$ receptors, but have a *negative* allosteric interaction. The key feature of archetypal benzodiazepine agonist drugs (e.g. **diazepam**) is that they show a *positive* allosteric interaction with GABA; they mutually enhance binding at the $GABA_A$ receptors; and increase the number of channels that are opened by a given concentration of GABA (rather than increasing the average open channel time or channel conductance). Benzodiazepine receptor inverse agonists have the opposite action, so tend to inhibit chloride channel opening and thereby *increase* neuron excitability. Notably, they have pro-convulsant and anxiogenic actions. The best-known examples of such an inverse agonist, extensively used experimentally, is the β-carboline known as **DMCM**. The paradox of the proconvulsant and anxiogenic actions of this compound is not so much the fact that it is chemically remote in structure from the benzodiazepines (in fact, there are a number of β-carbolines that are positive modulators of $GABA_A$ receptors, and which have ANTICONVULSANT and ANXIOLYTIC actions), but more the challenge it presents in mechanistic terms. The novel actions of inverse agonists can best be accommodated by a two-state model which proposes an equilibrium between two alternative states of the benzodiazepine receptor, one of which can bind a GABA molecule and open the channel, and one which cannot bind GABA, therefore, a resting equilibrium between these two states can be moved to varying extents between the extremes according to the binding preferences of drugs.

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benzoic acid (Aserbine™) has ANTIFUNGAL, KERATOLYTIC and ANTISEPTIC activity. Clinically, it can be used topically as a DERMATOLOGICAL AGENT for various skin complaints.

benzoic sulphimide ➡ **saccharin**.

α-benzopyrone ➡ **coumarin**.

benzoquinamide ➡ **benzquinamide**.

benzoquinonium chloride [INN] is a synthetic bisquaternary ammonium heterocyclic complex, a NICOTINIC CHOLINOCEPTOR ANTAGONIST, a (competitive) NEUROMUSCULAR BLOCKING AGENT formerly used as a SKELETAL MUSCLE RELAXANT in anaesthesia. It is also a weak GANGLION BLOCKING AGENT, and has ANTICHOLINESTERASE activity, so cannot successfully be reversed postoperatively with anticholinesterases.

benzosulfinide ➡ **saccharin**.

benzotheophylline ➡ **prox-benzotheophylline**.

benzoxazocine ➡ **nefopam**.

benzoxonium chloride [INN] is an ANTIFUNGAL and ANTIBACTERIAL AGENT.

benzoylpas calcium ➡ **calcium benzamidosalicylate**.

benzoyl peroxide [USAN] (dibenzoyl peroxide; benzoyl superoxide; Acnecide™; Acnegel™; Benzac™; Clearasil™; Desquam™; Mediclear™; Panoxyl™ and many others) is a KERATOLYTIC and ANTIMICROBIAL AGENT, used as a topical DERMATOLOGICAL AGENT to treat conditions such as acne and skin infections such as athlete's foot, often in combination with antimicrobial drugs.

benzoyl superoxide ➡ **benzoyl peroxide**.

benzphetamine [BAN] (benzfetamine [INN]; Didrex™) is an **amphetamine** analogue with SYMPATHOMIMETIC properties, including CNS stimulation. It has been used as an APPETITE SUPPRESSANT, but is no longer marketed.

benzpiperylone [INN] (KB 95) is one of the pyrazolone series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It has been used to treat musculoskeletal and connective tissue disorders.

benzpyrinium bromide [INN] is a quaternary ammonium carbamate, a reversible ANTICHOLINESTERASE.

benzquinamide [BAN, JAN, USAN] (benzoquinamide; BZQ; Emete-Con™) is a benzoquinolizine derivative, with ANTIEMETIC and mild SEDATIVE properties. It has been used to control vomiting associated with anaesthesia and surgery.

benzthiazide [BAN, INN] (Exna™ etc.) is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.

benztropine [BAN] (benzatropine [INN]; benztropine mesilate, [JAN]; benztropine mesylate [USAN]; Cogentin™ and many others) is a tertiary amine with structural features found in **atropine** and **diphenhydramine**. It is a MUSCARINIC CHOLINOCEPTOR ANTAGONIST and a HISTAMINE H_1-RECEPTOR ANTAGONIST. It is used as an ANTIPARKINSONIAN AGENT to increase mobility and decrease rigidity and tremor. It acts as an appetite stimulant for livestock.

benztropine mesilate ➡ **benztropine**.

benztropine mesylate ➡ **benztropine**.

benzydamine [BAN, INN] (benzydamine hydrochloride [JAN, USAN]; benzidamine; Difflam™) is an indazoloxypropanamine. Applied locally, it has COUNTER-IRRITANT (rubefacient or topical analgesic) actions in the symptomatic relief of pain. It has been used orally as an NSAID ANALGESIC, ANTIPYRETIC and ANTIINFLAMMATORY.

benzydamine hydrochloride ➡ **benzydamine**.

benzyl benzoate can be used topically as a SCABICIDAL and PEDICULICIDAL to treat skin or head infestations.

7-benzylidenenaltrexone ➡ **BNTX**.

benzyl isothiocyanate (phenylmethyl isothiocyanate; benzyl mustard oil) can be isolated from *Tropaeolum majus* and *Lepidium sativum* and other plants especially in the Cruciferae. It shows activity as an ANTIBACTERIAL, ANTIVIRAL, ANTIFUNGAL and ANTICANCER AGENT. It inhibits tumourigenesis in animal models.

benzyl mustard oil ➡ **benzyl isothiocyanate**.

benzylpenicillin [INN] (penicillin G sodium [USAN]; penicillin G potassium [USAN]; penicillin G; Cristapen™) is a (penicillin) ANTIBIOTIC, clinically widely used as an ANTIBACTERIAL. Penicillin G, from *Penicillium* sp. and also other fungal spp., was the first of a series of β-lactam antibiotics. It is a starting material for production of 6-aminopenicillanic acid. It and its derivatives can be used clinically as parenteral antibacterial agents to treat Gram-positive and Gram-negative bacterial infections. Derivatives include the benzylphenylammonium salt, **benethamine penicillin**, and the dibenzylethylenediammonium salt, **benzathine penicillin**.

bepafant [INN] (WEB 2170) is a complex cyclopentatriazolodiazepine structure, which shows PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST activity under investigation in inflammatory and allergic conditions, and with experimental cardioprotective activity.

bephenium hydroxynaphthoate [BAN, INN] is an ANTHELMINTIC.

bepridil [BAN, INN] (bepridil hydrochloride [USAN]; Vascor™) is a CALCIUM-CHANNEL BLOCKER with properties similar to **nifedipine**. It has VASODILATOR, ANTIANGINAL properties and shows ANTIARRHYTHMIC activity.

bepridil hydrochloride ➡ **bepridil**.

beraprost [INN, USAN] (beraprost sodium [USAN]) is a synthetic prostaglandin derivative, a PROSTANOID RECEPTOR AGONIST with PLATELET AGGREGATION INHIBITOR, ANTITHROMBOTIC and VASODILATOR actions.

beraprost sodium ➡ **beraprost**.

Berenil™ ➡ **diminazene aceturate**.

Berkamil™ ➡ **amiloride**.

Berkaprine™ ➡ **azathioprine**.

Berkozide™ ➡ **bendrofluazide**.

bermoprofen [INN] (AD 1590) is one of the propionic acid series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

Berotec™ ➡ **fenoterol**.

bestatin (ubenimex [INN]; NK 421; Inobestin™) is a peptide antibiotic produced by *Streptomyces olivoreticuli*. It can be used as a pharmacological and biochemical tool as an AMINOPEPTIDASE INHIBITOR, including as a (thiol) PROTEASE INHIBITOR against aminopeptidase N (EC 3.4.11.2) and aminopeptidase B (EC 3.4.11.6). It also is reported to have ANTICANCER properties (against leukaemia).

Beta-Adalat™ ➡ **nifedipine**.

betacarotene ➡ **β-carotene**.

betacemethadone ➡ **dimepheptanol**.

betacetylmethadol ➡ **dimepheptanol**.

Betacholyl™ ➡ **methacholine chloride**.

Betadine™ ➡ **povidone-iodine**.

Betaferon™ ➡ **interferon β**.

Betagen™ ➡ **levobunolol**.

betahistine [BAN] (β-histine; betahistine hydrochloride [USAN]; betahistine mesilate [JAN]; Serc™) is a **histamine** analogue and HISTAMINE RECEPTOR AGONIST. It is a VASODILATOR claimed to improve circulation in the labyrinth of the ear, and is used orally to treat Ménière's disease. It is a DIAMINE OXIDASE INHIBITOR.

betahistine hydrochloride ➡ **betahistine**.

betahistine mesilate ➡ **betahistine**.

Betaloc™ ➡ **metoprolol**.

betameprodine ➡ **meprodine**.

betamethadol ➡ **dimepheptanol**.

betamethasone [BAN, INN, JAN, USAN] (betamethasone acetate [JAN, USAN]; betamethasone benzoate [BAN, USAN]; betamethasone dipropionate [BAN, JAN, USAN]; betamethasone valerate [BAN, JAN, USAN]; betamethasone valeroacetate; betamethasone acibutate [BAN, INN]; betamethasone sodium phosphate [BAN, JAN, USAN]; Betnelan™; Betnesol™; Betnovate™; Diprosone™) is a potent CORTICOSTEROID, a GLUCOCORTICOID with ANTI-INFLAMMATORY and ANTIALLERGIC properties. It is used in the treatment of many kinds of inflammation, particularly inflammation associated with skin conditions, such as eczema and psoriasis, and of the eyes, ears or nose. It is also used to treat cerebral oedema and congenital adrenal hyperplasia. It is administered in several forms by different methods, depending on the form of the drug, including orally, by topical application and by injection. Betamethasone is also available in several compound preparations with ANTIMICROBIALS and LOCAL ANAESTHETICS. (For 16α-epimer see **dexamethasone**).

betamethasone acetate ➡ **betamethasone**.

betamethasone acibutate ➡ **betamethasone**.

betamethasone benzoate ➡ **betamethasone**.

betamethasone dipropionate ➡ **betamethasone**.

betamethasone sodium phosphate ➡ **betamethasone**.

betamethasone valerate ➡ **betamethasone**.

betamethasone valeroacetate ➡ **betamethasone**.

betamicin sulfate ➡ **isepamicin**.

betanidine ➡ **bethanidine**.

betanidine sulfate ➡ **bethanidine**.

Betaseron™ ➡ **interferon β**.

betaxolol [BAN, INN] (betaxolol hydrochloride [USAN]; Betoptic™; Kerlone™) is a β-ADRENOCEPTOR ANTAGONIST showing β_1-selectivity, which is relatively lipophilic. It can be used therapeutically as an ANTIHYPERTENSIVE, ANTIANGINAL and ANTIGLAUCOMA. The (*S*)-form is levobetaxolol [INN].

betaxolol hydrochloride ➡ **betaxolol**.

betazole ➡ **ametazole**.

bethanechol chloride [BAN, JAN] (Duvoid™; Myocholine™; Myotonine™; Urecholine™) is a quaternary ammonium choline ester analogue of **acetylcholine**. It is MUSCARINIC CHOLINOCEPTOR AGONIST, and its PARASYMPATHOMIMETIC properties can be used to stimulate motility in the intestines and to treat urinary retention.

bethanidine [BAN] (betanidine [INN]; bethanidine sulfate [USAN]; betanidine sulfate [JAN]) is a guanidine derivative which is an adrenergic neuron blocking agent, formerly used as an ANTIHYPERTENSIVE AGENT.

bethanidine sulfate ➡ **bethanidine**.

Betnelan™ ➡ **betamethasone**.

Betnesol™ ➡ **betamethasone**.

Betnovate™ ➡ **betamethasone**.

Betoptic™ ➡ **betaxolol**.

bevantolol [BAN, INN] (bevantolol hydrochloride [USAN]) is a β-ADRENOCEPTOR ANTAGONIST showing β_1-selectivity. It can be used therapeutically in ANTIHYPERTENSIVE treatment.

bevantolol hydrochloride ➡ **bevantolol**.

bevonium methylsulfate [BAN, JAN] (bevonium metilsulfate [INN]) is a quaternary ammonium compound, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST that can be used as an ANTISPASMODIC.

bevonium metilsulfate ➡ **bevonium methylsulfate**.

bezafibrate [BAN, INN, USAN] (BM 15075; LO 44; Bezalip™) is one of the fibrate group and is extensively used as an ANTIHYPERLIPIDAEMIC.

Bezalip™ ➡ **bezafibrate**.

bezitramide [BAN, INN] (R 4845) is one of the

phenylpiperidine series and is an OPIOID RECEPTOR AGONIST, which can be used as and OPIOID ANALGESIC and ANTITUSSIVE.
Bezonase™ ➡ **beclomethasone**.
BG 8301 ➡ **teceleukin**.
BG 8967 ➡ **bivalirudin**.
Bgt3.1 ➡ **κ-bungarotoxin**.
BHC ➡ **benextramine**.
BI 61.012 ➡ **sargramostim**.
BI 71052 ➡ **epoetin gamma**.
bialamicol [BAN, INN] (bialamicol hydrochloride [USAN]) has properties as an AMOEBICIDAL AGENT.
bialamicol hydrochloride ➡ **bialamicol**.
Biaxin™ ➡ **clarithromycin**.
BB 10010 ➡ **nagrestipen**.
BIBR 277 ➡ **telmisartan**.
BIBS 222 is a benzimidazolylmethylbenzate, a non-peptide (AT_1/AT_2) ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE activity.
bicalutamide [BAN, INN] (ICI 176334; Casodex™) is a non-steroidal ANTIANDROGEN investigated for ANTICANCER treatment for advanced prostate cancer.
Bicillin™ ➡ **benzathin penicillin**.
bicozamycin [INN] is a diketopiperazine ANTIBIOTIC. It can be used as an ANTIBACTERIAL antiinfective agent for gut infections, and commercially as a growth stimulant for chickens and swine.
bicuculline is an alkaloid from many *Corydalis* spp. and several *Fumaria* spp. It is a ($GABA_A$) GABA RECEPTOR ANTAGONIST, a CNS STIMULANT, convulsant and NEUROTOXIN. It is a much-used pharmacological tool
bifemelane [INN] (bifemelane hydrochloride [JAN]; E 687; MCI 2016) is a phenoxybutanamine derivative, a central cholinergic agent and NOOTROPIC AGENT (cognition enhancer) used in the treatment of senile dementia. It has experimental ANTIDEPRESSANT activity; also protects CA1 neurons following transient cerebral ischaemia.
bifemelane hydrochloride ➡ **bifemelane**.
bifonazole [BAN, INN, JAN, USAN] is an (imidazole group) broad-spectrum ANTIFUNGAL. Clinically, it is used topically as a DERMATOLOGICAL AGENT for various skin disorders.
big-endothelin I ➡ **endothelin-1**.
bigumalum ➡ **proguanil**.
Bilarcil™ ➡ **metriphonate**.
Biltricide™ ➡ **praziquantel**.
BIM 23014C ➡ **lanreotide**.
bimakalim [INN] (SR 44866) is a pyridinylbenzopyran-carbonitrile derivative, a POTASSIUM-CHANNEL ACTIVATOR. It has ANTIHYPERTENSIVE properties and is a potential cardioprotective agent.
BIMU 1 is a benzimidazole-carboxamide derivative, a selective (5-HT_4-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST. It has ANTIEMETIC properties, and is used as a pharmacological tool.
BIMU 8 is a benzimidazole-carboxamide derivative, a selective (5-HT_4-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST. It has experimental GASTRIC MOTILITY STIMULANT (gastroprokinetic) activity; used as a pharmacological tool.
binedaline [INN] (Scha 1659) is a phenylindole, a noradrenaline UPTAKE INHIBITOR and ANTIDEPRESSANT. Never marketed.
binifibrate [INN] (WAC 104) is one of the fibrate group, extensively used as an ANTIHYPERLIPIDAEMIC.
bioallethrin ➡ **allethrin**.
biochanin B ➡ **formononetin**.
Biogamma™ ➡ **interferon γ**.
biogastrone acid ➡ **enoxolone**.
Bioplex™ ➡ **carbenoxolone**.
Bioral™ ➡ **carbenoxolone**.
Biorphen™ ➡ **orphenadrine**.
biotin [INN, USAN] (vitamin H; coenzyme R; Vitamin B_7; Factor S) is a VITAMIN that occurs in yeast, eggs and liver, and is also produced by various other microorganisms and isolated from various higher plant sources, e.g. maize seedlings. A bacterial growth factor for 'egg white injury', it is an essential coenzyme in fat metabolism and other carboxylation reactions. Deficiency is rare apart from in certain paediatric disorders. It is incorporated into numerous multivitamin preparations.
biperiden [BAN, INN, JAN, USAN] (biperiden hydrochloride [JAN]; biperiden lactate [JAN]; Akineton™ and many others) is a tertiary amine and substituted bicyclophenylpiperidine, with MUSCARINIC CHOLINOCEPTOR ANTAGONIST and weak NICOTINIC CHOLINOCEPTOR ANTAGONIST activity. It is used as an ANTIPARKINSONIAN AGENT to increase mobility and decrease rigidity and the tendency to produce an excess of saliva, also to control drug-induced extrapyramidal disorders and as an ANTIDOTE to treat **nicotine** poisoning; it has sedative properties.
biperiden hydrochloride ➡ **biperiden**.
biperiden lactate ➡ **biperiden**.
biphasic insulin ➡ **insulin**.
***p*-biphenylylacetic acid** ➡ **felbinac**.
BIRM 270 ➡ **ontazolast**.
bisacodol [BAN, INN] is a (stimulant) LAXATIVE of the diphenylmethane group. It is used in many proprietary laxative preparations, and also in the form of a water-soluble tannic acid complex (bisacodyl tannex [USAN]).
bisacodyl tannex ➡ **bisacodol**.
bisantrene [INN] (bisantrene hydrochloride [USAN]; ADCA; CL 216942; NSC 337766; orange crush) is an anthracene cytotoxic ANTICANCER AGENT, probably acting as an intercalating agent.
bisantrene hydrochloride ➡ **bisantrene**.
bisdequalinium diacetate is a bisquaternary quinolinium ANTISEPTIC with some ANTIFUNGAL and ANTIBACTERIAL activity. Clinically, it may be used topically.
bisfentidine [INN] (DA 50470) is an imidazolylphenyl-imidamide, a HISTAMINE H_2-RECEPTOR ANTAGONIST. It is a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.
BISG 10 ➡ **1,1-decamethylenediguanidine**.
bismuth carbonate oxide ➡ **bismuth subcarbonate**.
bismuth glycollylarsanilate [BAN] (glycobiarsol [INN]) has activity as an AMOEBICIDAL AGENT and can be used for veterinary trichomoniasis.
bismuth oxide is a DERMATOLOGICAL AGENT, a mild ASTRINGENT. It is used topically, especially for haemorrhoids.
bismuth subcarbonate [JAN, USAN] (bismuth carbonate oxide) has veterinary and other medical uses, mainly as a topical DERMATOLOGICAL AGENT and mild ASTRINGENT.
bismuth subgallate (basic bismuth gallate) is a DERMATOLOGICAL AGENT, a mild ASTRINGENT. It is used topically for haemorrhoids, in particular, and as an ANTISEPTIC for wounds (especially in former USSR).
bisobrin [INN] (bisobrin lactate [USAN]) is an isoquinoline, a FIBRINOLYTIC (not used therapeutically).
bisobrin lactate ➡ **bisobrin**.
Bisodol™ ➡ **magnesium carbonate**; **sodium bicarbonate**.
bisoprolol [BAN, INN, USAN] (bisoprolol fumarate [JAN, USAN]; Emcor™; Monocor™; Zebeta™) is a β-ADRENOCEPTOR

ANTAGONIST showing β_1-selectivity, which is relatively lipophilic; used as an ANTIHYPERTENSIVE and ANTIANGINAL.

bisoxatin [INN] (bisoxatin acetate [BAN, JAN]) is a bishydroxyphenylbenzoxazin, a (stimulant) LAXATIVE.

bisoxatin acetate ➡ **bisoxatin**.

bispyrithione magsulfex [USAN] (omadine MDS) is a dithiopyridine: magnesium sulphate complex with ANTIBACTERIAL, ANTIFUNGAL and antidandruff properties.

bithionol [BAN, INN] is a halogenated phenol with ANTIBACTERIAL, ANTHELMINTIC and algicide activity; formerly used in soaps and cosmetics but now banned by the FDA.

bithionoloxide [INN] is an organochlorine sulphide, an ANTHELMINTIC.

bitolterol [BAN, INN] (bitolterol mesylate [JAN, USAN]; Tornalate™) is a β-ADRENOCEPTOR AGONIST which can be used as a BRONCHODILATOR.

bitolterol mesylate ➡ **bitolterol**.

bitoscanate [INN] is a phenylene isothiocyanate derivative, an ANTHELMINTIC.

bivalirudin [BAN, INN] (hirulog I; hirulog; BG 8967) is a direct-acting ANTITHROMBIN with ANTICOAGULANT activity. It is a 19 residue peptide fragment derived from the naturally occurring anticoagulant **hirudin**. Therapeutically, it can be used in thromboembolytic disorders.

DArg-[Hyp³,DPhe⁷,Leu⁸]BK ➡ **R-493**.

ArgThre-BK ➡ **polisteskinin J_t**.

[desArg⁹]BK ➡ **Lys-[desArg⁹]-bradykinin**.

[desArg⁹]BK ➡ **[desArg⁹]-bradykinin**.

[Hyp³]BK ➡ **[Hyp³]bradykinin**.

Lys-BK_{1-8} ➡ **Lys-[desArg⁹]-bradykinin**.

Lys-[Leu⁸,desArg⁹]BK ➡ **Lys-[Leu⁸,desArg⁹]bradykinin**.

BK1-8 ➡ **[desArg⁹]-bradykinin**.

BL 4162A ➡ **anagrelide**.

BL 5572M ➡ **proxorphan**.

BL 5641A ➡ **etintidine**.

BL 6341A is a thiazolylguanidine derivative, a HISTAMINE H_2-RECEPTOR ANTAGONIST. It is a GASTRIC SECRETION INHIBITOR, and potentially an ANTIULCEROGENIC.

Blenoxane™ ➡ **bleomycin sulphate**.

bleomycin A_2 ➡ **bleomycin sulphate**.

bleomycin B_2 ➡ **bleomycin sulphate**.

bleomycin sulfate ➡ **bleomycin sulphate**.

bleomycin sulphate [BANM] (bleomycin sulfate [USAP]; Blenoxane™) is a mixture of (glycopeptide) ANTIBIOTICS isolated from *Streptomyces verticillus*. It can be used as a cytotoxic in ANTICANCER chemotherapy; acting through interference with DNA synthesis, possibly through metal chelation. In medicinal use it is a mixture of antibiotics, of which bleomycin A_2 and B_2 are major components.

Blistering Beetle ➡ **cantharides**.

Blocadren™ ➡ **timolol**.

blood-coagulation factor I ➡ **fibrinogen**.

blood-coagulation factor V ➡ **factor V**.

blood-coagulation factor VII ➡ **factor VII**.

blood-coagulation factor VIII ➡ **factor VIII**.

blood-coagulation factor IX ➡ **factor IX**.

blood-coagulation factor X ➡ **factor X**.

blood-coagulation factor XII ➡ **factor XII**.

blood-coagulation factor XIII ➡ **factor XIII**.

blood-coagulation factor XIV ➡ **factor XIV**.

blutene chloride ➡ **tolonium chloride**.

BM 06002 ➡ **imexon**.

BM 41.440 ➡ **ilmofosine**.

BM 6011 ➡ **clodronic acid**.

BM 6019 ➡ **epoetin beta**.

BM 06022 ➡ **reteplase**.

BM 12531 ➡ **azimexon**.

BM 13177 ➡ **sulotroban**.

BM 15075 ➡ **bezafibrate**.

BM 41332 ➡ **ciamexon**.

BMS 180291 ➡ **ifetroban**.

BMS 180560 is an imidazole-5-carboxylic acid derivative, an early ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE activity.

BMS 181173 ➡ **gusperimus**.

BMS 181339-01 ➡ **paclitaxel**.

BMS 182874 is an isoxazolylnaphthalenesulphonamide which acts as a subtype-selective (ET_A) ENDOTHELIN RECEPTOR ANTAGONIST. It shows experimental antiatherosclerotic activity, and is used as a pharmacological tool.

BMS 18629500 ➡ **irbesartan**.

BMU ➡ **hymecromone**.

BMY 13805-1 ➡ **gepirone**.

BMY 13859 ➡ **tiospirone**.

BMY 40481 ➡ **etoposide**.

BMY 40900 ➡ **didanosine**.

BMY 41606 ➡ **vapreotide**.

BMY 42215-1 ➡ **gusperimus**.

BN 50730 ➡ **rocepafant**.

BN 52021 ➡ **ginkgolide B**.

BN 52063 ➡ **ginkgolide B**.

BNP ➡ **atrial natriuretic peptides; brain natriuretic peptides**.

BNP-32 (human) ➡ **brain natriuretic peptides**.

BNTX (7-benzylidenenaltrexone) is an analogue of the phenanthrene series antagonist **naltrexone** and is a (δ) OPIOID RECEPTOR ANTAGONIST.

Boc-Phe-Leu-Phe-Leu-Phe (*N-tert*-butyloxycarbonyl Phe-Leu-Phe-Leu-Phe) is an inhibitor of **fMLP** and some other chemotactic peptides, and is thought to act as a FORMYL RECEPTOR ANTAGONIST.

bolasterone [INN, USAN] (NSC 66233; U 19763) is an ANDROGEN and ANABOLIC AGENT used in veterinary practice.

boldenone [BAN, INN] (boldenone undecylenate [USAN]; 1-dehydrotestosterone; Ba 29038) is a steroid, a natural product that has been isolated from the scent gland of *Ilybius fenestratus*. It has activity as an ANABOLIC AGENT and has been used in veterinary practice.

boldenone undecylenate ➡ **boldenone**.

boldine dimethyl ether ➡ **glaucine**.

boletic acid ➡ **fumaric acid**.

bombesin (BB) is a tetradecapeptide derived from the skin of *Bombina bombina* and certain other frogs. It has been relatively extensively studied, so has given its name to a family of peptides and receptors, it is a BOMBESIN RECEPTOR AGONIST. Contrary to the original belief, the bombesin sequence is not found in mammals, but a number of similar peptide sequences have been identified in the central and peripheral nervous systems of mammals and in certain specialized mammalian neuroendocrine or paracrine cells (notably **neuromedin B**; **gastrin-releasing peptide**; **GRP_{18-27} = neuromedin C**).

BOMBESIN RECEPTOR AGONISTS act at sites that are sensitive to **bombesin**, a tetradecapeptide derived from the skin of *Bombina bombina* and certain other frogs. This peptide has been relatively extensively studied, so has given its name to a family of peptides and receptors. Contrary to the original belief, the bombesin (BB) sequence is not found in mammals; but a number of similar peptide sequences have

been identified in the central and peripheral nervous systems of mammals, and in certain specialized mammalian neuroendocrine or paracrine cells. Notably, these include **neuromedin B** (NMB), **gastrin-releasing peptide** (GRP) and **GRP_{18-27} (neuromedin C)**.

There are at least two types of receptors, called BB_1 (or neuromedin B-preferring) and BB_2 (or GRP-preferring). At BB_1 receptors there is a potency order, NMB ≥ BB > GRP, and at BB_2 receptors, GRP ≥ BB >> NMB. Both receptors have been cloned in humans and other species. They belong to the seven-transmembrane G-protein-coupled group of receptors and couple through the $InsP_3$/DAG pathway. Some antagonists discriminate between the two receptors (see BOMBESIN RECEPTOR ANTAGONISTS). A third receptor, bb_3 (or BRS-3), has been cloned in guinea-pigs and humans, and mRNA expression in rodents is restricted to reproductive organs.

The principal actions of these peptides are to stimulate gastric acid secretion, to contract intestinal smooth muscle and to contract or relax a range of vascular tissues. A number of neurons in the enteric and central nervous system are excited. Supposed roles for the peptides include a role as a major excitatory enteric neurotransmitter, in central neuronal processes, particularly in feeding and satiety processes and for GRP include a role in facilitating gastric acid secretion.

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BOMBESIN RECEPTOR ANTAGONISTS act at one or more receptors that recognize the mammalian peptide equivalents of the amphibian peptide bombesin (see BOMBESIN RECEPTOR AGONISTS). They have potential for modifying eating behaviour, for antagonizing the effects of peptide-secreting carcinomas and in antagonizing the growth-factor effects of neuromedins from small cell lung carcinoma.

At BB_1 (or neuromedin B-preferring) receptors selective antagonists include: DNal-Cys-Try-DTrp-Lys-Val-Cys-Nal-NH_2 and DNal-cyclo(Cys-Try-DTrp-Orn-Val-)-Nal-NH_2.

At BB_2 (GRP-preferring) receptors, selective antagonists include: the peptides [DPhe⁶]-BB_{6-13} ethyl ester, Ac-GRP_{20-26} ethyl ester, the pseudo-peptides [DPhe⁶,Cpa¹⁴-ψ13-14]-BB_{6-14}, and 1-naphthoyl-[DAla²⁴,DPro²⁶,ψ²⁶⁻²⁷]GRP_{20-27}, and recently the nonpeptides kuwanon G and H (isolated from mulberry).

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***p*-bomdylamine** ➡ **brompheniramine**.

Bonefos™ ➡ **clodronic acid**.

Bonjela™ ➡ **aminacrine**; **choline salicylate**.

bometolol [INN] is a β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically in ANTIHYPERTENSIVE treatment.

bopindolol [INN] is a β-ADRENOCEPTOR ANTAGONIST. Chemically, it is the prodrug of **mepindolol**. It can be used therapeutically in ANTIHYPERTENSIVE treatment.

boracic acid ➡ **boric acid**.

boric acid [INN, JAN] (boracic acid) is a commercially available ANTIBACTERIAL. It is a component of topical ANTISEPTIC preparations.

2-bornanone ➡ **camphor**.

bornaprine [BAN, INN] is a tertiary amine, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, used as an ANTISPASMODIC.

bornaprolol [INN] is a β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically in ANTIHYPERTENSIVE treatment.

bosentan [INN] (Ro 47-0203) is a four-ringed structure that is an orally active non-subtype-selective ENDOTHELIN RECEPTOR ANTAGONIST. It reduces contrast media-induced nephrotoxicity, and also is cardioprotective.

***Bothrops atrox* serine proteinase** ➡ **batroxobin**.

bovine adrenal medulla docosapeptide ➡ **BAM-22P**.

bovine adrenal medulla octadecapeptide ➡ **BAM-18P**.

bovine pituitary growth hormone (bovine somatotropin; ox somatotropin) is a naturally occurring bovine variant of **somatotropin**. It is a pituitary hormone, a peptide consisting of 191 amino acid residues. There are a number of naturally occurring molecular variants or synthetic variants: somagrebove, [INN, USAN]; sometribove [BAN, INN, USAN]; somavubove [INN, USAN]; somidobove [BAN, INN, USAN]. These veterinary forms of bovine growth hormone can be used by injection as bovine growth enhancers or as bovine galactopoietic agents (promoting milk production). See also **human pituitary growth hormone**.

bovine somatotropin ➡ **bovine pituitary growth hormone**.

BPA ➡ **interleukin-3**.

BPP_{9a} ➡ **teprotide**.

$BPP_{9\alpha}$ ➡ **teprotide**.

BQ 123 is a cyclic pentapeptide, which acts as a subtype-selective (ET_A) ENDOTHELIN RECEPTOR ANTAGONIST. It shows cardioprotective effects in an animal model of myocardial infarction. It is used as a pharmacological tool.

BQ 788 is a peptoid compound, which acts as a subtype-selective (ET_B) ENDOTHELIN RECEPTOR ANTAGONIST. It is used as a pharmacological tool.

BR 700 ➡ **fentiazac**.

Bradosol™ ➡ **domiphen bromide**.

bradykinin is a nonapeptide mediator produced in blood and tissues by enzymes (kallikreins) from blood-borne or tissue precursors (kininogens). It is formed along with the decapeptide analogue **kallidin**. These local hormones produce the three cardinal symptoms of inflammatory response: VASODILATION, increased capillary permeability and pain (sensory nerve C-fibre stimulation). It is rapidly inactivated by peptidases, and the effects are too short-lived for clinical application (though a synthetic analogue, **RMP-7**, is used). It acts as a BRADYKININ RECEPTOR AGONIST (active at the B_2-receptor subtype) and these receptors account for most actions (apart from mast cell activation).

bradykinin (1-8) ➡ **[desArg⁹]-bradykinin**.

[desArg⁹]-bradykinin ([desArg⁹]BK; bradykinin$_{(1-8)}$; BK_{1-8}) is a C-terminally deleted derivative of **bradykinin**, produced *in vivo* by the action of the enzyme carboxypeptidase N (kininase I). It is a BRADYKININ RECEPTOR AGONIST selective for the B_1-receptor subtype (induced in inflammatory states).

[Hyp³]bradykinin ([Hyp³]BK) is a naturally occurring homologue of **bradykinin** found in some mammals.

[Hyp³,DPhe⁷]-bradykinin (NPC 361) the first of the [DPhe⁷]BK series of antagonists and has appreciable

BRADYKININ RECEPTOR ANTAGONIST affinity for the B_2-receptor subtype. It has been used as a pharmacological tool.

Ile-Ser-bradykinin ➡ **T-kinin**.

Lys-bradykinin(1-8) ➡ **Lys-[desArg^9]-bradykinin**.

Lys-[desArg^9]-bradykinin (Lys[desArg^9]BK; Lys-bradykinin(1-8); Lys-BK_{1-8}; [desArg^{10}]-kallidin; [desArg^{10}]KD; kallidin(1-9); KAL_{1-9}) is a C-terminally deleted derivative of **kallidin**, and is a BRADYKININ RECEPTOR AGONIST selective for the B_1-receptor subtype (induced in inflammatory states). It is formed *in vivo* from kallidin by the action of the enzyme carboxypeptidase N (kininase I). See also **[desArg^9]-bradykinin**.

Lys-[Leu^8,desArg^9]bradykinin (Lys-[Leu^8,desArg^9]BK) is a BRADYKININ RECEPTOR ANTAGONIST selective for the B_1-receptor subtype.

N-ArgThre-bradykinin ➡ **polisteskinin J_t**.

[Thi^{5,8},DPhe^7]-bradykinin ([Thi^{5,8},DPhe^7]BK; NPC 431;B3592; B3880; B3926) is one of the [D-Phe^7]BK series of antagonists, substituted with the unnatural amino acid, the thienyl residue. It has reasonable BRADYKININ RECEPTOR ANTAGONIST affinity selective for the B_2-receptor subtype. It is used as a pharmacological tool.

[Thi^{5,8},DPhe^7]BK ➡ **[Thi^{5,8},DPhe^7]-bradykinin**.

bradykinin-potentiating peptide ➡ **teprotide**.

bradykinin potentiator B ➡ **teprotide**.

BRADYKININ RECEPTOR AGONISTS act at sites recognizing members and derivatives of the bradykinin family of hormone peptides – kinins – of which **bradykinin** (BK) and **kallidin** (**lysyl-bradykinin**; Lys-BK; KD) are the main mammalian members. The bradykinin family is distinct from the tachykinin family of peptides, though both have profound hypotensive actions and contract many intestinal and other smooth muscles. Historically, it was noted that the former action was relatively slow-developing, hence the name bradykinin. Notable actions of bradykinin and kallidin are to dilate blood vessels and increase their permeability to plasma proteins, and to stimulate sensory nerve C-fibres. These actions are pro-inflammatory, and reflect the fact that the kinin-formation system is activated in inflammation, and enzymes (kallikreins) form the kinins from blood-borne or tissue precursors (kininogens) on injurious insult.

Bradykinin has a linear sequence of 9 amino acid residues, and all residues are necessary for agonist activity at the constitutively expressed B_2-receptors. However, C-terminal deletion by enzymes including kininase I (EC.3.4.11.12), yields **[desArg^9]BK** (i.e. BK_{1-8}), and **[desArg^{10}]KD** (i.e. KD_{1-9}), and these metabolites are active at inducible B_1-receptors – but not at B_2-receptors. In contrast, the parent molecules are very potent at B_2-receptors, but have relatively little activity at B_1-receptors. The stimulus for induction of B_1-receptors seems to be certain inflammatory mediators, notably cytokines.

Genes for both B_1- and B_2-receptors, from several species including humans, have been cloned, sequenced and expressed. Both subtypes are of the seven-transmembrane G-protein-coupled superfamily. They can couple via the $InsP_3$/DAG ($G_q/_{11}$) pathway, but commonly also activate phospholipase A_2 which leads to liberation of prostaglandins. Also, activation of release of nitric oxide (NO) is common, and accounts for the prominent vasodilator action of bradykinin. Species-dependent subtypes have been demonstrated, and there is the possibility of alternative splicing. A proposed B_3-receptor, originally described in the guinea-pig airways, appears to be a species-variant of the B_2-receptor.

Other natural mammalian kinins include **T-kinin**, **[Hyp^3]BK** and [Hyp^4]KD. Relatively few agonist ligands are used experimentally. These include at B_1-receptors; **BK_{1-8}**; **KD_{1-9}** and Sar[DPhe^8]BK_{1-8}; and at B_2-receptors, there are **BK**, **KD**, [Hyp^3,Tyr(Me)^8]BK and [Phe^8,ψ(CH_2-NH)-Arg^9]BK.

There seem few likely applications in therapeutics for bradykinin receptor agonists, though there are many putative applications for antagonists. However, the synthetic bradykinin B_2 receptor agonist analogue **RMP-7** is of some value for increasing cerebrovascular permeability in order to allow delivery to the brain of drugs that would otherwise not pass the blood–brain barrier (e.g. methotrexate and carboplatin in tumour treatment).

Farmer, S.G. *et al.* (1992) Biochemical and molecular pharmacology of kinin receptors. *Annu. Rev. Pharmacol. Toxicol.*, **32**, 511-536.

Hall, J.M. (1992) Bradykinin receptors: Pharmacological properties and biological roles. *Pharmacol. Ther.*, **56**, 131-190.

Dray, A. et al (1993) Bradykinin and inflammatory pain. *Trends Neurosci.*, **16**, 99-104.

Hall, J.M. *et al.* (1997) The pharmacology and immunopharmacology of kinin receptors, in *The Handbook of Immunopharmacology: The Kinin System*, (ed. S.G. Farmer), Academic Press, London, pp. 9-43.

BRADYKININ RECEPTOR ANTAGONISTS act against agonists including **bradykinin** (BK) and **kallidin** (**lysyl-bradykinin**; Lys-BK; KD). There are two types of receptor; see BRADYKININ RECEPTOR AGONISTS. More work has been done in developing B_2-receptor antagonists than B_1-receptor antagonists.

The few B_1-receptor antagonists (all peptides) that are available include: **[Leu^8,desArg^9]-BK** (i.e. [Leu^8]BK_{1-8}); **Lys[Leu^8,desArg^9]BK** and [desArg^{10}]HOE 140 (i.e. DArg[Hyp^3,Thi^5,DTic^7,Oic^8,desArg^9]BK).

Large numbers of B_2-receptor antagonists have been produced. First-generation ligands are developed from [DPhe^7]-BK, and include: **NPC 361** ([Hyp^3,DPhe^7]BK; **NPC 349** (DArg[Hyp^3,Thi^{5,8},DPhe^7]BK) and NPC 567 (DArg[Hyp^3,DPhe^7]BK). Second-generation antagonists have a higher affinity and stability due to the incorporation of the unnatural amino acids DTic or LTic (a cyclized form of phenylalanine) and LOic. These include: **R-493** (DArg[Hyp^3,DPhe^7,Leu^8]BK); **icatibant** (**HOE 140**; DArg[Hyp^3,Thi^5,DTic^7,Oic^8]BK); WIN 65365 (DArg[Hyp^3,Thi^5,LTic^7,Oic^8]BK) and S 16118; NPC 18325; NPC 17731; NPC 17761; CP 0127 (deltibant) and CP 0364. The first nonpeptide B_2-receptor antagonist was **WIN 64338**, but this compound is not being developed for clinical usage. A further advance has been the development of **FR 173657**, the first B_2 antagonist active orally, and **FR 167344** which is a pharmacologically similar compound that was co-developed. Further examples of nonpeptide B_2 antagonists are confidently awaited.

Possible applications are extensive and include the treatment of pain (e.g. in burns), inflammation, neurogenic inflammation, oedema (including cerebral oedema and angio-oedema), shock (especially septic shock, probably with B_1 as well as B_2 antagonists), rhinitis and asthma, pancreatitis and defective ion transport, such as cholera, Crohn's disease and cystic fibrosis, and chronic inflammatory conditions such as rheumatoid and osteoarthritis.

Stewart, J.M. (1995) Bradykinin B_2 receptor antagonists: Development and applications. *Can. J. Physiol. Pharmacol.*, **73**, 787-790.

Stewart, J.M. (1995) Bradykinin antagonists: Development and applications. *Biopolymers*, **37**, 143-155.

Bertrand, C. *et al.* (1996) Tachykinin and kinin receptor antagonists: therapeutic perspectives in allergic airway disease. *Trends Pharmacol. Sci.*, **17**, 255-259.

Hall, J.M. (1997) Bradykinin receptors. Mini-review. *Gen. Pharmacol.*, **28**, 1-6.

brain natriuretic peptide ➡ **atrial natriuretic**

peptides; brain natriuretic peptides.

brain natriuretic peptides (BNP) are members of a peptide family that shows a degree of sequence homology with ATRIAL NATRIURETIC PEPTIDE (ANF). Several BNPs from different species have been characterized, having 26-45 amino acid residues, where the sequences are less conserved than those of the ANFs. It is processed from a pre-pro-BNP molecule, that can give rise to BNP's of various lengths. BNP-32 (human) is one such product. BNP was initially identified in pig brain, but is more abundant in cardiac atria than in the central nervous system. It is an ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONIST, and the range of pharmacological activities (natriuretic DIURETIC, HYPOTENSIVE and VASODILATOR actions) is similar to ANF.

BRDU ➡ broxuridine.

brefonalol [INN] is a combined α-ADRENOCEPTOR AGONIST and β-ADRENOCEPTOR AGONIST.

bremazocine [INN] (Ph 3753) is one of the benzomorphan series, and is a (mainly κ & μ) OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC.

brequinar [INN] (brequinar sodium [USAN]; DuP 785; NSC 368390) is a quinolinecarboxylic acid derivative, which inhibits *de novo* pyrimidine biosynthesis and acts as an ANTICANCER AGENT and IMMUNOSUPPRESSANT that has been used in organ transplantation.

brequinar sodium ➡ brequinar.

Brethine™ ➡ terbutaline.

Bretylate™ ➡ bretylium tosylate.

bretylium tosylate [BAN, INN, USAN] (Bretylol™; Bretylate™) is a quaternary ammonium ANTISYMPATHETIC and ADRENERGIC NEURON BLOCKING AGENT used as an ANTIHYPERTENSIVE and (class III) ANTIARRHYTHMIC.

Bretylol™ ➡ bretylium tosylate.

Brevibloc™ ➡ esmolol.

Brevital™ ➡ methohexitone.

Bricanyl™ ➡ terbutaline.

Brietal™ ➡ methohexitone.

Brietal Sodium™ ➡ methohexitone.

brifentanil [INN, USAN] is a tetrazolpiperidinyl derivative, an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

brimonidine [BAN, INN] (brimonidine tartrate [BAN, USAN]; UK 14304; Alphagan™) is an imidazolequinoxaline derivative, an (α_2-subtype-selective) α-ADRENOCEPTOR AGONIST (pharmacological analytical tool). Systemically, it is an ANTIHYPERTENSIVE, but clinically it can be used topically in ANTIGLAUCOMA TREATMENT to reduce intraocular pressure (in conjunction with β-ADRENOCEPTOR ANTAGONISTS).

brimonidine tartrate ➡ brimonidine.

British Anti-Lewisite ➡ dimercaprol.

brivudine [INN] is a nucleoside analogue ANTIVIRAL, clinically active against herpes simplex and varicella zoster.

BRL 13856 ➡ clopirac.

BRL 14777 ➡ nabumetone.

BRL 29060 ➡ paroxetine.

BRL 38227 ➡ levcromakalim.

BRL 46470A ➡ ricasetron.

BRL 61063 ➡ cipamfylline.

brocresine [BAN, INN, USAN] (CL 54998; NSD 1055) is a substituted bromophenol, a HISTIDINE DECARBOXYLASE INHIBITOR and DIAMINE OXIDASE INHIBITOR. It was formerly used in the treatment of gastric ulcers.

brodimoprim [INN] is a DIHYDROFOLATE REDUCTASE INHIBITOR which can be used as an ANTIBACTERIAL and SULPHONAMIDE potentiator.

brofaromine [INN] is a reversible, selective, MONOAMINE-OXIDASE INHIBITOR (MAOI; type A), which has been used as an ANTIDEPRESSANT.

Broflex™ ➡ benzhexol.

Brolene™ ➡ dibromopropamidine.

bromazepam [BAN, INN, JAN, USAN] (Lexotan™) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity, and is mainly used orally as an anxiolytic.

bromazine ➡ bromodiphenhydramine.

bromelains [BAN, INN, JAN, USAN] is a preparation of ENZYMES from *Ananas sativus* (pineapple plant). It has ANTIINFLAMMATORY, ANTICOAGULANT, proteolytic and antioedemic properties.

bromfenac [INN] (bromfenac sodium [USAN]; AHR 10282) is one of the heteroaryl acetic acid series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

bromfenac sodium ➡ bromfenac.

bromhexine [BAN, INN] (bromhexine hydrochloride [JAN, USAN]) is an ethanamine derivative, a MUCOLYTIC and EXPECTORANT used for respiratory disorders characterized by viscous or excessive mucus. It has ANTIOXIDANT properties.

bromhexine hydrochloride ➡ bromhexine.

bromisoval [INN] (bromvalerylurea [JAN]) is a ureide/acylurea analogue of **carbromal** with SEDATIVE/HYPNOTIC properties, and formerly used as a hypnotic.

bromoaprobarbital (ibomal) is a barbiturate with general HYPNOTIC /SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone**. It has been used as a hypnotic.

bromociclen ➡ bromocyclen.

bromocriptine [BAN, INN, USAN] (bromocriptine mesilate [JAN, USAN]; Parlodel™) is an alkaloid from ergot (*Claviceps purpurea*), a (D_2) DOPAMINE RECEPTOR AGONIST used as an ANTIPARKINSONIAN AGENT. It is also a PROLACTIN RELEASE INHIBITOR and can be used to relieve certain menstrual disorders, or to reduce or halt lactation (in galactorrhoea), prolactinoma (tumour of the pituitary gland, leading to excess prolactin secretion) and to treat cyclical benign breast disease; sometimes for acromegaly treatment of prolactinomas and to treat delayed puberty caused by hormonal insufficiency. It is an ANTIOXIDANT & FREE RADICAL SCAVENGER.

bromocriptine mesilate ➡ bromocriptine.

bromocyclen [BAN, BSI, ISO] (bromociclen [INN]) was formerly used as an insecticide and acaricide.

bromodiphenhydramine [BAN, USAN] (bromazine [INN]; Neo-Benadryl™) is an ethanolamine and one of the alkylamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS, with MUSCARINIC CHOLINOCEPTOR ANTAGONIST properties and SEDATIVE side-effects. It is incorporated into a number of compound ANTITUSSIVE 'cold-cure' preparations.

bromofos [INN] (bromophos [BSI, ISO]) is a phosphorothioate ANTICHOLINESTERASE formerly used as a non-systemic agricultural and public health INSECTICIDE.

bromophos ➡ bromofos.

5-bromotryptophan is an ANTISICKLING AGENT, which potentially can be used in the treatment of sickle-cell disease.

brompheniramine [BAN, INN] (brompheniramine maleate [USAN]; parabromdylamine; *p*-bomdylamine; Dimotane™; ND-STAT™ and many others) is one of the alkylamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS, also with MUSCARINIC CHOLINOCEPTOR ANTAGONIST properties and SEDATIVE side-effects. It is used orally to treat the

symptoms of allergic conditions, such as hay fever and urticaria, and is also used, in combination with other drugs, in ANTITUSSIVE prepations (e.g. Dimotapp™). Its (*S*)-(+)-form is dexbrompheniramine maleate [USAN] and is used for similar purposes.

bromsulfophthalein ➡ **sulfobromophthalein sodium.**

bromsulphalein ➡ **sulfobromophthalein sodium.**

bromvalerylurea ➡ **bromisoval.**

BRONCHODILATORS relax smooth muscle of the bronchioles, allowing them to dilate thus allowing better air flow in or out (the latter being the major problem in obstructive airways disease). There are a number of conditions that cause bronchospasm (often with increased secretion of mucus) and hence blockage. The most common are asthma and bronchitis. The type of drug most commonly used to treat bronchospasm is a β-receptor stimulant or other types of sympathomimetics. These work by stimulating β-adrenoceptors on smooth muscle of the airways, and it is necessary to use β_2-adrenoceptor-selective agents (e.g. **salbutamol** and **terbutaline**) to avoid potentially dangerous effects on the heart. See **β-ADRENOCEPTOR AGONISTS**. Other types of bronchodilator, such as the xanthine compounds **aminophylline** and **theophylline**, act directly on the smooth muscle of the bronchioles (working, at least in part, as **PHOSPHODIESTERASE INHIBITORS**). All these drugs, except in emergency, are best administered directly to the airways in the form of aerosols, ventilator sprays or nebulizing mists as this minimizes systemic side-effects.

Bronkodil™ ➡ **theophylline.**

Bronkometer™ ➡ **isoetharine.**

bronopol [BAN, BSI, INN, JAN] is an **ANTIBACTERIAL** and **ANTISEPTIC**, and a plant **ANTIFUNGAL** treatment. It is used as a preservative in cosmetics and toiletries.

broparestrol [INN] (BDPE; LN 107) is a synthetic non-steroid **OESTROGEN** and analogue of **stilboestrol** used therapeutically in **ANTICANCER** therapy and in dermatology.

broquinaldol [INN] is a methylquinoline **ANTIFUNGAL** and **ANTIBACTERIAL**.

brotianide [BAN, INN] is an **ANTHELMINTIC** for liver fluke.

brotizolam [BAN, INN, USAN] is one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST**, with properties like **diazepam**. It has **HYPNOTIC**, **ANTICONVULSANT** and **ANXIOLYTIC** activity, and was mainly used orally as a hypnotic.

brovanexine [INN] is a derivative of bromohexine and is a **MUCOLYTIC** and **EXPECTORANT** used in treating respiratory disorders characterized by viscous or excessive mucus.

brovincamine [INN] (brovincamine fumarate [JAN]) is a vincamine alkaloid derivative, a cerebral **VASODILATOR**.

brovincamine fumarate ➡ **brovincamine.**

broxaldine [INN] is a methylquinoline **ANTIBACTERIAL** and **ANTISEPTIC**.

broxaterol [INN] is a **β-ADRENOCEPTOR AGONIST** selective for the β_2-subtype that can be used as a **BRONCHODILATOR** and uterine **SMOOTH MUSCLE RELAXANT**.

broxuridine [INN, JAN] (BRDU; NSC 38297) is a thymidine analogue, and is an **ANTICANCER AGENT** that has been used as an adjunct to radiotherapy; also used to label DNA of tumour cells *in vivo*.

broxyquinoline [INN, JAN] is a halogenated 8-hydroxyquinoline with **ANTIFUNGAL** and **AMOEBICIDAL** activity.

brucine (dimethoxystrychnine) is an alkaloid from *Strychnos nux-vomica* and many other *Strychnos* spp. (Strychnaceae). It is a bitter substance that is a constituent at low concentration of the herbal and homoeopathic medicine *nux vomica*. At high concentrations it has convulsant actions similar to strychnine; reported to be an **ANTICANCER AGENT**.

Brufen™ ➡ **ibuprofen.**

BSF-1 ➡ **interleukin-4.**

BSF2 ➡ **interleukin-6.**

BSP ➡ **sulfobromophthalein sodium.**

BTS 13622 ➡ **hexaprofen.**

BTS 18322 ➡ **flurbiprofen.**

α-Btx ➡ **α-bungarotoxin.**

BU E50 ➡ **arpromidine.**

Buccastem™ ➡ **prochlorperazine.**

bucillamine [INN, JAN] (DE 019; SA 96) is a mercaptocysteine derivative, a **penicillamine** derivative. It is a **CHELATING AGENT** that can be used as an **ANTIINFLAMMATORY** in antirheumatic therapy.

bucindolol [BAN, INN] (bucindolol hydrochloride [USAN]) is a combined **α-ADRENOCEPTOR ANTAGONIST** and **β-ADRENOCEPTOR ANTAGONIST**. It can be used therapeutically in **ANTIHYPERTENSIVE** treatment.

bucindolol hydrochloride ➡ **bucindolol.**

bucladesine [INN] (bucladesine sodium [JAN]; dibutyrylcyclic AMP) is a more stable and lipid-soluble analogue of **cAMP**, with **CARDIAC STIMULANT** actions when given intravenously. It is used as a pharmacological tool.

bucladesine sodium ➡ **bucladesine.**

Bucladin-S™ ➡ **buclizine.**

buclizine [BAN, INN] (buclizine hydrochloride [USAN]; NSC 25141; Bucladin-S™) is a piperazine derivative, a **HISTAMINE H_1-RECEPTOR ANTAGONIST**, a weak **MUSCARINIC CHOLINOCEPTOR ANTAGONIST** and a **SEDATIVE**. It is used as an **ANTIEMETIC** and **ANTINAUSEANT** for motion sickness. It is a component of Migraleve™ (with **paracetamol** and **codeine phosphate**).

buclizine hydrochloride ➡ **buclizine.**

buclosamide [BAN, INN] (butylchlorosalicylamide) has antifungal properties and is used as a **DERMATOLOGICAL AGENT** used in topical preparations usually with **salicylic acid**.

bucricaine ➡ **tacrine.**

bucumolol [INN] (bucumolol hydrochloride [JAN]) is a **β-ADRENOCEPTOR ANTAGONIST**, which can be used therapeutically in **ANTIHYPERTENSIVE** treatment.

bucumolol hydrochloride ➡ **bucumolol.**

budesonide [BAN, INN, USAN] (S 1320; Entocort™; Preferid™; Pulmicort™; Rhinocort™) is a potent **CORTICOSTEROID**, a **GLUCOCORTICOID** with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties. It is used in the treatment of many kinds of inflammation, particularly inflammation associated with such skin conditions as eczema and psoriasis and of the eyes, ears or rhinitis of the nose. It is now also used orally for the induction of remission in mild to moderate Crohn's disease.

budipine [INN] is a phenylpiperidine derivative, an (NMDA) **GLUTAMATE RECEPTOR ANTAGONIST**, under evaluation as an **ANTIPARKINSONIAN AGENT** and **ANTIDEPRESSANT**.

bufetolol [INN] (bufetolol hydrochloride [JAN]) is a **β-ADRENOCEPTOR ANTAGONIST**. It has been used therapeutically in **ANTIARRHYTHMIC** treatment.

bufetolol hydrochloride ➡ **bufetolol.**

bufexamac [BAN, INN] has **CYCLOOXYGENASE INHIBITORS** with **NSAID ANALGESIC**, **ANTIINFLAMMATORY** and **ANTIPYRETIC** activity. It has mainly been used topically.

buflomedil [BAN, INN] is a butyrophenone, a non-specific **α-ADRENOCEPTOR ANTAGONIST**, with **ANTISPASMODIC** and peripheral **VASODILATOR** actions. It has been used to treat peripheral vascular diseases, including intermittent claudication, and is proposed for Alzheimer's disease.

buformin [INN, USAN] (buformin hydrochloride [JAN];

butylbiguanide; Glybigide™) is one of the biguanide group of (oral) HYPOGLYCAEMICS that (unlike the sulphonylureas) act mainly by decreasing gluconeogenesis and by increasing peripheral utilization of glucose, and is only effective in diabetics with some residual functioning pancreatic islet cells. It can be used as an ANTIDIABETIC in non-insulin-dependent diabetes mellitus (NIDDM). It is also a potent protein denaturant.

buformin hydrochloride ➡ **buformin**.

bufuralol [BAN, INN] is a β-ADRENOCEPTOR ANTAGONIST with LOCAL ANAESTHETIC activity. It has been used therapeutically in ANTIARRHYTHMIC treatment.

bufylline [BAN] (ambuphylline [USAN]) is a compound of **theophylline** with aminomethylpropanol. It has CARDIAC STIMULANT and ANTIASTHMATIC properties.

bumadizone [INN] (B 64114) is reported to be metabolized to **phenylbutazone** and **oxyphenylbutazone**, members of the pyrazone series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

bumetanide [BAN, INN, JAN, USAN] (Bumex™) is a (loop) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.

Bumex™ ➡ **bumetanide**.

bunaftine [INN] is a naphthamide, an ANTIARRHYTHMIC.

bunamidine [BAN, INN] (bunamidine hydrochloride [USAN]) is a veterinary ANTHELMINTIC.

bunamidine hydrochloride ➡ **bunamidine**.

bunaprolast [INN, USAN] is a methoxynaphthalene derivative, a LIPOXYGENASE INHIBITOR with potential as an ANTIASTHMATIC.

bunazosin [INN] (bunazosin hydrochloride [JAN]) is a quinazolinyldiazepine derivative with properties similar to **prazocin**. It is a (selective α_1-subtype) α-ADRENOCEPTOR ANTAGONIST. It can be used as an ANTIHYPERTENSIVE.

bunazosin hydrochloride ➡ **bunazosin**.

α-bungarotoxin (α-Btx) is a 74 amino acid residues peptide with 5 disulphide bridges from the snake venom of the krait, *Bulgarus multicinctus*. It is a NEUROTOXIN/TOXIN acting as a NICOTINIC RECEPTOR ANTAGONIST at skeletal muscle in mammals, but not at one of the major neuronal types (the 'α7' site). It is a pharmacological tool.

κ-bungarotoxin (neuronal bungarotoxin; Bgt3.1; toxin F) is a 66 amino acid peptide from the krait, *Bungarus multicinctus*, which acts as a NEUROTOXIN/TOXIN acting as a NICOTINIC RECEPTOR ANTAGONIST that shows selectivity for neuronal over neuromuscular receptors. It blocks at the neuromuscular junction to cause flaccid paralysis.

β-bungarotoxins are dimeric 180 amino acid peptides with covalently linked chains from snake venoms (*Naja, Bungarus, Laticauda* spp.: Elapidae). The A chain has a phospholipase (PLA_2 motif), and the B chain has a sequence analogous to part of mammalian protease inhibitors (e.g. bovine pancreatic trypsin inhibitor). It is a NEUROTOXIN leading to paralysis through block of acetylcholine release and synaptic transmission. It is a pharmacological tool.

bunitrolol [INN] (bunitrolol hydrochloride [JAN]) is a β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically in ANTIHYPERTENSIVE and ANTIARRHYTHMIC treatment.

bunitrolol hydrochloride ➡ **bunitrolol**.

bunolol hydrochloride [USAN] is a non-subtype-selective β-ADRENOCEPTOR ANTAGONIST. Chemically, it is a naphthalenone analogue in the (±)-form; though the (-)-form is most active at the receptor, whereas the (+)-form has CARDIAC DEPRESSANT activity. Therapeutically, it can be used in ANTIHYPERTENSIVE and ANTIGLAUCOMA TREATMENT. See also **levobunolol**.

buphenine [BAN, INN] (nylidrin hydrochloride [USAN]) is a phenylethylamine derivative, a β-adrenoceptor agonist that can be used as a peripheral vasodilator.

bupicomide [INN, USAN] (Sch 10595) is an amide of **fusaric acid**, a DOPAMINE β-HYDROXYLASE INHIBITOR, inhibiting synthesis of catecholamines, with ANTIHYPERTENSIVE properties.

bupivacaine [BAN, INN] (bupivacaine hydrochloride [JAN, USAN]; AH 2250; LAC 43; Win 11318; Marcaine™; Sensorcaine™) is an amide series LOCAL ANAESTHETIC with a slow onset and long duration of action. It has been used by injection for infiltration, regional and epidural pain relief and motor block.

bupivacaine hydrochloride ➡ **bupivacaine**.

bupranolol [INN] (bupranolol hydrochloride [JAN]) is a β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically in ANTIANGINAL and ANTIARRHYTHMIC treatment.

bupranolol hydrochloride ➡ **bupranolol**.

Buprenex™ ➡ **buprenorphine**.

buprenorphine [BAN, INN] (buprenorphine hydrochloride [JAN, USAN]; Temgesic™; Buprenex™) is one of the thebaine series, with mixed (partial μ) OPIOID RECEPTOR AGONIST and in some systems has (κ) OPIOID RECEPTOR ANTAGONIST activity. It is used as a long-lasting parenteral OPIOID ANALGESIC.

buprenorphine hydrochloride ➡ **buprenorphine**.

bupropion [BAN] (amfebutamone [INN]; bupropion hydrochloride [USAN]; BW 323U; Wellbutrin™) is one of the aminoketone class, a dopamine UPTAKE INHIBITOR used as an ANTIDEPRESSANT.

bupropion hydrochloride ➡ **bupropion**.

buquineran [BAN, INN] is a quinazolinylpiperidinylurea, a PHOSPHODIESTERASE INHIBITOR with (positive inotropic) CARDIAC STIMULANT actions.

burimamide (SKF 91923) is an imidazolylthiourea, a HISTAMINE H_2-RECEPTOR ANTAGONIST. It is a GASTRIC SECRETION INHIBITOR, potentially an ANTIULCEROGENIC AGENT.

Buscopan™ ➡ **hyoscine butyl bromide**.

buserelin [BAN, INN] (buserelin acetate [USAN]; luteinizing hormone-releasing factor (pig); Hoe 766; S 74676; Suprecur™; Suprefact™) is a synthetic nonapeptide analogue of **gonadorelin (gonadotrophin-releasing hormone)**, an LH-RH RECEPTOR AGONIST, with similar properties. It can be used (by injection or nasal spray) to treat endometriosis, in prostate gland ANTICANCER treatment, and also in fertility treatment. For further details see gonadotrophin-releasing hormone.

buserelin acetate ➡ **buserelin**.

Buspar™ ➡ **buspirone**.

buspirone [BAN, INN] (buspirone hydrochloride [USAN]; Buspar™) the archype member of the azaspirone group, a 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST, a partial agonist at the $5HT_{1A}$ receptor subtype. It is a recently introduced and novel ANXIOLYTIC without SKELETAL MUSCLE RELAXANT, SEDATIVE or ANTICONVULSANT actions. It is not a BENZODIAZEPINE BINDING-SITE AGONIST, and does not replace benodiazepines nor prevent their withdrawal syndrome. It is very widely used in the short-term managment of anxiety.

buspirone hydrochloride ➡ **buspirone**.

busulfan ➡ **busulphan**.

busulphan [BAN] (busulfan [INN]; NSC 750; Myleran™) is an alkylating cytotoxic ANTICANCER AGENT used orally in palliative treatment of chronic granulocytic leukaemia.

butabarbital ➡ **secbutobarbitone**.

butabarbital sodium ➡ **secbutobarbitone**.

butacaine [BAN, INN] is an ester series LOCAL ANAESTHETIC

used by topical application for the local relief of pain.

butalamine [BAN, INN] is an oxadiazole, a peripheral VASODILATOR with ANTIINFLAMMATORY properties.

butalbital [INN, USAN] (allylbarbital; tetrallobarbital) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone**. It is used as a hypnotic and sedative. (Note that the name butalbital has also been used as a name for *talbutal*.)

butanilicaine [BAN, INN] (Hoe 13233) is an amide series LOCAL ANAESTHETIC, which has been used by injection for dental and infiltration pain relief.

butaprost [BAN, INN, USAN] (Bay q 4218; TR 4979) is a prostaglandin, an (EP_2) PROSTANOID RECEPTOR AGONIST and a BRONCHODILATOR.

butaxamine ➡ **butoxamine**.

Butazolidin™ ➡ **phenylbutazone**.

butenafine [INN] is a benzylamine, an ANTIFUNGAL used in topical preparations.

buthiazide ➡ **butizide**.

butibufen [INN] (FF 106) is one of the propionic acid series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

butidrine [INN] is a β-ADRENOCEPTOR ANTAGONIST. It was used therapeutically in antianginal treatment.

butikacin [BAN, INN, USAN] is a derivative of **kanamycin A**, an (aminoglycoside) ANTIBIOTIC with antibacterial activity against a wide range of pathogenic bacteria, including many gentimicin-resistant strains.

Butisol™ ➡ **secbutobarbitone**.

butizide [INN] (buthiazide [USAN]) is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.

butobarbital ➡ **butobarbitone**.

butobarbitone [BAN] (butobarbital [INN]) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone**. It has been used as an intermediate duration hypnotic and sedative agent.

butoconazole [BAN, INN] (butoconazole nitrate [USAN]) is an (imidazole group) ANTIFUNGAL used topically.

butoconazole nitrate ➡ **butoconazole**.

butocrolol [INN] is a β-ADRENOCEPTOR ANTAGONIST. It potentially can be used in ANTIARRHYTHMIC treatment.

butoctamide [INN] (butoclamide semisuccinate [JAN]) is an aliphatic amide, formerly used as a HYPNOTIC in short-term management of insomnia.

butofilolol [INN] is a β-ADRENOCEPTOR ANTAGONIST. It potentially can be used in ANTIHYPERTENSIVE treatment.

butopamine [INN, USAN] is a β-ADRENOCEPTOR AGONIST that is a positive INOTROPIC AGENT; also a growth promoter. Chemically, it is the (R,R)-form, whereas the (±)-form is **ractopamine**.

butoprozine [INN] (butoprozine hydrochloride [USAN]) is a CALCIUM-CHANNEL BLOCKER and ANTIANGINAL.

butoprozine hydrochloride ➡ **butoprozine**.

butopyrammonium iodide ➡ **amidopyrine**.

butorphanol [BAN, INN, USAN] (butorphanol tartrate [USAN]; torbugesic [JAN]; BC 2627; Stadol™) is one of the phenanthrene series, an OPIOID RECEPTOR AGONIST which has OPIOID ANALGESIC and ANTITUSSIVE activity. It is used, by injection or nasal spray, to treat moderate to severe pain.

butorphanol tartrate ➡ **butorphanol**.

butoxamine [BAN] (butaxamine [INN]; butoxamine hydrochloride [USAN]) is a β-ADRENOCEPTOR ANTAGONIST showing β_2-selectivity. It was never marketed for therapeutic use but can be used as a pharmacological tool. It shows activity as an inhibitor of fatty acid metabolism, and as an (oral) HYPOGLYCAEMIC and ANTIHYPERLIPIDAEMIC AGENT.

butoxamine hydrochloride ➡ **butoxamine**.

butoxybenzylhyoscyamine bromide ➡ **butropium bromide**.

butriptyline [BAN, INN] (butryptyline hydrochloride [USAN]) is one of the tricyclic class of monoamine UPTAKE INHIBITORS, and has been used as an oral ANTIDEPRESSANT.

butropium bromide [INN, JAN] (butoxybenzylhyoscyamine bromide) is a quaternary ammonium compound, an **atropine** analogue, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as a visceral ANTISPASMODIC.

butylbiguanide ➡ **buformin**.

butylchlorosalicylamide ➡ **buclosamide**.

butylnorsynephrine ➡ **bamethan**.

butyloctopamine ➡ **bamethan**.

***N-tert*-butyloxycarbonyl Phe-Leu-Phe-Leu-Phe** ➡ **Boc-Phe-Leu-Phe-Leu-Phe**.

5-butylpicolinic acid ➡ **fusaric acid**.

butylscopolammonium bromide ➡ **hyoscine butyl bromide**.

buzepide metiodide [INN] is a quaternary ammonium compound, a MUSCARINIC RECEPTOR ANTAGONIST. It is a MYDRIATIC AGENT, a visceral ANTISPASMODIC, a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.

BW 12C ➡ **velaresol**.

BW 19C49 ➡ **diethylthiambutene**.

BW 47-83 ➡ **cyclizine**.

BW 47-442 ➡ **isomethadone**.

BW 49-191 ➡ **diethylthiambutene**.

BW 50-1 ➡ **ethylmethylthiambutene**.

BW 55-5 ➡ **oxypurinol**.

BW 295C51 ➡ **triprolidine**.

BW 301U ➡ **piritrexim**.

BW 323U ➡ **bupropion**.

BW 325U ➡ **trifenagrel**.

BW 337C48 ➡ **dipipanone**.

BW 430C ➡ **lamotrigine**.

BW 589C80 ➡ **tucaresol**.

BW 825C ➡ **acrivastine**.

BW 373U86 is a piperazinylbenzamide derivative, a (δ) OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

BW 56 158 ➡ **allopurinol**.

BW 57-322 ➡ **azathioprine**.

BW 723C86 is an indole-ethanamine, a selective ($5\text{-}HT_{2B}$-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST. It shows ANXIOLYTIC effects in an animal model, and is used as a pharmacological tool.

BWA 589C ➡ **tucaresol**.

BZQ ➡ **benzquinamide**.

C

C6 ➡ **hexamethonium bromide**.
C 1656 ➡ **clometacin**.
C 5720 ➡ **carprofen**.
C 34647Ba ➡ **baclofen**.
C 48401 ➡ **halometasone**.
Cabaser™ ➡ **cabergoline**.
cabergoline [BAN INN] (Cabaser™; Dostinex™) is an ergoline derivative, a recently introduced agent with properties similar to **bromocriptine**. It is a (D_2) DOPAMINE RECEPTOR AGONIST used as an ANTIPARKINSONIAN AGENT. It is also a PROLACTIN RELEASE INHIBITOR.
cachectin ➡ **tumour necrosis factor**.
cactinomycin ➡ **actinomycin C**.
cadralazine [BAN, INN, JAN] has properties similar to **hydralazine**. It is a VASODILATOR and formerly used as an ANTIHYPERTENSIVE.
caerulein ➡ **ceruletide**.
cafedrine [BAN, INN] (cafedrine hydrochloride [JAN]) is a **theophylline** derivative with similar actions. It has CNS STIMULANT and hypertensive activity; formerly used in the treatment of hypotensive states.
cafedrine hydrochloride ➡ **cafedrine**.
Cafergot™ ➡ **ergotamine**.
caffeic acid (3,4-dihydroxycinnamic acid) has ANTICANCER, ANTI-HIV, ANTIOXIDANT, CHOLERETIC and hepatotropic activity. The (*E*)-form is widespread in plants, both free and as glycosides.
caffeine [BAN, USAN] (methyltheobromine, trimethylxanthine) is a purine derivative, a component of *Coffea arabica*, many other *Coffea* spp., *Theobroma cacao*, *Camellia thea*, *Cola acuminata* and several other *Cola* spp. and several other plants (Rubiaceae, Sterculiaceae, Theaceae). It is a (P1 purinoceptor) ADENOSINE RECEPTOR ANTAGONIST and a PHOSPHODIESTERASE INHIBITOR. It is widely used as a CNS STIMULANT, and is also a CARDIAC STIMULANT. It possesses ANTIVIRAL and chemosterilant properties (against stored grain pests). It is used to treat colic, heat stroke, circulatory disturbance and fatigue in horses, and also for horse-doping. It has been used in many beverages.
calabash curare ➡ **calebassine**.
calamine [JAN, USAN] is a suspension containing mainly (basic) zinc carbonate (with added ferric oxide), which has a mild ASTRINGENT action. It is incorporated into several preparations that are used to cool and soothe itching skin in conditions such as pruritus, eczema and psoriasis, and is also used in some emollient preparations. Administration is as a lotion, cream or ointment. It is a component of Caladryl.
calcifediol [INN, USAN] (25-hydroxyvitamin D_3; 25-hydroxycholecalciferol; U 32070; Calderol™ and many other names), is a metabolite of vitamin D_3 and constituent of bone, liver and blood of mammals. It can be used in its own right as a VITAMIN and CALCIUM METABOLISM MODIFIER. It can be used orally in the management of metabolic bone disease and hypocalcaemia in patients undergoing kidney dialysis. Deuterated and tritiated compounds have been synthesized.
calciferol ➡ **ergocalciferol**.
Calcijex™ ➡ **calcitriol**.
calcipotriene ➡ **calcipotriol**.
calcipotriol [BAN, INN] (calcipotriene [USAN]; MC 903; Dovonex™) is a D VITAMIN derivative, an inducer of cell differentiation and inhibitor of cell proliferation. It is used as a topical DERMATOLOGICAL AGENT for psoriasis.
Calcitare™ ➡ **calcitonin (pork)**.
calcitonin [BAN, INN, JAN, USAN] (calcitonin M; thyrocalcitonin; Miacalcin™; Osteocalcin™) is a 32 residue peptide hormone secreted by the C-cells of the thyroid gland in mammals and from the ultimobrandial gland of fish and birds. It is a CALCITONIN RECEPTOR AGONIST and CALCIUM METABOLISM MODIFIER, used therapeutically by injection to lower calcium blood levels in hypercalcaemia, and to treat Paget's disease of the bone and for metastatic bone pain. Preparations for clinical use include synthetic human calcitonin, natural porcine calcitonin (**calcitonin (pork)** [BANM]) and synthetic salmon calcitonin (**salcatonin**). Eel calcitonin (**elcatonin**) was formerly available.
calcitonin (pork) [BANM] (calcitonin S; α-thyrocalcitonin; Calcitare™) is a natural form of **calcitonin**, with activity similar to human calcitonin. It is a CALCITONIN RECEPTOR AGONIST and CALCIUM METABOLISM MODIFIER. It is used therapeutically by injection to lower calcium blood levels in hypercalcaemia, and to treat Paget's disease of the bone and for metastatic bone pain. Prolonged use may lead to the body producing antibodies against it and consequent neutralization of its effect and hypersensitivity reactions.
calcitonin gene-related peptide (CGRP; αCGRP; CGRP-I; βCGRP; CGRP-II) exists in humans in two peptide forms, αCGRP (CGRP-I) and βCGRP (CGRP-II), both consisting of 37 amino acids with one intramolecular disulphide bridge and a *C*-teminal phenylalaninamide, but that differ in 3 residues. CGRP is a neuropeptide present in the central and peripheral nervous system of mammals, notably in sensory neurons. αCGRP is encoded by the same gene as calcitonin, and its existence was predicted by mRNA analysis, and its presence later established in humans. Also, there are isoforms between species, and calcitonin gene-related peptide(rat) is extensively used as a pharmacological tool. It is a potent CALCITONIN GENE-RELATED PEPTIDE RECEPTOR AGONIST, causing vasodilatation at very low concentrations. Therapeutic uses for CGRP being investigated include use in the treatment of subarachnoid haemorrhage, migraine, Raynaud's disease, congestive heart failure and myocardial infarction.
α-calcitonin gene-related peptide(8-37)(human) (αCGRP(8-37)(human)) is a synthetic peptide fragment of CGRP that acts as a CALCITONIN GENE-RELATED PEPTIDE RECEPTOR ANTAGONIST, reported to have a higher affinity at $CGRP_1$ over $CGRP_2$ receptors. This antagonist also blocks some actions of **amylin** and **adrenomedullin**. The corresponding peptide based on the rat sequence, calcitonin gene-related peptide(8-37)(rat), has similar properties.
calcitonin gene-related peptide(8-37)(rat) ➡ **α-calcitonin gene-related peptide(8-37)(human)**.
calcitonin gene-related peptide(rat) ➡ **calcitonin gene-related peptide**.
CALCITONIN GENE-RELATED PEPTIDE RECEPTOR AGONISTS act at a number of related G-protein-coupled receptor subtypes. Human calcitonin gene-related peptide (CGRP) itself, is found in two forms, **αCGRP** (CGRP-I) and

βCGRP (CGRP-II), that differ in 3 residues of the 37 amino acid human sequence, and are products of different genes. Also, there are differences between species. There are further structurally related peptides showing some sequence homology and characterized by a 6–7 amino acid ring structure linked by a disulphide bridge with an amidated C-terminus. The hormone **amylin** – also a peptide of 37 amino acid residues, but elaborated in the β-cells of the pancreas – shares about 50% sequence identity, and has actions on glucose metabolism. See AMYLIN RECEPTOR AGONISTS.

The hormone **adrenomedullin** (originally shown to be formed by the adrenal medulla, and now demonstrated in endothelial cells and other tissue). Active fragments (e.g. human adrenomedullin$_{13\text{-}50}$ and rat adrenomedullin$_{11\text{-}50}$) share about 26% homology with CGRP (over an homologous region), and are similar in many of their actions. See ADRENOMEDULLIN RECEPTOR AGONISTS.

Calcitonin, as the name implies, has its encoding controlled by the same gene as αCGRP, but is formed by the C-cells of the thyroid gland, through tissue-specific alternative splicing of a mRNA precursor. Calcitonin acts at its own (calcitonin) receptors. Receptor cloning studies are now throwing some light on the question of homology within and between these receptor families.

CGRP is found largely in neurons, particularly sensory neurons (where it is often co-localized with tachykinins), in the enteric nervous system, possibly in motor neuron terminals (with acetylcholine), and in the CNS (particularly in autonomic areas and those receiving sensory input). Its predominant and characteristic effect is a profound, directly mediated, long-lasting microvascular vasodilation – which strongly supports its role as a primary neuroinflammatory mediator on its release from peripheral endings of capsaicin-sensitive sensory C-fibres. It also inhibits gastrointestinal smooth muscle. Its actions apparently involve a G-protein positive coupling to adenylyl cyclase. Other effects include an enhanced secretion of Cl^- by epithelia including the basolateral epithelia in the intestine, depolarization of ganglia leading to increased firing, and modulation of nicotinic receptor ion channel opening and desensitization.

On the basis of information from differential functional effects of agonists, antagonists and from binding studies, two subtypes of receptor, referred to as $CGRP_1$ and $CGRP_2$, have been proposed. Human αCGRP (hCGRPα) is thought to be relatively active at the $CGRP_1$ subtype, whereas the analogues **[Cys(ACM)^{2,7}]-hCGRPα** and **[Cys(ACM)^{2,7}Ala^{20}]-hCGRPα** are active at the $CGRP_2$ subtype; also the antagonist **αCGRP$_{8\text{-}37}$** has a higher affinity for the former site. See CALCITONIN GENE-RELATED PEPTIDE RECEPTOR ANTAGONISTS. A number of putative receptor clones have been identified that have structures typical of the seven-transmembrane-segment G-protein-coupled superfamily of receptors and couple positively to the adenylyl cyclase (Gs) pathway. Although an adrenomedullin receptor with different properties has been identified, it has been suggested that a receptor protein can be converted to either adrenomedullin or calcitonin gene-related active receptor after combination with different 'accessory factor' proteins ('RAMPs').

Therapeutic applications for CGRP that have been sought are mostly related to its potent vasodilator actions, including counteracting the vasoconstriction common in subarachnoid haemorrhage in humans, in migraine, for Raynaud's disease and for other purposes including the treatment of congestive heart failure and myocardial infarction.

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Brain, S.D. *et al.* (1996) Calcitonin gene-related peptide: Vasoactive effects and therapeutic potential. *Gen. Pharmacol.*, **27**, 607-611.

Hall, J.M. *et al.* (1996) Pharmacology of calcitonin gene-related peptide, in *Neurogenic Inflammation* (eds Geppetti, P. et al.), CRC Press, Boca Raton, FL, pp. 101-114.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci.*, Suppl., **19**, 1-98.

Hall, J.M. *et al.* (1998) *Trends. Pharmacol. Sci.*, **19**, 303-305.

CALCITONIN GENE-RELATED PEPTIDE RECEPTOR ANTAGONISTS act at a heterogeneous group of receptors, in particular $CGRP_1$ and $CGRP_2$ receptors (see CALCITONIN GENE-RELATED PEPTIDE AGONISTS). Some also can interact with proposed **amylin** receptors and with **adrenomedullin** receptors. Antagonists formed from truncated sequences include **αCGRP$_{8\text{-}37}$** which acts principally at $CGRP_1$ receptors, though it has some affinity at $CGRP_2$ receptors; also $\alpha CGRP_{12\text{-}37}$. This antagonist also blocks some actions of amylin and adrenomedullin, but this may be interpreted as evidence of these peptides being able to interact with CGRP receptors. Possible applications of these antagonists include; correction of oversecretion syndromes, treating the CGRP-mediated vascular components of neurogenic inflammation, vasodilation and neurogenic inflammation following laser or surgery trauma, and in migraine.

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Giuliani, S. *et al.* (1992) Involvement of multiple receptors in the biological effects of calcitonin gene-related peptide and amylin in rat and guinea-pig preparations. *Br. J. Pharmacol.*, **107**, 510-514.

Mimeault, M. *et al.* (1992) Synthesis and structure-activity analysis of fragments and analogs of $CGRP_{8\text{-}37}$. *Ann. N. Y. Acad. Sci.*, **657**, 426-428.

Howitt, S.G. *et al.* (1997) The selectivity and structural determinants of peptide antagonists at the CGRP receptor of rat, L6 myocytes. *Br. J. Pharmacol.*, **121**, 1000-1004.

calcitonin M ➡ **calcitonin**.

CALCITONIN RECEPTOR AGONISTS activate receptors of the seven-transmembrane G-protein superfamily, which couple positively to the adenylyl cyclase (G_s) pathway, that recognize calcitonin and its analogues. Calcitonin is a 32 residue peptide hormone secreted by the C-cells of the thyroid gland in mammals, and from the ultimobrandial gland of fish or birds. Structurally, it is one of the **amylin**, **calcitonin gene-related peptide** and **adrenomedullin** superfamily. It acts as a CALCIUM METABOLISM MODIFIER, and is used therapeutically by injection to lower calcium blood levels in hypercalcaemia, and to treat Paget's disease of the bone and for metastatic bone pain. Preparations for clinical use include synthetic human calcitonin, natural porcine calcitonin (**calcitonin (pork)**) and synthetic salmon calcitonin (**salcatonin**). Eel calcitonin (**elcatonin**) was formerly available.

Stroop, S.D. *et al.* (1996) Determinants for calcitonin analog interaction with the calcitonin receptor N-terminus and transmembrane-loop regions. *Endocrinology*, **137**, 4752-4756.

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CALCITONIN RECEPTOR ANTAGONISTS inhibit the actions of calictonin and agonist analogues in activating calcitonin receptors (see CALCITONIN RECEPTOR AGONISTS). There are few selective antagonists available. **Salmon calcitonin(8-32)** has some activity as a calcitonin receptor antagonist. However, an analogue, **AC 187 (acetyl-[Asn^{30},Tyr^{32}]-salmon calcitonin$_{8\text{-}32}$)** instead acts mainly as an AMYLIN RECEPTOR ANTAGONIST that inhibits several metabolic actions of **amylin**.

calcitonin S ➡ **calcitonin (pork)**.

calcitriol [BAN, INN, USAN] (1α,25-dihydroxyvitamin D_3; 1α,25-dihydroxycholecalciferol; Ro 21-5535; U 49562; Calcijex™; Rocaltrol™) acts as a **VITAMIN** and **CALCIUM METABOLISM MODIFIER**. It is believed to be the hormonally active form of the vitamin. It is used orally or by injection to treat hypocalcaemia in patients undergoing kidney dialysis with postsurgery hypoparathyroidism and other hypoparathyroid states. It has also been found to induce differentiation of certain myeloid and leukaemic cells. Used topically to treat psoriasis.

calcium benzamidosalicylate [BAN, INN] (benzoylpas calcium [USAN]) is a 4-aminosalicylic acid derivative, an **ANTIBACTERIAL** and **ANTITUBERCULAR AGENT**.

calcium calcium chel 330 ➡ **calcium trisodium pentetate**.

calcium carbimide [INN] (cyanamide [JAN]) is an **ANTHELMINTIC**, pesticide, fertilizer, herbicide and defoliant.

calcium carbonate [BAN, USAN] (carbonic acid, calcium salt; chalk) is used as a non-systemic oral **ANTACID** for the relief of hyperacidity, dyspepsia and indigestion, and as an adjunct in the treatment of peptic ulcers. It is also used by mouth in the treatment of hyperphosphataemia, as a dietary **MINERAL SUPPLEMENT** for calcium and in toothpastes. It is a component of many compound preparations for antacid and dietary supplement purposes (e.g. Andrews™, Eno™, Gaviscon™, Maclean™, Rennie™, Sandocal™).

CALCIUM-CHANNEL ACTIVATORS are agents that lead to opening of calcium channels and allow calcium entry into the cell. There are many types of calcium channel and those in the cell membrane may be divided into two main categories:

Voltage-gated channels. One of the most studied experimental agents with regard to mechanism of action is the dihydropyridine **Bay K 8644** (actually (-)-(s)-Bay K 8644) – sometimes described as a 'calcium agonist'. The mechanism of action of this agent, which interacts with the α_1-subunit of the heterooligomeric calcium L-channel (one of the voltage-sensitive channels), is best described in terms of disturbing the equilibrium of the channel in favour of mode 2 – when the channel has a high opening probability. Conversely, dihydropyridine (DHP) calcium-channel antagonists, which can compete with Bay K 8644, displace the equilibrium in favour of mode 0 – when the open-state probability is zero. In the normal state in the absence of ligands, the channel spends most of its time in modes 1 and 2, where the former state is that of low opening probability. Although this DHP ligand has thrown light on important mechanistic aspects of voltage-gated calcium channels, no 'agonist' therapeutic agents have yet been developed from it, only 'antagonists' (see **CALCIUM-CHANNEL BLOCKERS**).

Other drugs affect intracellular calcium channels of the endoplasmic or sarcoplasmic reticulum, e.g. inositol triphosphate receptor channels open in response to $InsP_3$ itself and certain other inositol phosphates, are sensitized by **thiomersal** (which increases the sensitivity of the receptor to $InsP_3$ by acting as a sulphydryl reagent) and antagonized by **heparin**. The various ryanodine receptor channels, at which a putative natural agonist is cyclic adenosine diphosphate ribose (cADP-R), are activated by **caffeine** and low concentrations of **ryanodine** (but antagonized by high concentrations of ryanodine and ruthenium red).

Ligand-gated channels make up a diverse family of another type of membrane calcium channel, which may admit Ca^{2+} as a cation (usually together with Na^+). Amongst the oligomeric intrinsic-ion-channel superfamily, examples are the α_7 cholinergic nicotinic receptor (see **NICOTINIC CHOLINOCEPTOR AGONISTS**), NMDA glutamate receptors (see **GLUTAMATE RECEPTOR AGONISTS**), capsaicin receptors and certain P2X-purinoceptors (see **PURINE P2 RECEPTOR AGONISTS**).

Bertolino, M. *et al.* (1992) The central role of voltage-activated and receptor-operated calcium channels in neuronal cells. *Annu. Rev. Pharmacol. Toxicol.*, **32**, 399-421.

Perez-Reyes, E. *et al.* (1994) Calcium channels: Structure, function and classification. *Drug Dev. Res.*, **33**, 295-318.

Beech, D.J. (1997) Actions of neurotransmitters and other messengers on Ca^{2+} channels and K^+ channels in smooth muscle cells. *Pharmacol. Ther.*, **73**, 91-119.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

CALCIUM-CHANNEL BLOCKERS are agents that literally block or close any of the many types of calcium channels. However, in common usage the term is mainly used to describe a class of drugs finding increasing application in therapeutics (also called *calcium antagonists* or *calcium-entry blockers*) typified by the dihydropyridines (DHPs). In a more general usage of the term, there are many different classes of calcium-channel blockers, and many types of calcium channels. See **CALCIUM-CHANNEL ACTIVATORS**.

First, in the cell membrane, the voltage-gated calcium channels are of at least six types – termed L, N, T, P, Q, R – that may be differentiated by electrophysiological, molecular cloning and pharmacological criteria. The L- and N-channels are high-voltage activated, voltage-dependent and undoubtedly of great importance in normal physiology; L mainly in smooth, cardiac and skeletal muscle (and some neurons), but N only in neurons. T-channels are important in repetitive activity in cardiac SA node of the heart, neurons and some endocrine cells. The remainder have been found more recently in neurons. These channels are products of different genes, but they all share great structural similarity – both with respect to each other, and to voltage-gated K^+ and Na^+ channels. The individual pharmacology of each of these six ion channels resides largely in the α_1-subunit (which includes a voltage-sensing sequence); but even this is heterogeneous within a given channel (for the L-channel there are at least six different genes). Calcium is vital to the function of every cell type, and plays multiple roles ranging from charge-carrier across the membrane, to near-universal final intracellular-mediation of contraction, secretion or cell growth. Calcium-channel blockers can be used for therapeutic effect (or for analytical purposes) without endangering the function of every cell, partly by reason of the extreme diversity of the α_1-subunits. For instance, there is considerable selectivity of action between blockers of the N-channel (blocked by **ω-conotoxin GVIA**, a peptide toxin from a marine snail), whereas DHP and related blockers are much more active at L-channels. There are only rather nonselective blockers for the T-channels, e.g. octanol, Ni^{2+}, **amiloride**, **flunarizine**. The P-channels are characterized by their sensitivity to **ω-agatoxin IVA** (a funnel web spider toxin (FTX)), and are also blocked by **ω-agatoxin IIIA** and **ω-conotoxin MVIIC**. The Q-channel is blocked by ω-agatoxin IVA and ω-conotoxin MVIIC.

In clinical practice, there is further selectivity of drug action at the L-channels, in part originating from the fact that there seem to be separate, but adjacent, binding sites for different chemical classes of calcium antagonists. Of the L-channel blockers, some chemical families are more active on the smooth muscle of the cardiovascular system (e.g. **nifedipine** and most other DHPs), whereas others are more cardioactive (e.g. **verapamil**). Some further details of these

differences are given at the VASODILATOR entry. This selectivity has been attributed to there being different binding sites on the α_1-subunits (closely located by molecular biology mutation techniques) for the dihydropyridines (e.g. nifedipine, **nitrendipine**, **nimodipine**), benzothiazepines (e.g. **diltiazem**) and phenylalkylamines (e.g. verapamil) groups. Latterly, further chemical groups of L-channel blockers have been developed that may afford some selectivity for uterine, gastrointestinal or airways smooth muscle (including some indolizinesulphones, e.g. **fantofarone** and mixed calcium-/sodium-channel blockers, e.g. **lifarizine**). A further factor contributing to some degree of selectivity follows from the fact that L-channel blockers show use-dependence through binding more strongly to the inactivated mode; a consequence of which might be that more electrophysiologically active, and often pathological, states would be more sensitive to the blocking action of some L-channel blockers, and so would to some extent be self-regulating.

Clinically, the main uses of the L-channel calcium-channel blockers include a direct smooth muscle relaxant action as vasodilators and for effects on heart muscle (see SMOOTH MUSCLE RELAXANTS; VASODILATORS), leading to their widespread use as ANTIHYPERTENSIVES (e.g. **amlopidine**, **isradipine**, **nicardipine**, nifedipine, verapamil), in ANTIANGINAL AGENTS (e.g. amlopidine, diltiazem, nicardipine, nifedipine, verapamil), as ANTIARRHYTHMIC AGENTS (e.g. verapamil), as vasodilators to treat peripheral vascular disease or Raynaud's phenomenon (e.g. nifedipine), in the prevention of ischaemic damage following subarachnoid haemorrhage (nimodipine), and as ANTIMIGRAINE AGENTS in prophylaxis against attacks (e.g. nifedipine, verapamil).

Yet other drugs affect intracellular calcium channels of the endoplasmic or sarcoplasmic reticulum, e.g. inositol triphosphate receptor channels, which open in response to $InsP_3$ itself and certain other inositol phosphates antagonized by **heparin**. The various ryanodine receptor channels, are activated by low concentrations of **ryanodine**, but antagonized by high concentrations of ryanodine and by **ruthenium red**. The ryanodine receptor in skeletal muscle has a mutant form (on an autosomal dominant gene) which can be triggered by **halothane** and **suxamethonium chloride** to precipitate the dangerous condition of malignant hyperthermia. The muscle rigidity of this condition, and some other muscle rigidity states, can be treated clinically by blocking the receptors with **dantrolene**. These and other intracellular sites may well represent important future targets for drug action.

Turning to ligand-gated channels, less is known about channel-blocking mechanisms. Some possible sites are outlined at the calcium-channel activators entry. Blocking agents may work by indirect, possibly allosteric, interactions with intrinsic ion channels (e.g. ruthenium red at the capsaicin receptor, or glycine at the NMDA glutamate receptor). Others work through a direct-coupled G-protein action (e.g. N-type calcium channel-closure through opioid or α_2-adrenoceptor activation).

Saccomano, N.A. *et al.* (1994) Ca^{2+} channel toxins: Tools to study channel structure and function. *Drug Dev. Res.*, **33**, 319-343.

Miljanich, G.P. *et al.* (1995) Antagonists of neuronal calcium channels: Structure, function, and therapeutic implications. *Annu. Rev. Pharmacol. Toxicol.*, **35**, 707-734.

Sutko, J.L. *et al.* (1997) The pharmacology of ryanodine and related compounds. *Pharmacol. Rev.*, **49**, 53-98.

Zucchi, R. *et al.* (1997) The sarcoplasmic reticulum Ca^{2+} channel/ryanodine receptor: modulation by endogenous effectors, drugs and disease states. *Pharmacol. Rev.*, **49**, 1-51.

calcium clofibrate ➡ **clofibrate**.

calcium folinate [BAN, INN] (leucovorin calcium [USAN]; Refolinon™) is a Ca salt of the (*dl*)-L-form of **folinic acid**. This is the normal commercial form consisting of a mixture of diastereoisomers that is used therapeutically as an ANTIDOTE to folic acid antagonists, such as **methotrexate**, e.g. in cancer chemotherapy. See also **folic acid**.

calcium hydrate ➡ **calcium hydroxide**.

calcium hydroxide [INN, USAN] (slaked lime; hydrated lime; calcium hydrate) is used as a DERMATOLOGICAL AGENT, mainly as an ASTRINGENT, and in dentistry to line cavity walls.

calcium levofolinate [INN] (levoleucovorin calcium [USAN]) is the Ca salt of the (-)-L-form of **folinic acid**. Therapeutically, it is used as an ANTIDOTE to the toxic effects caused by the folate-antagonist activity of (antimetabolite) cytotoxic drugs used in ANTICANCER chemotherapy.

CALCIUM METABOLISM MODIFYING AGENTS

influence calcium homeostasis in the body in a variety of ways. Calcium has a central role in body function, having intracellular and extracellular roles. Intracellular function is related mainly to its role as the main second-messenger control system of the body, largely through regulation of a wide range of enzymes. Extracellular roles are mainly concerned, along with phosphate, in formation of bone and related structures. Calcium and phosphate homeostasis in the body are intimately interconnected, both being influenced by parathyroid hormone and hormones derived from vitamin D. Topics will relate to pharmacological intervention with calcium metabolism for therapy of disease states.

Parathyroid hormone (parathormone) is a polypeptide secreted by the parathyroid gland, and increases plasma concentration of calcium by mobilizing calcium from bone, by increasing reabsorption in the kidney and by stimulating production of **calcitriol**. Its net effect is to increase calcium concentration in plasma and to reduce that of phosphate. Secretion of parathyroid hormone from vesicles in the parathyroid gland is controlled by a Ca^{2+}-sensor receptor of seven-transmembrane type whereby low Ca^{2+}-concentrations stimulate secretion of the hormone, and high concentrations inhibit it. In fact parathyroid hormone is not normally used clinically except as a diagnostic agent. **Teriparatide**, a synthetic preparation of the first 34 amino acids in the parathyroid hormone sequence, is under investigation for treatment of osteoporosis. Hypoparathyroidism is most easily treated with **vitamin D**; or in emergencies by means of Ca^{2+}-infusion.

Calcitriol is the main active metabolite of vitamin D, and synergizes with parathormone in mobilizing bone calcium and increasing calcium absorption from the intestine. Vitamin D occurs in a number of sterol forms. These include vitamin D_3 (**cholecalciferol** – the form in foods and made in the skin by the action of UV); vitamin D_2 (**ergocalciferol** – also from plants). These forms are 25-hydroxylated in the kidney, and then 1α-hydroxylated in the kidney (under the control of **parathormone**), to make the most active form. This is available as calcitriol. Vitamin D facilitates the absorption of calcium and to a lesser extent, phosphorus, from the intestine and promotes deposition into the bones. A deficiency of vitamin D therefore results in bone deficiency disorders, e.g. rickets in children. Therapeutic replacement of vitamin D in cases of severe deficiency requires quantities of the vitamin best provided by one of the synthetic vitamin D analogues (e.g. alfacalcidol and dihydrotachysterol).

Calcitonin is a hormone from the thyroid gland, unrelated in structure or function to the thyroxine analogues and is

secreted by a different cell type (C-cells) in follicles of the gland. It is concerned with lowering calcium levels in the blood, and its action is balanced in the body by corresponding opposite action of parathyroid hormone from the anatomically adjacent parathyroid gland. Calcitonin (a CALCITONIN RECEPTOR AGONIST) is used in therapeutics to treat hypercalcaemia, Paget's disease of the bone and for certain cancers. It works by reducing calcium uptake to bone by binding to specific receptors on osteoclasts, and acting on the kidney to decrease calcium and phosphate reabsorption. Preparations for clinical use include natural porcine calcitonin and synthetic **salcatonin** (salmon calcitonin). The former contains impurities and may lead to sensitization and production of neutralizing antibodies material; and the latter may cause inflammation at the injection site. Also now available is the synthetic human 32 amino acid linear sequence (it differs from the salmon form in 2 residues).

Calcium forms used therapeutically include the folinic acid supplement **calcium folinate**, and the mineral supplements **calcium bicarbonate**, **calcium carbonate**, **calcium gluconate** and **calcium lactate**.

Other agents used as calcium metabolism modifying agents in disorders of calcium and phosphate metabolism include **bisphosphonates** (diphosphonates or biphosphonates), which are enzyme-resistant analogues of pyrophosphate and natural inhibitors of bone mineralization. They are used in Paget's disease of the bone, malignant hypercalcaemia, osteoporosis and are being evaluated in cancer metastases of the bone. The main bisphosphonates used are **alendronic acid** (alendronate sodium), **clodronic acid** (sodium clodronate), **etidronic acid** (sodium etidronate), **pamidronic acid** (pamidronate disodium) and **tiludronic acid** (tiludronate disodium). Also, OESTROGENS are used in prevention of post-menopausal osteoporosis. **Gallium nitrate**, which inhibits bone resorption, is being tested for treatment of hypercalcaemia, though there may be problems with toxicity.

Sambrook, P. *et al.* (1993) Prevention of corticosteroid osteoporosis. A comparison of calcium, calcitriol, and calcitonin. *N. Engl. J. Med.*, **328**, 1747-1752.
Dunn, C.J. *et al.* (1994) Etidronic acid. A review of its pharmacological properties and therapeutic efficacy in resorptive bone disease. *Drugs Aging*, **5**, 446-474.
Patel, S. (1996) Current and potential future drug treatments for osteoporosis. *Ann. Rheum. Dis.*, **55**, 700-714.
Rosen, C.J. *et al.* (1996) Comparative clinical pharmacology and therapeutic use of bisphosphonates in metabolic bone diseases. *Drugs*, **51**, 537-551.

calcium pantothenate ➡ **pantothenic acid**.

calcium polycarbophil ➡ **polycarbophil calcium**.

calcium trisodium pentetate [BAN, INN] (calcium chel 330; NSC 34249) is a metal CHELATING AGENT, used clinically as an ANTIDOTE in promoting excretion of plutonium.

Calcort™ ➡ **deflazacort**.

calcozine blue ZF ➡ **methylthioninium chloride**.

Calderol™ ➡ **calcifediol**.

calebassine (*C*-toxiferine II; C-strychnotoxine I; C-calebassine; C-curarine II) is an alkaloid from calabash curare, *Strychnos divaricans* and several other *Strychnos* spp. (Strychnaceae). It is a NICOTINIC CHOLINOCEPTOR ANTAGONIST, a (competitive) NEUROMUSCULAR BLOCKING AGENT which can be used as a SKELETAL MUSCLE RELAXANT.

Calimal™ ➡ **chlorpheniramine**.

Calmurid™ ➡ **hydrocortisone**.

calusterone [INN, USAN] (NSC 88536; U 22550) is a steroid, an ANDROGEN and ANABOLIC AGENT, used as an ANTICANCER AGENT. It has experimental haematopoietic effects.

camazepam [INN] (SB 5833) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with similar properties to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It has been used orally to treat insomnia, anxiety and for preoperative medication.

cambendazole [BAN, INN, USAN] is a mainly veterinary ANTHELMINTIC.

Camcolit™ ➡ **lithium carbonate**.

camostat [INN] (camostat mesilate [JAN]; Foipan™; FOY 305; FOY 5980) is a guanidobenzoate derivative, an ENZYME INHIBITOR active as a (serine) PROTEASE INHIBITOR. It has a protective effect in animal models of pancreatitis, and has been used by mouth in human therapeutics.

camostat mesilate ➡ **camostat**.

cAMP ➡ **cyclic AMP**.

2-camphanone ➡ **camphor**.

camphor [USAN] (2-bornanone; 2-camphanone) is a natural ketone that has a widespread distribution, but is found especially in the Camphor tree (*Cinnamomum camphora*), and is common in the Lauraceae, Labiatae and Compositae. The normal natural product is (1R)-(+)-form, and the manufactured product is a racemate. It has many actions given parenterally, notably CNS STIMULANT or analeptic actions (though no longer used by this route in UK or USA). Used topically it has COUNTER-IRRITANT (rubefacient or topical analgesic) actions, and is included in antipruritic and antirheumatic preparations. It is claimed to have EXPECTORANT actions.

Camptetin™ ➡ **irinotecan**.

Campto™ ➡ **irinotecan**.

camptothecin is a quinolinedione derivative, a cytotoxic agent enhancing binding of topoisomerase I to DNA, thus promoting DNA strand breaks. It shows potent ANTICANCER activity in experimental animals, and has been used clinically in China against gastrointestinal tumours. It also shows ANTI-HIV and ANTIPROTOZOAL activity, and has plant growth regulatory and insect chemosterilant properties.

Camsilon™ ➡ **ecothiopate iodide**.

Canderel™ ➡ **aspartame**.

candesartan ➡ **candesartan cilexetil**.

candesartan cilexetil (Amias™) is a benzimidazole-carboxylic acid derivative, an (AT_1) ANGIOTENSIN RECEPTOR ANTAGONIST, used as an ANTIHYPERTENSIVE. It is an ethyl ester prodrug of candesartan (CV 11974). It has experimental renal protective effects.

candoxatril [BAN, INN, USAN] (UK 79300) the ester prodrug of **candoxatrilat**. It is a NEUTRAL ENDOPEPTIDASE INHIBITOR ('enkephalinase' inhibitor) which can be used as an ANTIHYPERTENSIVE or in HEART FAILURE TREATMENT. By acting as an atriopeptidase inhibitor, it prolongs the action of endogenous ATRIAL NATRIURETIC PEPTIDE which is an ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONIST.

candoxatrilat [BAN, INN, USAN] (UK 73967) is a NEUTRAL ENDOPEPTIDASE INHIBITOR ('enkephalinase' inhibitor), which can be used as an ANTIHYPERTENSIVE or in HEART FAILURE TREATMENT. By acting as an atriopeptidase inhibitor, it prolongs the action of endogenous ATRIAL NATRIURETIC PEPTIDE which is as an ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONIST. It can be used in the form of its ester prodrug, **candoxatril**.

Canesten™ ➡ **clotrimazole**.

CANNABINOID RECEPTOR AGONISTS act at receptors that recognize constituents of **cannabis**, namely compounds called cannabinoids, which include **Δ^9-tetrahydrocannabinol** (Δ^9-THC is also called Δ^1-THC), Δ^6-THC and cannabinol (which is formed spontaneously from Δ^1-THC). Cannabinoid receptors have been isolated

and cloned and are of the seven-transmembrane G-protein-coupled receptor type. They are coupled negatively to adenylyl cyclase, and appear to regulate K^+-channel opening and also can directly inhibit calcium channel function. The distribution of receptors corresponds roughly to the pharmacological effects. They occur particularly in the hippocampus (which is concerned with memory impairment), mesolimbic dopamine pathways (concerned with reward), cerebellum and substantia nigra (concerned with motor disturbances) as well as in the cortex. Certain cannabinoid derivatives have been developed for therapeutic use and show promise as analgesics or antiemetics, e.g. **nabilone**, an antinauseant used in cancer chemotherapy (see ANTIEMETICS). The occurrence of receptors has triggered a search for an endogenous ligand and has led to the discovery of **anandamine**, an eicosanoid (an amide of arachidonic acid), which produces short-lived cannabinoid-like actions, and has led to interest in factors influencing physiological alterations in the eicosanoid system.

There appear to be two forms of the receptor, termed CB_1 and CB_2, that seem to be largely localized to the brain and periphery, respectively. Agents acting at these receptors include: nabilone, anandamine, **levonantradol**, Δ^8-THC, WIN 55212-2 and CP 55940. There is some selectivity in that CP 55940 has more activity at CB_1 receptors, and cannabinol at CB_2 receptors.

Pertwee, R.G. (1988) The central neuropharmacology of psychotropic cannabinoids. *Pharmacol. Ther.*, **36**, 189-261.

Devane, W.A. (1994) New dawn of cannabinoid pharmacology. *Trends Pharmacol. Sci.*, **15**, 40-41.

Howlett, A.C. (1995) Pharmacology of cannabinoid receptors. *Annu. Rev. Pharmacol. Toxicol.*, **35**, 607-634.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci.*, Suppl., **19**, 1-98.

CANNABINOID RECEPTOR ANTAGONISTS act by blocking cannabinoid receptors, of which there seem to be two forms – termed CB_1 and CB_2 – largely localized to the brain and periphery, respectively (see CANNABINOID RECEPTOR AGONISTS). Experimental antagonists include **SR 141716A**, which is more active at the CB_1 receptor.

Collins, D.R. *et al.* (1995) Prevention by the cannabinoid antagonist, SR141716A, of cannabinoid- mediated blockade of long-term potentiation in the rat hippocampal slice. *Br. J. Pharmacol.*, **115**, 869-870.

cannabinol [BAN, INN] is a cannabinoid, a constituent of **cannabis**, isolated from *Cannabis sativa*. It is a CANNABINOID RECEPTOR AGONIST and mild PSYCHOTROPIC AGENT.

cannabis ➡ **Δ^8-tetrahydrocannabinol**; **Δ^9-tetrahydrocannabinol**; **dronabinol**.

canrenoate potassium ➡ **canrenoic acid**.

canrenoic acid [BAN, INN] (potassium canrenoate [INN, JAN]; canrenoate potassium [USAN]; Spiroctan-M™) is a steroid, an ALDOSTERONE-ANTAGONIST (potassium-sparing) DIURETIC, which can be used in ANTIHYPERTENSIVE therapy. It is a metabolite of **spironolactone**.

cantharides (Blistering Beetle; cantharis; 'Russian Flies'; 'Spanish Fly') is a preparation of the dried cantharides beetle containing not less than 0.6% of **cantharidin**. The beetle may be *Cantharis vesicatoria* (= *Lytta vesicatoria*) (Meloidae) and other spp. Sometimes *Mylabris* (Chinese blistering beetle, *Mylabrus sidae* (= *M. phalerata*) and other species are used. A group of blister beetles including the species of the genus *Paederus* (Family: Staphylinidae) has somewhat different clinicopathological features and contains a different vesicant agent, **pederin**. Cantharides has been used externally as a COUNTER-IRRITANT (rubefacient or topical analgesic) or vesicant. Taken internally preparations are very toxic. Their use in cosmetic products is banned in the UK. It is a reputed aphrodisiac and a component of 'Spanish Fly'.

cantharides camphor ➡ **cantharidin**.

cantharidin (cantharides camphor; cantharone) is an epoxyisobenzofurandione and the main active principle obtained from *Lytta vesicatoria* and many other insects. Cantharidin (in its crude form, cantharides) has been used externally as a COUNTER-IRRITANT (rubefacient or topical analgesic) and vesicant. Cantharidin is a lipid-soluble SENSORY IRRITANT and TOXIN that effects especially the eye, skin and respiratory tract. Currently, in some countries cantharidin is the active ingredient in various wart removal compounds. It has been shown to inhibit both type 1 and type 2A phosphatase activity, and it may be that its effects are mediated by increasing the phosphorylation state of several regulatory proteins It is a tumour-promoting agent.

cantharis ➡ **cantharides**.

cantharone ➡ **cantharidin**.

Cantil™ ➡ **mepenzolate bromide**.

Capastat™ ➡ **capreomycin**.

Capitrol™ ➡ **chloroxine**; **chlorquinaldol**.

Caplenal™ ➡ **allopurinol**.

capobenate sodium ➡ **capobenic acid**.

capobenic acid [INN, USAN] (capobenate sodium [USAN]) is a benzamido derivative, a VASODILATOR, ANTIARRHYTHMIC and ANTIANGINAL AGENT, used for treatment of cardiac infarction.

Capoten™ ➡ **captopril**.

Capozide™ ➡ **captopril**.

capreomycin [BAN, INN] (Capastat™) is a mixture of cyclic peptide ANTIBIOTICS, used as a parenteral ANTITUBERCULAR.

capsaicin (natural capsaicin; capsacutin; capsaiene) is a diterpene, a pungent principle of various hot peppers of various members of *Capsicum* spp. (Solanaceae). It is now regarded as a VANILLOID RECEPTOR AGONIST. This newly defined site, activation of which causes opening of a cation-selective ion channel-receptor complex that admits Ca^{2+} and Na^+, causes depolarization of nerve endings and the release of sensory neurotransmitters. The action of capsaicin at this site can be antagonized competitively by the VANILLOID RECEPTOR ANTAGONIST **capsazepine**. It is a specific sensory irritant, stimulating sensory neurons, causing desensitization and depletion of neurotransmitters, and at high doses acting as a neurotoxin (especially in neonates). It is a pharmacological tool used as a selective probe for studying neurogenic inflammation and the role of nociceptors in animal and human pathophysiology. Clinically, it is used as a COUNTER-IRRITANT (rubefacient or topical analgesic) as a topical dermatological preparation for some painful skin conditions. Commercially available capsaicin is sometimes the more readily prepared *n*-nonanoyl analogue, **pseudocapsaicin**. Also, the dihydro derivative, **dihydrocapsaicin**, is a minor constituent of natural capsaicin. The (*Z*)-isomer, zucapsaicin [INN, USAN] also acts as a local analgesic.

capsazepine is a synthetic compound developed out of vallinoids, such as **capasicin**, and is a competitive VANILLOID RECEPTOR ANTAGONIST. It is used as a pharmacological tool.

capsicum is often used medically in the form of the resin, capsicum oleoresin, and is a pungent extract from capsicum peppers; various members of the *Capsicum* spp. (Solanaceae). The active principle is **capsaicin**. Both capsicum resin and capsaicin are incorporated into medicines with COUNTER-IRRITANT (rubefacient or topical analgesic) actions, and when rubbed into the skin cause a feeling of warmth and that offsets the pain from underlying muscles, joints or internal organs.

captopril [BAN, INN, JAN, USAN] (Capoten™, Capozide™ and many other names) is a (mercapto) ACE INHIBITOR. It is a VASODILATOR that therapeutically can be used as an ANTIHYPERTENSIVE. In 1995 it was the 6th best-selling prescription drug in the world.
Carace™ ➡ lisinopril.
caracemide [INN, USAN] is a hydroxylamine derivative, an inhibitor of nucleic acid and protein synthesis, which has been investigated as an ANTICANCER AGENT. It also is reported to be a MUSCARINIC CHOLINOCEPTOR ANTAGONIST.
Carafate™ ➡ sucralfate.
caramiphen [BAN, INN] (caramiphen edisylate [BANM]; caramiphen edisilater [INNM]) is a diethylaminoethylphenylcyclopentanecarboxylate derivative, a centrally-acting non-narcotic ANTITUSSIVE. It is used as the edisylate (ethanedisulphonate) in the relief of cough. Caramiphen edisylate and **phenylpropanolamine hydrochloride** are constituents of a number of preparations, e.g. Ordrine™ and Tussogest™. Caramiphen was originally used in the form of hydrochloride as a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, as an ANTIPARKINSONIAN AGENT to reduce rigidity.
caramiphen edisilate ➡ caramiphen.
caramiphen edisylate ➡ caramiphen.
caraway oil ➡ carvone.
carazolol [BAN, INN] is a β-ADRENOCEPTOR ANTAGONIST. It was used therapeutically in ANTIHYPERTENSIVE treatment, and can be used as an analytical tool because it has a high affinity for the β_3-adrenoceptor where it acts as an agonist, whereas it is an antagonist at β_1- and β_2-sites.
carbachol [INN] (carbamoylcholine; choline carbamate; Isopto Carbachol™; Miostat™) is a stable analogue of **acetylcholine** which is not hydrolysed by cholinesterases. It is a MUSCARINIC CHOLINOCEPTOR AGONIST, and a PARASYMPATHOMIMETIC that can be used to stimulate motility in the intestines and to treat urinary retention, and as a MIOTIC AGENT for ANTIGLAUCOMA TREATMENT and in ophthalmic surgery. It is also a NICOTINIC CHOLINOCEPTOR AGONIST.
carbadox [BAN, INN, USAN] is an ANTIBACTERIAL agent which can be used as an animal growth promoter (banned in UK).
carbaldrate ➡ dihydroxyaluminium sodium carbonate.
carbamazepine [BAN, INN, JAN, USAN] (Tegretol™ and many other names) is a dibenzazepine that acts as a use-dependent SODIUM-CHANNEL BLOCKER which modulates opening in neurons and attenuating high-frequency action potential firing. It is used as an ANALGESIC for trigeminal neuralgia, has ANTICONVULSANT properties and is used as an ANTIEPILEPTIC.
carbamic acid nitrile ➡ cyanamide.
carbamide ➡ urea.
carbamidine ➡ guanidine hydrochloride.
carbamimidic hydrazide ➡ pimagedine.
carbamohydroxamic acid ➡ hydroxyurea.
carbamoylcholine ➡ carbachol.
carbamoylhydroxylamine ➡ hydroxyurea.
carbaril ➡ carbaryl.
carbarsone [INN, USAN] is an arsenical AMOEBICIDAL AGENT used in veterinary practice.
carbaryl [ANSI, BAN, BSI, ISO] (carbaril [INN]; Carylderm™; Clinicide™; Derbac-C™ ; Suleo-C™ and many other names) is a contact insecticide, comonly used as a PEDICULICIDAL for head and crab lice.
carbaspirin calcium ➡ aspirin.
carbazilquinone ➡ carboquone.
carbazochrome [INN, JAN] (carbazochrome salicylate [INN]) is the semicarbazone of **adrenochrome**. It has been given as an antihaemorrhagic HAEMOSTATIC by mouth or injection.
carbazochrome salicylate ➡ carbazochrome.
carbenicillin [BAN, INN] (carbenicillin disodium [USAN]; carbenicillin potassium [USAN]; α-carboxybenzylpenicillin) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat certain infections.
carbenicillin disodium ➡ carbenicillin.
carbenicillin indanyl sodium ➡ carindacillin.
carbenicillin phenyl sodium ➡ carfecillin.
carbenicillin potassium ➡ carbenicillin.
carbenoxolone [INN] (carbenoxolone sodium; enoxolone hydrogen succinate; Bioplex™; Bioral™; Pyrogastrone™) is derived from liquorice, and is a synthetic derivative of glycyrrhizinic acid. It can be used orally as an ANTIULCEROGENIC for gastric ulcers because it acts as a cytoprotective and promotes healing; may also be used locally for mouth ulcers.
carbenoxolone sodium ➡ carbenoxolone.
carbetocin [BAN, INN] is a synthetic analogue of **oxytocin** and is a VASOPRESSIN RECEPTOR AGONIST acting at the oxytocin receptor (OT) subtype. It has a longer duration of action than oxytocin and can also be used as an OXYTOCIC AGENT.
carbidopa [BAN, INN, JAN, USAN] is a hydrazine derivative of **DOPA**, a peripheral DOPA-DECARBOXYLASE INHIBITOR used as an ANTIPARKINSONIAN AGENT. It prevents **levodopa** being too rapidly broken down into **dopamine** in the periphery, so as to increase the amounts reaching the brain. It is normally co-administered with levodopa as an oral single-compound preparation called co-careldopa (Sinemet™ etc.).
carbimazole [BAN, INN] (thioimidazole; Neo-Mercazole™) is a prodrug of **methimazole**, one of the thionamide (thioureylene) series of ANTITHYROID AGENTS that act on the thyroid gland to reduce the production of the THYROID HORMONES. It is used orally to treat hyperthyroidism (Graves' disease) and its detrimental effects (thyrotoxicosis), and also in preparation for thyroid surgery.
carbimide ➡ cyanamide.
carbinoxamine [BAN, INN] (carbinoxamine maleate [JAN, USAN]) is one of the ethanolamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS, with MUSCARINIC CHOLINOCEPTOR ANTAGONIST, 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST properties and SEDATIVE side-effects. It can be used for the symptomatic relief of allergic symptoms, such as hay fever and urticaria. It is a component of various ANTITUSSIVE and 'cold-cures': e.g. Cardex™, Davenol™, Rondec™. The (-)-form is rotoxamine [INN, USAN].
carbinoxamine maleate ➡ carbinoxamine.
Carbocaine™ ➡ mepivacaine.
carbocisteine [BAN, INN, JAN] (carbocysteine [USAN]; AHR 3053; LJ 206; Mucodyne™ and many other names) is a cysteine derivative, a MUCOLYTIC and EXPECTORANT, used in treating respiratory disorders characterized by viscous or excessive mucus.
carbocromen ➡ chromonar.
carbocromen hydrochloride ➡ chromonar.
carbocysteine ➡ carbocisteine.
carbofenotion [INN] (carbophenothion [ANSI, BAN, BSI, ISO]) is a phosphorodithioate ANTICHOLINESTERASE, formerly used as an INSECTICIDE and ACARICIDE.
carbohydroquinonic acid ➡ dihydroxybenzoic acid.
carbolonium bromide [BAN] (hexcarbacholine bromide [INN]; hexabiscarbacholine; Imbretil™) is a quaternary amine, a (depolarizing) NICOTINIC CHOLINOCEPTOR AGONIST, a (depolarizing) NEUROMUSCULAR BLOCKING AGENT. It can be used as a SKELETAL MUSCLE RELAXANT in general anaesthesia.
carbomer [BAN, INN] (GelTears™; Viscotears™) is a

synthetic high molecular weight acrylic polymer cross linked with allylsucrose or with allyl ethers of pentaerythritol. It is used as a suspending agent, emulsifier and binding agent in cosmetics. It can be used as a topical liquid gel in artificial tears where there is dryness of the eye due to disease, such as keratoconjunctivitis.

carbon disulfide [ISO] has DISINFECTANT and INSECTICIDAL properties, but is now little used.

carbonic acid ammonium salt ➡ **ammonium carbonate**.

carbonic acid, calcium salt ➡ **calcium carbonate**.

carbonic acid, magnesium salt ➡ **magnesium carbonate**.

carbonic acid, monosodium salt ➡ **sodium bicarbonate**.

CARBONIC ANHYDRASE INHIBITORS act as inhibitors to the enzyme carbonic anhydrase. This enzyme is widely distributed in the body and has a fundamental role in the control of acid-base balance. In the 1920s it was noticed that the SULPHONAMIDE **sulfanilamide** had a weak diuretic action. **Acetazolamide** is a subsequent thiadiazole-sulphonamide derivative with potent carbonic anhydrase inhibitor activity. Clinically, it is used for ANTIGLAUCOMA TREATMENT, is a weak DIURETIC and can be used to treat mountain sickness. **Dichlorphenamide** and **dorzolamide** are sulphonamide derivatives also used for antiglaucoma treatment. **Methazolamide** is used as a diuretic. Now that seven or more isoenzymes of carbonic anhydrase have been cloned, isolated and mapped, some new initiatives are aimed at developing agents with more selective actions.

Sly, W.S. *et al.* (1995) Human carbonic anhydrases and carbonic anhydrase deficiencies. *Annu. Rev. Biochem.*, **64**, 375-401.

carbophenothion ➡ **carbofenotion**.

carboplatin [BAN, INN, JAN, USAN] (NSC 241240; CBDCA; JM 8; Paraplatin™) is a derivative of **cisplatin**, an alkylating ANTICANCER AGENT. It is used intravenously in the treatment of ovarian cancer, is also active in small cell lung cancer and is under trial in a variety of other malignancies.

carboprost [BAN, INN, USAN] (carboprost trometamol [BAN]; carboprost methyl [USAN]) is a synthetic prostaglandin 15-methyl analogue of **dinoprost** ($PGF_{2\alpha}$) with a longer duration of action, and is a PROSTANOID RECEPTOR AGONIST. It has smooth muscle stimulant, OXYTOCIC and ABORTIFACIENT actions; also used to treat cyclophosphamide-induced haemorrhagic cystitis.

carboprost methyl ➡ **carboprost**.

carboprost trometamol ➡ **carboprost**.

carboquone [INN, JAN] (NSC 134679; CS 310; carbazilquinone) is an alkylating ANTICANCER AGENT, used against various carcinomas, including leukaemia.

α-carboxybenzylpenicillin ➡ **carbenicillin**.

carboxyethylgermanium sesquioxide ➡ **propagermanium**.

CARBOXYPEPTIDASE INHIBITORS act against various members of carboxypeptidase enzyme family that cleave the C-terminal residue from oligopeptides or from proteins. They can be divided into classes on the basis of their functional characteristics. These classes are dealt with separately in terms of their alternate names, notable substrates and inhibitors. Most of these are thought to correspond to the metalloproteinase class of enzyme. There are a number of enzymes of special interest in relation to their neuropeptidase actions.

Dipeptidyl carboxypeptidase A (EC 3.4.15.1; angiotensin-converting enzyme; ACE; kininase II) is a much-studied zinc-metalloproteinase, cleaving the last two carboxyterminal residues of peptides. It has a wide distribution and is found in a membrane-bound form, notably on vascular endothelial cells and in plasma. Notable substrates include **angiotensin I** (converted to an active product, **angiotensin II**), **bradykinin**, **cholecystokinin**, **gastrin**, **leucine-enkephalin**, **methione-enkephalin**, **LH-RH**, **neurotensin** and **substance P**. Inhibitors include the large family of ACE inhibitors used in therapeutics as antihypertensives. Examples in clinical use include **captopril**, **cilazapril**, **enalapril**, **fosinopril**, **lisinopril**, **perindopril**, **quinapril**, **ramipril** and **trandolapril**. ACE inhibitors can be administered clinically as prodrugs that are converted to the active molecule *in vivo*, e.g. enalapril to **enalaprilat**, and ramipril to **ramiprilat**. See ACE INHIBITORS.

Carboxypeptidase H (EC 3.4.27.10; carboxypeptidase H; enkephalin convertase) is not fully characterized, and may be a metalloproteinase. Substrates of this enzyme, found in cell membranes and secretory vesicles, include **enkephalins**, bradykinin and ATRIAL NATRIURETIC PEPTIDE. Two mercapto inhibitors used are **MERGETPA** (MGTA) and GEMSA, but they are not very selective.

Carboxypeptidase N (EC 3.4.17.3; kininase I; arginase carboxypeptidase) is a zinc-metalloproteinase. Notable substrates of this soluble enzyme include: bradykinin (to form [desArg^9]-BK, active at B_1 bradykinin receptors), enkephalins and atrial natriuretic peptide. An inhibitor used is MERGETPA, but it is not very selective.

Carboxypeptidase P (EC 3.4.17.-; prolylcarboxypeptidase; angiotensinase C) is not fully characterized, and may be a metalloproteinase. Notable substrates of this plasma membrane enzyme include enterostatin. Inhibitors include **EDTA** and o-phenanthroline.

Skidgel, R.A. (1992) Bradykinin-degrading enzymes: Structure, function, distribution, and potential roles in cardiovascular pharmacology. *J. Cardiovasc. Pharmacol., Suppl. 9*, **20**, 4-9.

Turner, A.J. *et al.* (1994) Neuropeptidases: candidate enzymes and techniques for study. *Biochem. Soc. Trans.*, **22**, 122-127.

carboxyterfenadine ➡ **fexofenadine**.

carbromal [BAN, INN] is a ureide/acylurea, with SEDATIVE/HYPNOTIC properties, formerly used as a hypnotic agent.

carbutamide [BAN, INN] (Glybutamide™) is one of the sulphonylurea group of (oral) HYPOGLYCAEMICS. It can be used as an ANTIDIABETIC in non-insulin-dependent diabetes mellitus (NIDDM).

carbuterol [BAN, INN] (carbuterol hydrochloride [USAN]) is a β-ADRENOCEPTOR AGONIST which has been used, as carbuterol hydrochloride, as a BRONCHODILATOR.

carbuterol hydrochloride ➡ **carbuterol**.

Cardene™ ➡ **nicardipine**.

Cardex™ ➡ **carbinoxamine**.

CARDIAC DEPRESSANTS are little used in medicine, however, some are used to slow the heartbeat in tachycardias and a number of these are often analogues or derivatives of other drugs with optimized activity for this purpose in the heart (e.g. **procainamide**, **quinidine**) – these are dealt with under ANTIARRHYTHMIC AGENTS.

In addition to drugs in these classes, many drugs have the adverse effect of cardiac depression as a side-effect. This is particularly so with LOCAL ANAESTHETICS (e.g. **lignocaine**, **procaine**), which is a major reason why they are only used by local application. A number of other drugs, particularly chemotherapeutic agents that have strong reasons for their selection, may be cardiac depressants in some patients at high doses (e.g. **doxorubicin**, **quinine**). Many drugs with depressant actions on the CNS are also cardiac depressant in

higher doses (e.g. **carbamazepine**, **chlorpromazine**, **pentobarbitone**). Drugs with actions on the autonomic system may have cardiac depressant actions (e.g. **bretylium**, **reserpine**) Also, β-ADRENOCEPTOR ANTAGONISTS, whose actions are generally beneficial, can in some conditions and in overdose cause heart block or even cardiac arrest. Cholinoceptor muscarinic agonists, by definition, will have negative inotropic and chronotropic actions, and rarely **methacholine** is used in the emergency treatment of supraventricular tachycardias. See MUSCARINIC CHOLINOCEPTOR AGONISTS.

CARDIAC GLYCOSIDES are a class of drugs derived from the leaf of *Digitalis* spp. foxgloves. These drugs have a pronounced effect on the failing heart, increasing the force of contraction, so they have commonly been used to increase the force of contraction in congestive HEART FAILURE TREATMENT (see also CARDIAC STIMULANTS). Also, they correct certain abnormal heart rhythms (especially rapid atrial fibrillation) and are therefore used in antiarrhythmic treatment (see ANTIARRHYTHMICS). The greater effectiveness of ACE inhibitors in prolonging survival in patients with heart failure has led to a decrease in their use in patients with sinus rhythm (though they are effective).

Cardiac glycosides are used much less than previously, because doses that are useful therapeutically are close to those that are toxic, and the dose must be carefully adjusted in the individual. An important determinant of concentration in the body is the rate of metabolism and excretion, and some of the shorter-acting glycosides (e.g. **ouabain**) are now no longer used. Examples of cardiac glycosides include **digitoxin** and **digoxin**. Chemically, they are comprised of three components, a steroid ring structure, a lactone and a sugar moiety containing some unique monosaccharides. The lactone ring is essential for activity, but the steroid moiety can be replaced.

The mechanism of action of cardiac glycosides has always been a subject of debate. The main site at which glycosides act is the Na^+/K^+-ATPase of the cell membrane, which constitutes the Na^+/K^+ pump, and they bind to the K^+-binding site, thus inhibiting the enzyme (see ATPASE INHIBITORS). This inhibition, through a series of interrelated actions, eventually causes depolarization and affects cardiac rhythm. There is also an eventual increase in sarcoplasmic calcium content and an increase in the amount of calcium released by the action potential – and thus the force of contraction is increased. These are the principal beneficial actions.

Goto, A. *et al.* (1992) Physiology and pharmacology of endogenous digitalis-like factors. *Pharmacol. Rev.*, **44**, 377-399.

Sweadner, K.J. (1993) Multiple digitalis receptors: A molecular perspective. *Trends Cardiovasc. Med.*, **3**, 2-6.

cardiac natriuretic hormone ➡ **atrial natriuretic peptides**.

CARDIAC STIMULANTS are used in medicine to stimulate the rate (chronotropic action) and/or the force (inotropic action) of the heartbeat when it is weak as a result of some disease state, or in medical emergencies.

CARDIAC GLYCOSIDES have a pronounced effect on the failing heart, increasing the force of contraction, so they were formerly widely used to increase the force in congestive heart failure treatment (e.g. **digitoxin**, **digoxin**).

Some PHOSPHODIESTERASE INHIBITORS (e.g. **enoximone** and **milrinone**) are valuable, and some exert most of their effect on the myocardium (those acting at a heart-specific subtype of this enzyme (type III phosphodiesterase) to raise the intracellular concentration of cAMP) and may be used as positive INOTROPIC AGENTS in the short-term treatment of severe congestive heart failure.

A number of sympathomimetic β-ADRENOCEPTOR AGONISTS can be used to directly stimulate force (and rate) (e.g. **adrenaline**, **dobutamine**, **dopexamine** and **isoprenaline**). Of these, dobutamine is especially valuable for its inotropic action and has less chronotropic action than the others. Most of these drugs tend to be reserved for emergencies, such as cardiogenic shock, septic shock, heart surgery, cardiac infarction and cardiac arrest. **Xamoterol** is a partial agonist at β-adrenoceptors and is used in mild heart failure only.

ATRIAL NATRIURETIC PEPTIDE has a beneficial local hormone effect on the heart and, theoretically, agents that mimic its effects may be useful in heart failure e.g. **candoxatril**.

Cardilate™ ➡ **erythrityl tetranitrate**.

cardio-green ➡ **indocyanine green**.

Cardioxane™ ➡ **razoxane**.

Cardura™ ➡ **doxazosin**.

carebastine [INN] is the active metabolite of **ebastine**, a HISTAMINE H_1-RECEPTOR ANTAGONIST.

carfecillin [BAN, INN] (carbenicillin phenyl sodium [USAN]; carfecillin sodium [JAN]; α-phenoxycarbonylbenzylpenicillin) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat certain infections.

carfecillin sodium ➡ **carfecillin**.

carfenazine ➡ **carphenazine**.

carfentanil [INN] (carfentanil citrate [USAN]) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST and (veterinary) OPIOID ANALGESIC.

carfentanil citrate ➡ **carfentanil**.

cargutocin [INN, JAN] is a synthetic analogue of **oxytocin** and is an agonist at oxytocin receptors (an (OT) VASOPRESSIN RECEPTOR AGONIST). It has a similar action to oxytocin and can also be used as an OXYTOCIC AGENT.

carindacillin [BAN, INN] (carbenicillin indanyl sodium [USAN]; carindacillin sodium [JAN]; Geocillin™) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an oral ANTIBACTERIAL to treat certain infections.

carindacillin sodium ➡ **carindacillin**.

carisoprodol [BAN, INN, USAN] (isopropyl meprobamate; Carisoma™; Soma™) is a derivative of the carbamate meprobamate. It is a (CNS-acting) SKELETAL MUSCLE RELAXANT, used in a variety of musculospastic disorders.

CARMINATIVES help relieve flatulence and are used to reduce gastric discomfort and colic. They may work by helping the bringing up of wind or eructation (belching). There are many agents used but the mode of action (or efficacy) is not well established. Examples are: extracts of volatile oils of caraway, cardamom, camomile, cinnamon, cloves, dill, fennel, ginger, nutmeg and peppermint. Alcoholic solutions of **ether** and **chloroform** have also been used. A more recent approach is to use a polymer with a defoaming action agent, which helps gas coalesce, e.g. **dimethicone** (simethicone is an activated form with silicon dioxide).

carmine blue ➡ **indigotin disulfonate sodium**.

carmofur [INN, JAN] (HCFU) is a derivative of **fluoruoracin** and an ANTICANCER AGENT that has been used in the treatment of breast and gastrointestinal carcinomas.

carmustine [BAN, INN, USAN] (NSC 409962; SK 27702; BCNU™) is a halogenated nitrosourea, an alkylating ANTICANCER AGENT that directly damages DNA so interfering with cell replication. It is used intravenously to treat some myelomas, lymphatic cancer and gliomas and brain tumours.

carnidazole [BAN, INN, USAN] can be used as a veterinary ANTIPROTOZOAL, and of possible use as a radiosensitizer.

carnitine [INN] (vitamin B_T; *(L)*-form = levocarnitine [INN, USAN]) is an amino acid derivative that is often considered as a VITAMIN. It is a constituent of striated muscle, liver and

whey. It is a facilitator of long-chain fatty acids through mitochondrial membranes, thus allowing their metabolic oxidation. It is a regulator of blood lipid levels, used in sport and infant nutrition. As a drug it can be used to increase cardiac output and improve myocardial function; often administered after haemodialysis. Therapeutically, it is used to treat primary carnitine deficiency.

caroid ➡ **papain**.

α-carotene (**β,ε-carotene**) is a widespread carotenoid and is a **vitamin A** precursor. Although it has vitamin A activity, it is less than that of **β-carotene**.

β-carotene (betacarotene [INN, USAN]; β,β-carotene; E160(a); Solatene™) is a carotenoid and a **vitamin** substance widespread in plants and animals. In plants it is almost always associated with chlorophyll. It is a **vitamin A** precursor and exhibits strong vitamin A activity. It can be used in topical ultraviolet **SUNSCREEN** preparations (but has not been shown to be effective). It can be given orally to reduce photosensitivity reactions in patients with erythropoetic protoporphyria, and is sometimes tried as an adjunct in treating polymorphous light eruptions. It can be used orally as a dietary supplement; also used as a yellow food colorant.

β,β-carotene ➡ **β-carotene**.

β,ε-carotene ➡ **α-carotene**.

β,φ-carotene ➡ **γ-carotene**.

γ-carotene (β,φ-carotene) is a widespread carotenoid and is a **vitamin A** precursor, with vitamin A activity.

caroxazone [INN, USAN] (FI 6654) is a reversible, selective, **MONOAMINE-OXIDASE INHIBITOR** (MAOI) which has been used as an **ANTIDEPRESSANT**.

carperitide [INN] (atriopeptin (human α-component); atriopeptin 28-(human); α-human atrial natriuretic peptide; atriopeptin; α-hANP; ANP (human)) is one of the forms of the 28-residue peptide mediators secreted by the heart and acting as an **ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONIST**. It has **VASODILATOR, HYPOTENSIVE**, natriuretic **DIURETIC** and **CARDIAC STIMULANT** actions. It also increases vascular permeability and modifies the release of other hormones and neurotransmitters. The biological half-life of the natural analogue is normally too short for clinical use, but co-administration of peptidase inhibitors (e.g. **candoxatril**) may allow it to have a more prolonged action. See **ATRIAL NATRIURETIC PEPTIDES**.

carphenazine [BAN] (carfenazine [INN]; carphenazine maleate [USAN]; NSC 71755) is a phenothiazine with general properties similar to **chlorpromazine**, and was formerly used as an **ANTIPSYCHOTIC**.

carphenazine maleate ➡ **carphenazine**.

carpindolol [INN] is a **β-ADRENOCEPTOR ANTAGONIST**.

carprofen [BAN, INN, USAN] (C 5720; Ro 20-5720/000) is one of the propionic acid series of **CYCLOOXYGENASE INHIBITORS** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity.

carp prolactin ➡ **prolactin**.

carteolol [BAN, INN] (carteolol hydrochloride [JAN, USAN]; Teoptic™) is a **β-ADRENOCEPTOR ANTAGONIST**. It can be used therapeutically in topical **ANTIGLAUCOMA TREATMENT**.

carteolol hydrochloride ➡ **carteolol**.

carticaine ➡ **articaine**.

carubicin [INN] (carubicin hydrochloride [USAN]) is an (anthracycline group) **ANTIBIOTIC** isolated from *Actinomadura carminata*. It is a cytotoxic (similar to **doxorubicin**) and has been tried as an **ANTICANCER AGENT**.

carubicin hydrochloride ➡ **carubicin**.

carumonam [BAN, INN] is a semisynthetic (monobactam / β-lactam) **ANTIBIOTIC**. Clinically, it shows **ANTIBACTERIAL** activity against Gram-negative bacteria.

carvedilol [BAN, INN, USAN] (Eucardic™) is a (subtype-non-selective) **β-ADRENOCEPTOR ANTAGONIST** that also shows **CALCIUM-CHANNEL BLOCKER** activity, and which is relatively lipophilic. It also has **VASODILATOR** activity.

carvol ➡ **carvone**.

carvone (carvol; *p*-menthadienone) is an oil and a **CNS STIMULANT, CARMINATIVE** and **INSECTICIDE**. The (*R*)-form is a constituent of **spearmint oil** (from *Mentha crispa*) and kuromoji oil and other oils, and is a flavour ingredient. The (*S*)-form is a constituent of dill oil (from *Anethum graveolens*), caraway oil (from *Carum carvi*) and oils of *Lippia carviodora*, *Orthodon carvoriferum* and *Artemisia* spp., and is used as a flavouring. The (±)-form is a constituent of gingergrass oil and oil of *Litsea guatemalensis* and others.

Carylderm™ ➡ **carbaryl**.

Casodex™ ➡ **bicalutamide**.

β-casomorphin is a heptapeptide from bovine milk, a fragment from β-casein. It is an **OPIOID RECEPTOR AGONIST** and has **OPIOID ANALGESIC** activity. A tetrapeptide within this sequence, **morphiceptin**, also has opioid activity.

catabolin ➡ **interleukin-1**.

Catapres™ ➡ **clonidine**.

Catarase™ ➡ **chymotrypsin**.

catechol-4-carboxylic acid ➡ **dihydroxybenzoic acid**.

cathinone [INN] (norephedrone) has **CNS STIMULANT**, psychostimulant, **APPETITE SUPPRESSANT** and **ANALGESIC** actions. The (*S*)-form can be isolated from leaves of the shrub *Catha edulis* (Khat) (Celastraceae), which are chewed for effect on mood, possibly psychotropic. Cathinone is the true alkaloid but is transformed in unfresh leaves to **ephedrine** and **pseudoephedrine**.

Caverject™ ➡ **alprostadil**.

CB 304 ➡ **azaribine**.

CB 311 ➡ **human pituitary growth hormone**.

CB 337 ➡ **meglutol**.

CB 1348 ➡ **chlorambucil**.

CB 1639 ➡ **cycloleucine**.

CB 4261 ➡ **tetrazepam**.

CB 8022 ➡ **norethandrolone**.

CB 8027 ➡ **mestranol**.

CB 30038 ➡ **minaprine**.

CBA 93626 ➡ **clonixin**.

CBDCA ➡ **carboplatin**.

CBS 645 ➡ **midazogrel**.

CCA ➡ **lobenzarit**.

C-calebassine ➡ **calebassine**.

CCK ➡ **cholecystokinin**.

CCK-4 ➡ **cholecystokinin; tetragastrin**.

CCK-8 ➡ **cholecystokinin; sincalide**.

CCK-33 ➡ **cholecystokinin**.

CCK-PZ ➡ **cholecystokinin**.

CCNU™ ➡ **lomustine**.

CCRG 81045 ➡ **temozolomide**.

***C*-curarine II** ➡ **calebassine**.

CD 271 ➡ **adapalene**.

CDD/ANF-(95-126) ➡ **carperitide; urodilatin**.

CDP-choline ➡ **citicoline**.

6720-CDRI ➡ **centchroman**.

Ceclor™ ➡ **cefaclor**.

Cedocard™ ➡ **isosorbide dinitrate**.

CEENU™ ➡ **lomustine**.

cefacetrile [INN] (cephacetrile sodium [USAN]; cefacetrile sodium [JAN]) is a synthetic (first-generation cephalosporin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat a variety of infections.

cefacetrile sodium ➡ **cefacetrile**.

cefaclor [BAN, INN, JAN, USAN] (Ceclor™; Distaclor™) is a semisynthetic (second-generation cephalosporin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat a variety of infections.

cefadroxil [BAN, INN, JAN, USAN] (Baxan™; Duricef™) is a semisynthetic (first-generation cephalosporin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat various infections.

Cefadyl™ ➡ **cephapirin**.

cefalexin ➡ **cephalexin**.

cefaloglycin ➡ **cephaloglycin**.

cefalonium ➡ **cephalonium**.

cefaloram ➡ **cephaloram**.

cefaloridine ➡ **cephaloridine**.

cefalotin ➡ **cephalothin**.

cefamandole ➡ **cephamandole**.

cefamandole nafate ➡ **cefamandole**.

cefamandole sodium ➡ **cefamandole**.

cefaparole [INN, USAN] is a (cephalosporin group) ANTIBIOTIC, which can be used as an ANTIBACTERIAL.

cefapirin [BAN, INN] (cephapirin sodium [USAN]; sodium cefapirin [JAN]; Cefadyl™) is a semisynthetic (first-generation cephalosporin) ANTIBIOTIC. It can be used as a parenteral ANTIBACTERIAL to treat various infections.

cefatrizine [BAN, INN, JAN, USAN] is a semisynthetic broad-spectrum orally active (cephalosporin) ANTIBIOTIC. It can be used as an antibacterial to treat various infections.

cefazaflur ➡ **cefazaflur sodium**.

cefazaflur sodium [USAN] (cefazaflur [INN]) is a semisynthetic (cephalosporin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat various infections.

cefazedone [BAN, INN] is a semisynthetic (cephalosporin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat a variety of infections.

cefazolin ➡ **cephazolin**.

cefbuperazone [INN, USAN] (cefbuperazone sodium [JAN]) is a semisynthetic (cephalosporin) ANTIBIOTIC. It can be used as a parenteral ANTIBACTERIAL to treat a variety of infections.

cefbuperazone sodium ➡ **cefbuperazone**.

cefdinir ➡ **cefixime**.

cefepime [INN, USAN] (Axepim™; Maxipim™) is a semisynthetic (third-/fourth-generation cephalosporin) ANTIBIOTIC, used as a broad-spectrum oral ANTIBACTERIAL, resistant to β-lactamase, to treat a variety of infections.

cefetamet [INN, USAN] (cefetamet pivoxil is a prodrug) is a semisynthetic (third-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum oral ANTIBACTERIAL to treat a variety of veterinary infections.

cefetrizole [INN] is a (cephalosporin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL in veterinary practice.

cefivitril [INN] is a (cephalosporin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL in veterinary practice.

cefixime [BAN, INN, USAN] (Suprax™; O-carboxymethyl derivative of cefdinir [INN, USAN]) is a semisynthetic (third-generation cephalosporin) ANTIBIOTIC. It can be used clinically as a broad-spectrum oral ANTIBACTERIAL, resistant to β-lactamase, to treat a variety of infections.

Cefizox™ ➡ **ceftizoxime**.

cefmenoxime [INN] (cefmenoxime hydrochloride [JAN, USAN]) is a semisynthetic (third-generation cephalosporin) ANTIBIOTIC, used as a broad-spectrum parenteral ANTIBACTERIAL, resistant to β-lactamase, to treat various infections.

cefmenoxime hydrochloride ➡ **cefmenoxime**.

cefmetazole [INN] (cefmetazole sodium [JAN, USAN]; Zefazone™) is a semisynthetic (second-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL to treat various infections.

cefmetazole sodium ➡ **cefmetazole**.

Cefobid™ ➡ **cefoperazone**.

cefodizime [BAN, INN] is a semisynthetic (third-generation cephalosporin) ANTIBIOTIC. It can be used as a parenteral ANTIBACTERIAL to treat a variety of infections.

cefonicid [BAN, INN] (cefonicid sodium [USAN]; Monocid™) is a semisynthetic (second-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL to treat a variety of infections.

cefonicid sodium ➡ **cefonicid**.

cefoperazone [BAN, INN] (cefoperazone sodium [USAN]; Cefobid™) is a semisynthetic (third-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL to treat various infections.

cefoperazone sodium ➡ **cefoperazone**.

ceforanide [BAN, INN, USAN] is a semisynthetic (cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL to treat various infections.

Cefotan™ ➡ **cefotetan**.

cefotaxime [BAN, INN, JAN] (Claforan™) is a semisynthetic (third-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL to treat a variety of infections.

cefotetan [BAN, INN, USAN] (cefotetan sodium [JAN]; Cefotan™) is a semisynthetic (second-generation cephalosporin) ANTIBIOTIC, used as a broad-spectrum parenteral ANTIBACTERIAL, resistant to β-lactamase, to treat various infections.

cefotetan sodium ➡ **cefotetan**.

cefotiam [BAN, INN] (cefotiam hydrochloride [JAN, USAN]) is a semisynthetic (second-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL, resistant to β-lactamase, to treat various infections.

cefotiam hydrochloride ➡ **cefotiam**.

cefoxitin [BAN, INN, USAN] (cefoxitin sodium [JAN, USAN]; Mefoxin™) is a semisynthetic (second-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL, resistant to β-lactamase, to treat various infections.

cefoxitin sodium ➡ **cefoxitin**.

cefpimizole [INN, USAN] (cefpimizole sodium [USAN]) is a semisynthetic (second-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL to treat various infections.

cefpimizole sodium ➡ **cefpimizole**.

cefpiramide [INN, USAN] (cefpiramide sodium [JAN, USAN]) is a semisynthetic (third-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL to treat a variety of infections.

cefpiramide sodium ➡ **cefpiramide**.

cefpirome [BAN, INN] (cefpirome sulfate [USAN]; Cefrom™) is a semisynthetic (third-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL, with a relatively long duration of action, to treat a variety of infections.

cefpirome sulfate ➡ **cefpirome**.

cefpodoxime ➡ **cefpodoxime proxetil**.

cefpodoxime proxetil [BANM, USAN] (cefpodoxime [INN]; Orelox™; Vantin™) is a (third-generation cephalosporin)

ANTIBIOTIC. It can be used as a broad-spectrum oral ANTIBACTERIAL to treat a variety of infections.

cefradine ➡ **cephradine**.

Cefrom™ ➡ **cefpirome**.

cefroxadine [INN, JAN] is a (cephalosporin) ANTIBIOTIC, used as an oral ANTIBACTERIAL to treat various infections.

cefsulodin [BAN, INN] (cefsulodin sodium [JAN, USAN]) is a (cephalosporin) ANTIBIOTIC. It can be used as a parenteral ANTIBACTERIAL to treat a variety of infections.

cefsulodin sodium ➡ **cefsulodin**.

ceftazidime [BAN, INN, USAN] (Fortaz™; Fortum™; Kefadim™) is a semisynthetic (third-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL to treat various infections.

cefteram [INN] (cefteram pivoxil [JAN]) is a (cephalosporin) ANTIBIOTIC. It can be used as an oral ANTIBACTERIAL to treat a variety of infections.

cefteram pivoxil ➡ **cefteram**.

ceftezole [INN] (ceftezole sodium [JAN]) is a (cephalosporin) ANTIBIOTIC. It can be used as a parenteral ANTIBACTERIAL to treat a variety of infections.

ceftezole sodium ➡ **ceftezole**.

Ceftib™ ➡ **cefuroxime**.

ceftiofur [BAN, INN] (ceftiofur sodium [USAN]; ceftiofur hydrochloride [USAN]) is a (cephalosporin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat various veterinary infections.

ceftiofur hydrochloride ➡ **ceftiofur**.

ceftiofur sodium ➡ **ceftiofur**.

ceftizoxime [BAN, INN] (ceftizoxime sodium [JAN, USAN]; Cefizox™) is a semisynthetic (third-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL to treat a variety of infections.

ceftizoxime sodium ➡ **ceftizoxime**.

ceftriaxone [BAN, INN] (Rocephin™) is a semisynthetic (third-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum parenteral ANTIBACTERIAL to treat a variety of infections.

cefuracetime [BAN, INN] is a (cephalosporin) ANTIBIOTIC. It can be used as a parenteral ANTIBACTERIAL to treat a variety of infections.

cefuroxime [BAN, INN, USAN] (cefuroxime axetil [BVAN, USAN]; cefuroxime pivoxetil ; cefuroxime sodium [JAN]; Ceftib™; Zinacef™; Zinnat™) is a semisynthetic (second-generation cephalosporin) ANTIBIOTIC. It can be used as a broad-spectrum oral or parenteral ANTIBACTERIAL to treat a variety of infections.

cefuroxime axetil ➡ **cefuroxime**.

cefuroxime pivoxetil ➡ **cefuroxime**.

cefuroxime sodium ➡ **cefuroxime**.

Celance™ ➡ **pergolide**.

celatonium napadisilate ➡ **aclatonium napadisylate**.

Celectol™ ➡ **celiprolol**; **esmolol**.

celiprolol [BAN, INN, USAN] (Celectol™) is a β-ADRENOCEPTOR ANTAGONIST, which is relatively water-soluble. It can be used therapeutically in ANTIANGINAL and hypertensive treatment.

celiprolol hydrochloride ➡ **celiprolol**.

CellCept™ ➡ **mycophenolic acid**.

cellulase [USAN] is a concentrate of cellulose-splitting ENZYMES, isolated from *Aspergillus niger*. It is used as an adjunct DIGESTIVE AGENT.

celmoleukin [INN] (more fully termed interleukin 2 (human clone pTIL2-21a protein moiety) is a recombinant version of **interleukin-2**, a peptide cytokine inflammatory mediator, acting as a CYTOKINE RECEPTOR AGONIST. It can be used in therapeutics as an IMMUNOMODULATOR, and is proposed for use with human **tumour necrosis factor** as an ANTICANCER AGENT.

centchroman ((-)-form = levormeloxifene [INN]; 6720-CDRI) is a non-steroidal non-hormonal benzopyran derivative, with ANTIOESTROGEN and antiprogestogen activity. It has been administered weekly as an oral CONTRACEPTIVE.

CentoRx™ ➡ **abciximab**.

cephacetrile sodium ➡ **cefacetrile**.

cephalexin [BAN, USAN] (cefalexin [INN, JAN]; Ceporex™; Keflex™) is a semisynthetic orally active (cephalosporin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat a variety of infections.

cephaloglycin [BAN, USAN] (cefaloglycin [INN, JAN]) is a semisynthetic (cephalosporin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat a variety of infections.

cephalonium [BAN] (cefalonium [INN]) is a semisynthetic (cephalosporin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat infections.

cephaloram [BAN] (cefaloram [INN]) is a (cephalosporin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat various infections.

cephaloridine [BAN] (cefaloridine [INN]) is a (first-generation cephalosporin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat a variety of infections.

cephalosporin C is a (cephalosporin) ANTIBIOTIC from *Cephalosporium acremonium* and *Streptomyces* spp., manufactured for synthesis of semisynthetic drugs by cleavage to 7-aminocephalosporanic acid, and hence to semisynthetic cephalosporins.

cephalothin [BAN] (cephalothin sodium [USAN]; cefalotin [INN]; Keflin™) is a (first-generation cephalosporin) ANTIBIOTIC. It can be used as a (parenteral) ANTIBACTERIAL to treat a variety of infections.

cephalothin sodium ➡ **cephalothin**.

cephamandole [BAN] (cefamandole [INN, USAN]; cefamandole sodium [JAN, USAN]; cefamandole nafate [USAN]; Mandol™) is a semisynthetic (cephalosporin) ANTIBIOTIC.

cephapirin sodium ➡ **cephapirin**.

cephazolin [BAN] (cefazolin [INN]; Kefzol™; Ancef™) is a (first-generation cephalosporin) ANTIBIOTIC. It can be used as a parenteral ANTIBACTERIAL to treat a variety of infections.

cephoxazole [BAN] (cefoxazole [INN]) is a (cephalosporin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL.

cephradine [BAN, USAN] (cefradine [INN, JAN]; Velosef™) is a (first-generation cephalosporin) ANTIBIOTIC. It can be used clinically as an oral ANTIBACTERIAL to treat various infections.

Ceporex™ ➡ **cephalexin**.

Ceredase™ ➡ **alglucerase**.

ceronapril [INN, USAN] is an ACE INHIBITOR that has be considered for use as an ANTIHYPERTENSIVE AGENT.

certoparin ➡ **heparin**.

certoparin sodium (Alphaparin™) is a (parenteral) ANTICOAGULANT, chemically a low-molecular weight form of **heparin**. It can be used therapeutically in the treatment of deep-vein thrombosis.

Cerubidin™ ➡ **daunorubicin**.

Cerubidine™ ➡ **daunorubicin**.

ceruletide [BAN, INN, USAN] (ceruletide diethylamine [JAN, USAN]; caerulein) is a decapeptide present in the skin of Australian amphibians. It is a CHOLECYSTOKININ RECEPTOR AGONIST that is a HYPOTENSIVE AGENT. It contracts the gall bladder and relaxes the sphincter of Oddi, increases secretion of pancreatic enzymes, and contracts intestinal smooth

muscle. It can be used in experimental models of acute pancreatitis and as a diagnostic agent in radiographic visualization of bile ducts and the gall bladder.

ceruletide diethylamine ➡ **ceruletide**.

cervonic acid ➡ **doconexent**.

Cesamet™ ➡ **nabilone**.

cetamolol [INN] (cetamolol hydrochloride [USAN]) is a β-ADRENOCEPTOR ANTAGONIST with some intrinsic β-partial agonist activity. It was used as an ANTIHYPERTENSIVE.

cetamolol hydrochloride ➡ **cetamolol**.

Cetapril™ ➡ **alacepril**.

cethexonium chloride [INN] is a quaternary ammonium ANTIBACTERIAL and ANTISEPTIC.

cetiedil [INN] (cetiedil citrate [USAN]) is an azepinyl derivative, a (I_{KCa}) POTASSIUM-CHANNEL BLOCKER and an acetylcholine UPTAKE INHIBITOR. It is a peripheral VASODILATOR, and also used as an ANTISICKLING AGENT.

cetiedil citrate ➡ **cetiedil**.

cetirizine [BAN, INN] (cetirizine hydrochloride [USAN]; Zirtec™ and many other names) is a metabolite of **hydroxyzine** and a recently introduced member of the piperazine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS with a long duration of action and with little central SEDATIVE activity. It appears to have some ANTIALLERGIC activity through mast cell stabilization. It can be used orally for the symptomatic relief of allergic symptoms, such as allergic rhinitis and urticaria.

cetirizine hydrochloride ➡ **cetirizine**.

cetrimide [BAN] is an ANTISEPTIC and disinfectant. It is used clinically (often in combination with **chlorhexidine**) for cleansing the skin and scalp, burns and wounds, and as a soap-substitute for conditions such as acne and seborrhoea.

cetrorelix [INN] (SB 75) is a pseudopeptide with an alaninamide C-terminus and is an analogue of **ganirelix**. It is a long-acting LH-RH RECEPTOR ANTAGONIST, and can, in principle, be used as a LUTEOLYTIC AGENT to inhibit ovulation. A projected use is for the treatment of sex hormone-related diseases, especially as part of ANTICANCER hormone therapy of sex hormone-dependent tumours. It is related to **detirelix** and **ramorelix**.

cetylpyridinium chloride [BAN, INN] (Merocet™) is a surface-active agent with ANTIBACTERIAL properties, used as a topical ANTISEPTIC (e.g. as throat lozenges).

CG24 ➡ **alclofenac**.

CG 635 ➡ **etiroxate**.

CG 4203 ➡ **taprostene**.

CG 4305 ➡ **naxaprostene**.

CGP 6258 ➡ **oxindanac**.

CGP 21690E ➡ **oxiracetam**.

CGP 23339 ➡ **pamidronic acid**.

CGP 30694 ➡ **edatrexate**.

CGP 32349 ➡ **formestane**.

CGP 35348 is a phosphinic acid derivative, a ($GABA_B$) GABA RECEPTOR ANTAGONIST. It is used as a pharmacological tool, and shows ANTICONVULSANT / ANTIEPILEPTIC properties in animal models.

CGRP ➡ **calcitonin gene-related peptide**.

αCGRP ➡ **calcitonin gene-related peptide**.

βCGRP ➡ **calcitonin gene-related peptide**.

[Cys(ACM)^{2,7}Ala^{20}]-hCGRPα is a cross-bridged peptide derived from **calcitonin gene-related peptide** that acts as a CALCITONIN GENE-RELATED PEPTIDE RECEPTOR AGONIST relatively selective for the $CGRP_2$ subtype.

CGRP-I ➡ **calcitonin gene-related peptide**.

CGRP-II ➡ **calcitonin gene-related peptide**.

αCGRP(8-37)(human) ➡ **α-calcitonin gene-related peptide (8-37) (human)**.

CGS 13080 ➡ **pirmagrel**.

CGS 14824 ➡ **benazepril**.

CGS 15040A ➡ **serazapine**.

CGS 15943 is a substituted triazoloquinazolinamine, a (P1 purinoceptor) ADENOSINE RECEPTOR ANTAGONIST selective for the A_2-subtype. It is used as a tool in adenosine receptor studies, and is reported to be cerebroprotective.

CGS 16949A ➡ **fadrozole**.

CGS 19755 ➡ **selfotel**.

CGS 20267 ➡ **letrozole**.

CGS 21680 is a carboxamidoadenosine derivative, a (P1 purinoceptor), which has selectivity for the A_{2A}-receptor subtype. It is used as a tool in adenosine receptor studies, and is a HYPOTENSIVE AGENT.

chalk ➡ **calcium carbonate**.

charybdotoxin (ChTX; α-KTx1.1) is a single-chain peptide of 37 amino acid residues (3 disulphide bridges). It is a minor component of the venom of scorpion *Leiurus quinquestriatus* and is structurally related to other scorpion toxins such as **iberiotoxin**, **margatoxin** and **noxiustoxin**. It is a POTASSIUM-CHANNEL BLOCKER and NEUROTOXIN acting on a number of types of Ca^{2+}-activated K^+-channels, including certain channels in the mammalian central nervous system and skeletal muscle, invertebrate neurons and mutant forms of Shaker K^+-channels, and the maxi-K channel ($I_{BK(Ca)}$). It is used as a pharmacological analytical tool.

CHELATING AGENTS can be used pharmacologically for a number of purposes: as ANTIDOTES to metal poisoning, where they have a high affinity for those particular metallic ions; and to treat too high levels of metals due to external origin (accidental or environmental), abnormal metabolism (e.g. high levels of copper in Wilson's disease; iron-overload in thalassaemia), or in disease (rheumatoid arthritis). Examples of useful agents include **desferrioxamine** (iron overload), **dicobalt edetate** (cyanide poisoning), **dimercaprol** (As, Au, Hg; also Lewisite), **penicillamine** (Cu, Pb; useful in rheumatoid arthritis and Wilson's disease) and **sodium calcium edetate** (Pb).

Goyer, R.A. (1991) 'Toxic effects of metals', in *Casarett and Doull's Toxicology: The Basic Science of Poisons*, 4th edn, (eds M.O. Amdur, et al.), Pergamon Press, New York, pp. 623-680.

Fernández-Martín, J.L. *et al.* (1994) Binding of aluminium to plasma proteins: Comparative effect of desferrioxamine and deferiprone (L1). *Clin. Chim. Acta*, **230**, 137-145.

Kontoghiorghes, G.J. (1995) Comparative efficacy and toxicity of desferrioxamine, deferiprone and other iron and aluminium chelating drugs. *Toxicol. Lett.*, **80**, 1-18.

Olivieri, N.F. *et al.* (1995) Iron-chelation therapy with oral deferiprone in patients with thalassemia major. *N. Engl. J. Med.*, **332**, 918-922.

Chemet™ ➡ **succimer**.

Chendol™ ➡ **chenodeoxycholic acid**.

chenic acid ➡ **chenodeoxycholic acid**.

chenodeoxycholic acid [BAN, INN] (chenodiol [USAN]; chenic acid; Chendol™; Chenofalk™ and many other names) is a steroid bile acid that occurs in human bile and bile of many other spp. It has experimental use in prevention and dissolution of gallstones. A combination of chenodeoxycholic acid and **ursodeoxycholic acid** (Combidol™) is also used as a GALLSTONE DISPERSING AGENT.

chenodiol ➡ **chenodeoxycholic acid**.

Chenofalk™ ➡ **chenodeoxycholic acid**.

Chibroxin™ ➡ **norfloxacin**.

CHIP ➡ **iproplatin**.

chitan ➡ **poliglusam**.

chitin ➡ **poliglusam**.

chloral betaine ➡ **chloral hydrate**.

chloral hydrate [BAN, JAN, USAN] (trichloroacetaldehyde monohydrate; Noctec™; Welldorm™ and many other names) is a short-term SEDATIVE and HYPNOTIC, used particularly for inducing sleep in children or elderly patients. It is also used in the form of a betaine complex: chloral betaine [BAN, USAN]; cloral betaine [INN]; also a phenazone complex: dichloralphenazone [BAN]; Midrid™.

chloralodol ➡ **chlorhexadol**.

chloralosane ➡ **chloralose**.

chloralose [BSI, INN, ISO] (glucochloralose; chloralosane) has HYPNOTIC and SEDATIVE properties similar to **chloral hydrate**, of which it is a derivative. It was formerly used clinically as a hypnotic, and can be used as a (non-recovery) GENERAL ANAESTHETIC in animal experimentation and also as a pesticide.

chlorambucil [BAN, INN] (CB 1348; NSC 3088; Leukeran™) is an alkylating ANTICANCER AGENT interfering with DNA and so preventing cell replication. It is used orally particularly for chronic lymphocytic leukaemia, lymphomas and solid tumours. It can be used in conjunction with **oestradiol** to target breast cancer.

chloramine ➡ **mustine**.

chloramine T ➡ **tosylchloramide sodium**.

chloramphenicol [BAN, INN] (Actinac™; Chloromycetin™; Kemicetine™) is a broad-spectrum ANTIBACTERIAL and ANTIBIOTIC, which can be used orally or parenterally to treat many forms of infection.

chlorazanil [INN] is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.

chlorazol sky blue FF ➡ **azovan blue**.

chlorcyclizine [BAN, INN] (chlorcyclizine hydrochloride [USAN]; Diparalene™) is a recently introduced member of the piperazine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS with little central SEDATIVE activity. It can be used orally for the symptomatic relief of allergic symptoms, such as allergic rhinitis and urticaria. It can also be used topically for hypersensitivity reactions and pruritic skin disorders, available in antiallergic antiinflammatory preparations with **hydocortisone acetate** (Mandadil™). It is also an ANTIEMETIC.

chlorcyclizine hydrochloride ➡ **chlorcyclizine**.

chlordiazepoxide [BAN, INN] (chlordiazepoxide hydrochloride [USAN]; Librium™) is one of the original [1,4]benzodiazepines and is a BENZODIAZEPINE BINDING-SITE AGONIST, similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It is used orally to treat insomnia, anxiety and in alcoholism management.

chlordiazepoxide hydrochloride ➡ **chlordiazepoxide**.

chlorfenvinphos [BAN, BSI] (clofenvinfos [INN]) is an INSECTICIDE, used especially to combat soil pests and ectoparasites of farm animals.

chlorhexadol [BAN] (chloralodol [INN]; WM 1127) has properties similar to **chloral hydrate**, and was used as a HYPNOTIC and SEDATIVE.

chlorhexidine [BAN, INN] is an ANTISEPTIC and disinfectant which is a constituent in many preparations (e.g. Savlon™). It can be used prior to surgery and in obstetrics, but is used mainly (as chlorhexidine acetate, chlorhexidine gluconate or chlorhexidine hydrochloride) either as a mouthwash for oral hygiene or as a dressing for minor skin wounds and infections. It can also be used for instillation in the bladder to relieve minor infections.

chlorhexidine acetate ➡ **chlorhexidine**.

chlorhexidine gluconate ➡ **chlorhexidine**.

chlorhexidine hydrochloride ➡ **chlorhexidine**.

chlorhistapyridamine ➡ **chlorpheniramine**.

CHLORIDE-CHANNEL ACTIVATORS lead to the opening of membrane chloride channels. Chemical agents and other influences (e.g. cell membrane stretch) that open or close chloride channels in the membrane have received much less study than the three cation channels. Studies have been hampered by the paucity of the sorts of selective chemical tools – particularly venoms and toxins – that have proved so valuable in dissecting the properties of individual cation channels. However, recently a number of chloride channels have been cloned and expressed, and this has facilitated studies of their individual properties. Further, the considerable prevalence of cystic fibrosis (CF), in which the core pathology is a failure to properly transport Cl^- in all secretory epithelia, has stimulated research. Recently, this has led to the elucidation of much of the molecular pathology of this disease, to the level of the genomic location of mutants in epithelial cystic fibrosis transmembrane conductance regulator gene (CFTR). It transpires that CFTR is a substrate for PKA phosphorylation, a step in the activation pathway of one or more Cl^- channels, and is thought to be a cAMP-dependent chloride-conducting channel (I_{Cl})cAMP). This conductance can also be activated by **genistein**, **levamisole** and psoralens.

Calcium-activated chloride channels (CaCC), ($I_{Cl(Ca)}$) – like the equivalent K^+-current – is activated when there is Ca^{2+}-mobilization within the cell, for instance, on activation of receptors coupled to the $InsP_3$/DAG systems. This chloride channel provides the current commonly measured in oocytes as a means of detecting G-protein activation, on activation of experimentally expressed receptors. In smooth muscle, where the chloride equilibrium potential is typically more positive than the membrane potential; this current can cause depolarization that follows a rise in $[Ca]_i$.

Maxi Cl (I_{Cl}(maxi)) is a large conductance channel that is activated by G-proteins, and may be regulated by cell swelling, large voltage steps and GTPγS.

Voltage-gated chloride channels are found in many membranes. Recently, an expanding gene family called 'ClC' has been recognized, at least some of which are voltage-gated. There are at least nine different ClC genes in mammals, several of which seem to be expressed ubiquitously, while others are expressed in a highly specific manner (e.g. the muscle-specific ClC-1 channel and the kidney-predominant ClC-5 channels). ClC chloride channels are structurally unrelated to other channel proteins, and have 12 putative transmembrane domains. They function as multimers with probably 4 subunits.Their properties are not yet fully explored, and specific activators or blockers are not yet developed They mainly are voltage-activated (but by depolarization or hyperpolarization depending on the channel) but some are also volume activated (also *vide infra*).

Volume-sensitive chloride channels are central to regulating cell volume in response to osmotic shock or nutrient uptake responses, especially in epithelial cells. A few are thought by some to be associated with the multidrug resistance gene (MDR-1 gene) product, which encodes the multidrug transporter protein P-glycoprotein, an ATPase transporter capable of pumping a wide variety of hydrophobic chemotherapeutic agents out of the cell. The relationship between these channels, the various ATP-activated chloride currents observed on heart and gland (apparently via P_2-receptors) and the ClC family of channels is not entirely clear. However, the so-called VRAC (volume regulated anion

channel) family can be activated by tyrosine phosphatase blockers, thrombin and intracellular ATP requirments. Also ClC-3 can be activated by swelling.

Ligand-gated channels in the form of heterooligomeric $GABA_A$ and glycine receptors with intrinsic chloride ion channels, have a widespread distribution in the central nervous system of vertebrates, and the entire nervous system of invertebrates The endogenous natural activators of these receptor channels are γ-aminobutyric acid and glycine themselves, but a number of unnatural chemicals may activate or modulate them so they become more permeant to Cl^- and so decrease membrane excitability. See **GABA RECEPTOR AGONISTS; GLYCINE RECEPTOR AGONISTS.**

Hudson, A.J. *et al.* (1995) The skeletal muscle sodium and chloride channel diseases. *Brain*, **118**, 547-563.
Jentsch, T.J. *et al.* (1995) Properties of voltage-gated chloride channels of the ClC gene family. *J. Physiol. Suppl.* **482**, 19S-25S.
Scott, R.H. *et al.* (1995) Aspects of calcium-activated chloride currents: A neuronal perspective. *Pharmacol. Ther.*, **66**, 535-565.
Strange, K *et al.* (1996) Cellular and molecular physiology of volume-sensitive anion channels. *Am. J. Physiol.*, **270**, C711-C730.
Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

CHLORIDE-CHANNEL BLOCKERS can act at various channel sites as outlined in **CHLORIDE-CHANNEL ACTIVATORS.** The exact subtypes of chloride channels are not yet clear (and have no official nomenclature).

However, a number of agents have been shown to block voltage-gated chloride channels, volume-sensitive chloride channels, calcium-activated chloride channels and at some other sites. These include -nitro or -amino 4,4'-derivatives of disulphonic stilbenes; e.g. DNDS, DIDS, SITS, oxonol dyes (diBA-(5)-C-4), **chlorotoxin** (scorpion venom; polyamine spider toxins and some of their analogues, certain NSAID fenemate series derivative, including **flufenamic acid, mefenamic acid, niflumic acid**, also in some instances **quinine** and **verapamil**. The selectivity of these is not generally high, so which channels are blocked will not be listed here.

Venglarik, C.J. *et al.* (1994) Comparison of -nitro versus -amino 4,4'-substituents of disulfonic stilbenes as chloride channel blockers. *Mol. Cell. Biochem.*, **140**, 137-146.
Arreola, J. *et al.* (1995) Volume-activated chloride channels in HL-60 cells: Potent inhibition by an oxonol dye. *Am. J. Physiol. Cell Physiol.*, **269**, C1063-C1072.
Greenwood, I.A. *et al.* (1995) Comparison of the effects of fenamates on Ca-activated chloride and potassium currents in rabbit portal vein smooth muscle cells. *Br. J. Pharmacol.*, **116**, 2939-2948.
Lippens, G. *et al.* (1995) NMR sequential assignments and solution structure of chlorotoxin, a small scorpion toxin that blocks chloride channels. *Biochemistry*, **34**, 13-21.

chlorimipramine ➡ **clomipramine.**

chlormadinone [BAN, INN] (chlormadinone acetate [USAN]; NSC 92338) is a steroid, a **PROGESTOGEN** structurally related to **progesterone**, and has been used (alone or in combination with an **OESTROGEN**) in the treatment of menstrual disorders and as an oral **CONTRACEPTIVE.**

chlormadinone acetate ➡ **chlormadinone.**

chlormerodrin [BAN, INN] is an organic (mercurial) **DIURETIC.** It is also employed in labelled form as a diagnostic agent for renal function determination or a radiological agent (chlormerodrin Hg197 [USAN] and chlormerodrin Hg203 [USAN]).

chlormethine ➡ **mustine.**

chlormethine hydrochloride ➡ **mustine.**

chlormidazole [BAN, INN] is an (imidazole group) **ANTIFUNGAL** used topically.

chlornaltrexamine (β-chlornaltrexamine) is an analogue of the phenanthrene series agent **naltrexone**, an irreversible **OPIOID RECEPTOR ANTAGONIST** acting via alkylation. It is used as a pharmacological tool.

β-chlornaltrexamine ➡ **chlornaltrexamine.**

1-chloroacetophenone ➡ **CN.**

***o*-chlorobenzylidenemalononitrile** ➡ **CS.**

chlorobiocin is a (coumermycin-type) **ANTIBIOTIC**, active against Gram-positive and Gram-negative bacteria.

chloroethane ➡ **ethyl chloride.**

chloroform (trichloromethane; R200) is a volatile liquid, formerly used clinically as an inhalation **GENERAL ANAESTHETIC.** It is still is used in veterinary practice and emergency surgery. It can be used as a topical treatment for Herpes simplex sores.

chloroguanide ➡ **proguanil.**

Chloromycetin™ ➡ **chloramphenicol.**

chloroprocaine [INN] (chloroprocaine hydrochloride [USAN]; Nesacaine™) is an ester series **LOCAL ANAESTHETIC**, used by injection for infiltration and regional pain relief.

chloroprocaine hydrochloride ➡ **chloroprocaine.**

chloroprophenpyridamine ➡ **chlorpheniramine.**

chloropyramine ➡ **halopyramine.**

chloropyribenzamine ➡ **halopyramine.**

chloroquine [BAN, INN] (chloroquine sulfate; Aralen™; Avloclor™; Nivaquine™) is a halogenated 4-aminoquinoline, an **AMOEBICIDE** extensively used clinically as an **ANTIMALARIAL** in prophylaxis and treatment.

chloroquine sulfate ➡ **chloroquine.**

8-(3-chlorostyryl)caffeine ➡ **CSC.**

4-chlorotestosterone ➡ **clostebol acetate.**

chlorotestosterone caproate ➡ **clostebol acetate.**

chlorothiazide [BAN, INN, USAN] (chlorothiazide sodium [USAN]; Saluric™; Diuril™) is a (thiazide) **DIURETIC** which can be used in **ANTIHYPERTENSIVE** therapy.

chlorothiazide sodium ➡ **chlorothiazide.**

chlorotoxin is a basic 36 amino acid residue peptide venom isolated from the scorpion *Leiurus quinquestriatus*. It acts as a (small-conductance) **CHLORIDE-CHANNEL BLOCKER.** It is paralytic **TOXIN** to lobsters and cockroaches.

chlorotrianisene [BAN, INN, USAN] (TACE; NSC 10108) is a synthetic non-steroid **OESTROGEN** and analogue of **stilboestrol**. It has been used therapeutically in **ANTICANCER** therapy and HRT.

chloroxine [USAN] (Capitrol™) is a halogenated hydroxyquinoline with **ANTIBACTERIAL** and **ANTIFUNGAL** activity, which can be used as an antiseborrheic (e.g. in shampoos).

chloroxylenol [INN, USAN] is a cholinated phenolic **ANTISEPTIC** with **ANTIFUNGAL** properties, and used topically

chloroxymorphamine (COA) is an analogue of the phenanthrene series antagonist **naltrexone** and is an **OPIOID RECEPTOR ANTAGONIST.**

chlorphenamine ➡ **chlorpheniramine.**

chlorphenesin [BAN, INN] (Mycil™) can be used as a topical **ANTIFUNGAL**

chlorphenesin carbamate [BANM, JAN, USAN] (Maolate™) is an analogue of **mephenesin**. It has **SEDATIVE** actions and can be used as a (CNS-acting) **SKELETAL MUSCLE RELAXANT** to treat musculospastic disorders. It is a reported **ANALGESIC** in trigeminal neuralgia.

chlorpheniramine [BAN] (chlorphenamine [INN]; chlorpheniramine maleate [USAN]; chlorhistapyridamine; chloroprophenpyridamine; Calimal™; Piriton™) is one of the alkylamine series of **HISTAMINE H_1-RECEPTOR ANTAGONISTS**, and has some **MUSCARINIC CHOLINOCEPTOR ANTAGONIST** and **SEDATIVE** activity. It is used orally to treat the symptoms of allergic conditions such as hay fever and urticaria, and is also occasionally used parenterally in emergencies to treat

anaphylactic shock. It is a constituent of numerous ANTITUSSIVE and 'cold-cure' preparations. The (*S*)-form, the active isomer, is dexchlorpheniramine [INN].

chlorpheniramine maleate ➡ **chlorpheniramine**.

chlorphenoxamine [BAN, INN] (chlorphenoxamine hydrochloride [USAN]) is a congener of diphenhydramine with HISTAMINE H_1-RECEPTOR ANTAGONIST and MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity. It can be used as an ANTIEMETIC, a (CNS-acting) SKELETAL MUSCLE RELAXANT and as an ANTIPARKINSONIAN AGENT.

chlorphenoxamine hydrochloride ➡ **chlorphenoxamine**.

chlorphentermine [BAN, INN] (chlorphentermine hydrochloride [USAN]) is an **amphetamine** analogue with SYMPATHOMIMETIC properties formerly used as an APPETITE SUPPRESSANT.

chlorphentermine hydrochloride ➡ **chlorphentermine**.

chlorproethazine [INN] is a phenothiazine congener of **chlorpramazine** with SEDATIVE / TRANQUILLIZER actions, and can be used as a centrally acting SKELETAL MUSCLE RELAXANT and ANTIEMETIC.

chlorproguanil [BAN, INN] is a biguanide, an AMOEBICIDE used as an ANTIMALARIAL in prophylaxis and treatment.

chlorpromazine hydrochloride ➡ **chlorpropamide**.

chlorpropamide [BAN, INN, JAN] (chlorpromazine hydrochloride; Diabinese™ and many other names) is one of the sulphonylurea group of (oral) HYPOGLYCAEMICS. It increases insulin secretion from the pancreas by acting as a POTASSIUM-CHANNEL BLOCKER at certain ATP-sensitive K^+-channels. It can be used as an ANTIDIABETIC in non-insulin-dependent diabetes mellitus (NIDDM). Atypically for a sulphonylurea, chlorpropamide can also be used in DIABETES INSIPIDUS TREATMENT.

chlorpyramine ➡ **halopyramine**.

chlorquinaldol [BAN, INN] (Capitrol™) is a hydroxyquinoline ANTIBACTERIAL and ANTIFUNGAL topical agent, which can be used to treat dandruff and seborrhoeic dermatitis.

chlortalidone ➡ **chlorthalidone**.

chlortetracycline [BAN, INN] (chlortetracycline hydrochloride [USAN]; aureomycin; Aureomycin™) is a (tetracycline) ANTIBIOTIC. It can be used clinically as a broad-spectrum, normally topical, ANTIBACTERIAL to treat a variety of infections.

chlortetracycline hydrochloride ➡ **chlortetracycline**.

chlorthalidone [BAN, USAN] (chlortalidone [INN]; Hygroton™) is a (thiazide-related) DIURETIC which can be used in ANTIHYPERTENSIVE therapy (often in combination with other classes of diuretics, or β-ADRENOCEPTOR ANTAGONISTS).

chlorthenoxazin [BAN] (chlorthenoxazine [INN]; AP 67) is a benzoxazinone, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

chlorthenoxazine ➡ **chlorthenoxazin**.

chlorzoxazone [BAN, INN] (Paraflex™) is a chlorobenzoxazolinone derivative with SEDATIVE actions and can be used as a centrally acting SKELETAL MUSCLE RELAXANT to treat musculospastic disorders.

cholalic acid ➡ **cholic acid**.

cholecalciferol [BAN] (colecalciferol [INN]; vitamin D_3) acts as a VITAMIN and CALCIUM METABOLISM MODIFIER. It is a constituent of fish-liver oil, especially tuna oil. As an anti-rachitic agent it is approximately the same potency as vitamin D_2 in humans. It can be taken as a dietary supplement.

cholecystokinin (pancreozymin [BAN]; CCK; CCK-PZ; CCK-33) is a peptide hormone found in the mucosa of the upper intestine, first shown to cause gall bladder contraction. It also stimulates pancreatic exocrine secretion and intestine motility; also an APPETITE SUPPRESSANT, producing satiety in man. CCK in the body is produced by cleavage of a prohormone to yield different chain lengths; CCK-4 (see **tetragastrin**), CCK-8 (see **sincalide**) and CCK-33. The two short forms are thought to mediate many of the physiological effects. CCK-33 (the predominant gastrointestinal form) is sulphated at Tyr^{27}. There is some variation with species, and the long-form in the pig has 39 residues. The strength of original preparations of pancreozymin were determined by bioassay and probably contained differing proportions of the various forms. Cholecystokinin (CCK) peptides are members of a family of gastrointestinal hormones also containing **gastrin**. The C-terminal pentapeptide sequence is identical to that of gastrin and **caerulin**. They are CHOLECYSTOKININ RECEPTOR AGONISTS, the receptors being divided into CCK_A receptors where CCK-8 is most active, and CCK_B receptors (also called CCK_B/gastrin receptors), where both gastrin and CCK-8 are potent. It is now recognized that additionally to a hormone role, CCK is an important neurotransmitter in central and peripheral enteric nervous systems. It is thought to also be a growth factor in the pancreas, gastrointestinal tract and elsewhere, and is implicated in tumour development. Clinically, it can be used as a diagnostic agent to determine pancreatic function, and as an adjunct to cholecystography.

cholecystokininoctapeptide ➡ **sincalide**.

CHOLECYSTOKININ RECEPTOR AGONISTS recognize peptides of the family of gastrointestinal hormones containing cholecystokinins and gastrin. Subsequently, CCK was discovered in the brain and some peripheral nerves (particularly enteric nerves) and is now regarded as also having a neurotransmitter role. CCK in the body is produced by cleavage of a prohormone to yield different chain lengths, CCK-4, CCK-8 and possibly CCK-33, which may mediate the physiological effects. Roles include mediation of secretion and motility in the gastrointestinal tract (in the physiological response to a normal meal, including contraction of the gall bladder and gastric emptying). Also CCK and its receptors are widely distributed in the CNS and contribute to the regulation of satiety, anxiety, analgesia and dopamine-mediated behaviour.

Molecular biological techniques have identified two CCK receptors. The CCK_A receptors are found predominantly in the gastrointestinal system and certain areas of the CNS, and have high affinity for CCK. The CCK_B receptors are found predominantly in the CNS and certain areas of the gastrointestinal system, have high affinity for gastrin and CCK. Both CCK_A and CCK_B receptors are highly conserved between species, though there is some tissue-specific variation in expression. Both receptors couple through the $InsP_3$/DAG system.

Injection of CCK-4 (which is small enough to pass the blood–brain barrier) induces panic attacks in humans and there is interest in developing CCK_B receptor antagonists as novel anxiolytics. There is evidence that CCK fragments have memory-modulating or reinforcing, mneutropic, effects.

CCK_A receptors show an order of potency as follows: **CCK-8 >> gastrin = desulphated-CCK-8 > CCK-4**. The peptide analogue **A 71623** is regarded as a selective agonist.

CCK_B receptors (also called CCK_B/gastrin receptors) show an order of potency **CCK-8 ≥ gastrin = desulphated-CCK-8**

= **CCK-4**. The peptide analogues **BC 264**, gastrin and desulphated CCK-8 are regarded as selective agonists.

Silvente-Poirot, S. *et al.* (1993) The peripheral cholecystokinin receptors. *Eur. J. Biochem.*, **215**, 513-529.
Stanfa, L. *et al.* (1994) Cholecystokinin and morphine analgesia: Variations on a theme. *Trends Pharmacol. Sci.*, **15**, 65-66.
Wank, S.A. *et al.* (1994) Cholecystokinin receptor family. Molecular cloning, structure, and functional expression in rat, guinea pig, and human. *Ann. N. Y. Acad. Sci.*, **713**, 49-66.
Wank, S.A. (1995) Cholecystokinin receptors. *Am. J. Physiol.*, **269**, G628-G646.

CHOLECYSTOKININ RECEPTOR ANTAGONISTS have been developed that are selective for one receptor subtype over the other; see also **CHOLECYSTOKININ RECEPTOR AGONISTS**. Some early antagonists were peptide or peptoid in nature. A stimulus to drug development followed recognition of a chemical precursor of the nonpeptide CCK antagonist **asperlicin** in *Aspergillus* spp. ferments. The earlier antagonists **proglumide** and benzotript do not distinguish well between subtypes, whereas some more recent antagonists are highly subtype selective. CCK_A receptors have, as selective antagonists, **devazepide**, **lorglumide**, **lintitript** (SR 27897), PD 140548 and T 0632. CCKB receptors (also called CCK_B/gastrin receptors) have, as selective antagonists **L 365260**, **YM 022**, **L 740093**, **CI 988**, RP 69758, PD 135158, LY 262691, GV 150013 and tetronothiodin. There is interest in developing such analogues as anxiolytics (CCK_B), analgesics (either CCK_A or CCK_B), and appetite suppressants.

Iversen, L.L. *et al.* (1991) Cholecystokinin receptors: Synthetic antagonists with selectivity for receptor subtypes and possible clinical applications. *Biochem. Soc. Trans.*, **19**, 913-915.
Woodruff, G.N. *et al.* (1991) Cholecystokinin antagonists. *Annu. Rev. Pharmacol. Toxicol.*, **31**, 469-501.
Boden, P.R. *et al.* (1993) Cholecystokinin dipeptoid antagonists: Design, synthesis, and anxiolytic profile of some novel CCKA and CCKB selective and 'mixed' CCKA/CCKB antagonists. *J. Med. Chem.*, **36**, 552-565.
Singh, L. *et al.* (1995) Peptoid CCK receptor antagonists: Pharmacological evaluation of CCK_A, CCK_B and mixed $CCK_{A/B}$ receptor antagonists. *Eur. J. Pharmacol.*, **286**, 185-191.

cholеic acid ➡ **deoxycholic acid**.

cholera toxin (CTX) is a 87 kDa multimeric A-B toxin, elaborated by a bacterium (*Vibrio cholerae*). It is a protein that binds specifically to the G_s protein, and catalyses a conjugation reaction (ADP-ribosylation) on the α-subunit, resulting in permanent activation. Thus it is a G-protein activator that causes persistent activation of G_s, which explains many of the symptoms of cholera, particularly the excess secretion of electrolyte in the intestine (sometimes resulting in lethal dehydration). As well as being a major cause of disease in many areas of the world, this **TOXIN** is an important pharmacological/biochemical tool.

CHOLERETIC AGENTS stimulate the secretion of bile by the liver and thereby increase the flow of bile. Bile acids have this action, whereas bile salts have little choleretic activity. **Dehydrocholic acid**, a semisynthetic cholate, evokes the secretion of bile of low specific gravity, and is therefore called a hydrocholeretic drug. The increase in bile flow evoked by bile acids is not true stimulation of the generation of bile – cholepoisis – but, rather, reflects augmented flow to secrete the increased load of bile acid on the liver. For therapy, **chenodeoxycholic acid** is used, often in combination with **ursodeoxycholic acid**. The main reason for therapy with these drugs is the dissolution of gallstones. The useful effect of these agents results from their action in decreasing the cholesterol content of bile and so promoting dissolution of cholesterol gallstones. The mechanisms of the agent differ somewhat. Ursodeoxycholic acid inhibits intestinal absorption of dietary and biliary cholesterol and possibly reduces a compensatory increase in hepatic cholesterol synthesis. Chenodeoxycholic acid appears to work by inhibiting HMG-CoA reductase, which catalyses the conversion of HMG-CoA to mevalonic acid, the rate-limiting enzyme in cholesterol synthesis. Other drugs of this type are used in treating high levels of blood cholesterol (see **HMG-COA REDUCTASE INHIBITORS, ANTIHYPERLIPIDAEMICS**). Neither sort of agent is effective in treating calcified stones. Dehydrocholic acid produces thin watery bile and so it is used to flush small calculi out of the bile ducts, particularly after surgery.

Berg, C.L., *et al.* (1993) Pharmacology of hepatobiliary disease, in *Gastrointestinal Pharmacotherapy*, (ed. M.M. Wolfe), W.B. Saunders Co., Philadelphia, pp. 245-264.
Hofmann, A.F. (1993) The enterohepatic circulation of bile acids in health and disease, in *Gastrointestinal Disease*, 5th edn, (eds M.H. Sleisinger et al.), W.B. Saunders Co., Philadelphia, pp. 127-150.
Paumgartner, G. (1993) Nonaperative management of gallstone disease, in *Gastrointestinal Disease*, 5th edn, (eds M.H. Sleisinger et al.), W.B. Saunders Co., Philadelphia, pp. 1844-1857.

cholestyramine [BAN] (colestyramine [INN, JAN]; cholestyramine resin [USAN]; MK 325; AP 143; Questran™ and many other names) is a polymeric ion-exchange resin, a bile acid sequestrant that is used as an **ANTIHYPERLIPIDAEMIC**, antipruritic and **ANTIDIARRHOEAL**.

cholestyramine resin ➡ **cholestyramine**.

cholic acid (cholalic acid; hypocholate; NSC 6135) is a steroid originally isolated from bile and animal excretions. It is a widespread primary bile acid found in many species, and has **CHOLERETIC** and **LAXATIVE** actions.

choline carbamate ➡ **carbachol**.

choline chloride [INN] in the form of choline, occurs free and combined in many animal and vegetable products, and is a constituant of lecithin. It is important as a precursor of **acetylcholine**, but in itself is only a very weak **MUSCARINIC CHOLINOCEPTOR AGONIST**. It has been used as a lipotropic agent to treat liver disorders, and as a nutritional agent.

choline salicylate [BAN, INN, JAN] (salcolex [INN, USAN]; Audax™; Bonjela™; Teejel™) is the choline ester of **salicylic acid**. It has **NSAID ANALGESIC** and **ANTIPYRETIC** actions, and is used topically as a **COUNTER-IRRITANT** (rubefacient or topical analgesic) for symptomatic relief of underlying pain, including as ear-drops and gum gel.

CHOLINESTERASE REACTIVATORS are used to treat poisoning with 'irreversible' anticholinesterases, which is a considerable problem in the agricultural industry (insecticides) and potentially in warfare ('nerve gases'). This class of anticholinesterases are phosphorus-containing compounds largely made up of agents with a labile fluoride group (e.g. in **dyflos**) or organic leaving groups (e.g. in **ecothiopate** and **parathion**). Such organophosphorous anticholinesterases, after formation of intermediates, leave a residue covalently linked through the phosphorus atom to the serine of the enzyme. Normally, this process is essentially permanent, since there is only extremely slow hydrolysis of this linkage. However, for a short period cholinesterase reactivators can be used to reverse the inactivation. The originally developed agent to treat poisoning is **pralidoxime**, which together with the analogue **obidoxime** (HS-3), have been much used. Agents of this sort, developed by Wilson in the 1950s, are site-directed nucleophiles – oximes, hydroxylamines, or hydroxamic acids – that split off a phosphonated reaction product. The quaternary group of the reactivator binds to a negative site on the enzyme, bringing the nucleophile into close apposition to the bound phosphorous group; the phosphorous transfers, and the oxime–phosphonate is then split off, leaving regenerated enzyme. However, they are only effective before the poisoned enzyme undergoes an 'aging' process, so must be given early. Aging is thought to involve loss of one of the alkl groups

from the bound enzyme.

A disadvantage of these agents is that they do not reach the CNS, their action is short-acting, and they can be toxic. Agents with improved properties tested include the bispyridinium oximes **trimedoxime** and HI-6. Cholinesterase reactivators are not used alone, and **atropine** is used concurrently to control parasympathomimetic toxic effects of anticholinesterases. Another approach is to use the carbonate anticholinesterase, **pyridostigmine**, prophylactically: this prevents reaction of the enzyme with organophosphorous anticholinesterases.

Kusic, R. *et al.* (1991) HI-6 in man: efficacy of the oxime in poisoning by organophosphorus insecticides. *Hum. Exp. Toxicol.*, **10**, 113-118.

Shih, T. *et al.* (1991) A comparison of cholinergic effects of HI-6 and pralidoxime-2-chloride (2-PAM) in soman poisoning. *Toxicol. Lett.*, **55**, 131-147.

Wolthuis, O.L. *et al.* (1994) Search for a therapy against soman-intoxication. *Neurosci. Biobehav. Rev.*, **18**, 469-486.

cholorebic acid ➡ **deoxycholic acid**.

Choloxin™ ➡ **dextrothyroxine**.

cholyltaurine ➡ **taurocholic acid**.

Chorex™ ➡ **chorionic gonadotropin**.

choriogonadotrophin ➡ **chorionic gonadotropin**.

chorionic gonadotropin [BAN, USAN] (human chorionic gonadotropin; HCG; choriogonadotrophin; gonatropin; Chorex™; Pregnyl™; Profasi™) is a glycoprotein with a molecular weight of approx. 38 kDa and a carbohydrate content of 30%. The molecule consists of 2 peptide chains 96 and 145 amino acid units long, both glycosylated. It is a glycoprotein hormone synthesized by chorionic tissue of the placenta, and found in urine during pregnancy. It is found also in body fluids of persons with trophoblastic disease or embryonic testicular or ovarian tumours. Its main actions are the same as those of the PITUITARY HORMONE **luteinizing hormone** (LH). It can be used by intramuscular injection as an infertility treatment. It can also be used to correct deficiencies in prepubertal males, including aiding descent of testicles and to treat delayed puberty. Antigens to this hormone are being developed as vaccine CONTRACEPTIVES.

choriogonadotropin alfa ➡ **follicle-stimulating hormone**.

Christmas factor ➡ **factor IX**.

chromonar (carbocromen [INN]; chromonar hydrochloride [JAN]) is a benzopyran, a VASODILATOR which can be used in coronary heart disease.

ChTX ➡ **charybdotoxin**.

CHX 100 ➡ **masoprocol**.

Chymex™ ➡ **bentiromide**.

Chymodiactin™ ➡ **chymopapain**.

chymopapain [BAN, INN, USAN] (NSC 107079; BAX 1526; Chymodiactin™) is an ENZYME (MW *c.* 27,000) isolated from *Carica papaya* (papaya). It is a proteolytic enzyme, used by injections into vertebral discs to treat sciatica and lumbar pain (herniated lumbar discs).

chymostatin is a peptide antibiotic complex consisting of three components (A, B & C), isolated from *Streptomyces hygroscopicus*. It is a mixed PROTEASE INHIBITOR acting against the chymotrypsins and papain. It is reported to have ANTIINFLAMMATORY activity.

chymotrypsin [BAN, INN] (EC 3.4.21.1; Catarase™; Zonulysin™) is an enzyme (MW *c.* 25,000; α-form). It is a (serine) ENDOPEPTIDASE stored as zymogen in granules of pancreatic β-cells of mammals. It catalyses the hydrolysis of amide and ester bonds of peptides and proteins, particularly those adjacent to the carbonyl group of hydrophobic L-amino acids. Therapeutically, it is used in ocular surgery, especially for removal of cataracts. It was used formerly as a DIGESTIVE AGENT given by mouth to make up deficiencies in secretions from the pancreatic exocrine gland (e.g. in cystic fibrosis, and following pancreatectomy or chronic pancreatitis), using special enteric-coated preparations.

CI 395 ➡ **phencyclidine**.

CI 400 ➡ **eticyclidine**.

CI 581 ➡ **ketamine**.

CI 583 ➡ **meclofenamic acid**.

CI 719 ➡ **gemfibrozil**.

CI 879 ➡ **pramiracetam**.

CI 881 ➡ **ametantrone**.

CI 882 ➡ **sparfosic acid**.

CI 898 ➡ **trimetrexate**.

CI 904 ➡ **diaziquone**.

CI 911 ➡ **rolziracetam**.

CI 912 ➡ **zonisamide**.

CI 942 ➡ **piroxantrone**.

CI 977 ➡ **enadoline**.

CI 988 is a complex tricyclo-indolyl structure, a selective (CCK_B) CHOLECYSTOKININ RECEPTOR ANTAGONIST, used as a pharmacological tool.

C.I. 22120 ➡ **Congo red**.

C.I. 45440 ➡ **rose bengal**.

C.I. 52015 ➡ **methylthioninium chloride**.

C.I. 52040 ➡ **toluidine blue**.

C.I. 77891 ➡ **titanium dioxide**.

C.I. acid blue 74 ➡ **indigotin disulfonate sodium**.

C.I. Basic blue 9 ➡ **methylthioninium chloride**.

C.I. Basic blue 17 ➡ **toluidine blue**.

C.I. Direct blue 53 ➡ **azovan blue**.

C.I. Direct red 28 ➡ **Congo red**.

C.I. Natural Orange 6 ➡ **lawsone**.

C.I. pigment blue 63 ➡ **indigotin disulfonate sodium**.

C.I. pigment white 6 ➡ **titanium dioxide**.

C.I. Solvent red 141 ➡ **rose bengal**.

C.I. Solvent yellow 94 ➡ **fluorescein**.

ciamexon [BAN, INN] (BM 41332) is a aziridinecarbonitrile, an IMMUNOMODULATOR under investigation for the treatment of autoimmune diseases. It has reported ANTICANCER actions.

cianergoline [INN] is an ergoline derivative, a DOPAMINE RECEPTOR AGONIST with ANTIHYPERTENSIVE activity. It lowers intraocular pressure in animal models.

cianopramine [INN] (Ro 11-2465) is one of the tricyclic class and a (SSRI) selective serotonin UPTAKE INHIBITORS and has been used as an oral ANTIDEPRESSANT.

ciapilome [INN] is a cetamidocyanopyrimidinone derivative, a XANTHINE-OXIDASE INHIBITOR, decreasing synthesis of uric acid, so potentially an antigout treatment.

Ciba 7115 ➡ **ketobemidone**.

Ciba 12669A ➡ **demecolcine**.

Ciba 16038 ➡ **aminoglutethimide**.

Ciba 19390 ➡ **clonidineclonitazene**.

Ciba 33112 ➡ **desferrioxamine**.

Cibacen™ ➡ **benazepril**.

cibenzoline [BAN, INN] (cifenline [USAN]) is a cyclopropylimidazole derivative, a HYPOGLYCAEMIC acting as a pancreatic β-cell POTASSIUM-CHANNEL BLOCKER. It also is a CARDIAC DEPRESSANT and can be used as an ANTIARRHYTHMIC (class Ia with some class III and class IV properties).

cicaprost [INN] is a prostacyclin analogue, an (IP) PROSTANOID RECEPTOR AGONIST, with PLATELET AGGREGATION INHIBITOR and VASODILATOR activity.

ciclacillin [BAN, INN, JAN] (cyclacillin [USAN]) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat certain infections.

cicletanine [BAN, INN, USAN] has DIURETIC and ANTIHYPERTENSIVE properties.
ciclobendazole [BAN, INN] (cyclobendazole [USAN]) is a carbamate formerly used as an ANTHELMINTIC.
ciclopirox [BAN, INN] (ciclopirox olamine [JAN, USAN]) is a broad-spectrun ANTIFUNGAL, administered topically.
ciclopirox olamine ➡ **ciclopirox**.
cicloprolol ➡ **cycloprolol**.
cicloprolol hydrochloride ➡ **cycloprolol**.
ciclosidomine [BAN, INN] is a peripheral VASODILATOR and ANTIHYPERTENSIVE.
ciclosporin ➡ **cyclosporine**.
ciclotropium bromide [INN] is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST, an ANTISPASMODIC, reported to delay gastric emptying.
cicloxilic acid [INN] is a phenylcyclohexanecarboxylic acid derivative, used as a CHOLERETIC to treat liver disorders. It is also important as a starting material in the synthesis of a series of dialkylaminoethyl or aminocycloalkyl esters which are used as ANTISPASMODICS.
Cidomycin™ ➡ **gentamicin**.
cifenline ➡ **cibenzoline**.
ciladopa [BAN, INN] (ciladopa hydrochloride [USAN]) is a piperazinylcycloheptatriene extended form of **DOPA**, with DOPAMINE RECEPTOR AGONIST properties, and was formerly used as an ANTIPARKINSONIAN AGENT.
ciladopa hydrochloride ➡ **ciladopa**.
cilazapril ➡ **cilazaprilat**.
cilazaprilat [BAN, INN] (prodrug is cilazapril [BAN, INN, USAN]) is a diazepine derivative, an ACE INHIBITOR and ANTIHYPERTENSIVE.
Cilest™ ➡ **norgestimate**.
cilofungin [INN, USAN] is a semisynthetic ANTIBIOTIC with ANTIFUNGAL activity.
Ciloprost™ ➡ **iloprost**.
cilostazol [INN, JAN] is a quinolinone, a (type III) PHOSPHODIESTERASE INHIBITOR. It is a PLATELET AGGREGATION INHIBITOR and VASODILATOR.
Ciloxan™ ➡ **ciprofloxacin**.
cimaterol [INN, USAN] is a β-ADRENOCEPTOR AGONIST. It has animal growth promoter activity.
cimetidine [BAN, INN, USAN] (SKF 92334; Algitec™; Dysametp™; Tagamet™) is a substituted guanidine, a HISTAMINE H_2-RECEPTOR ANTAGONIST. It is a GASTRIC SECRETION INHIBITOR used therapeutically as an ANTIULCEROGENIC.
cimetropium bromide [INN] is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST and an ANTISPASMODIC, which can be used in the treatment of irritable bowel syndrome.
cimoxatone [INN] (MD 780515) is a reversible, selective, MONOAMINE-OXIDASE INHIBITOR (MAOI) and is an ANTIDEPRESSANT. It was never marketed.
cinalukast [INN, USAN] (Ro 24-5913) is a thiazolyl compound, a (LTD_4) LEUKOTRIENE RECEPTOR ANTAGONIST with ANTIASTHMATIC activity.
cinametic acid [INN] (ANP 3401) is a cinnamic acid derivative, which has been used as a CHOLERETIC AGENT.
cinamolol [INN] is a benzonitrile, a β-ADRENOCEPTOR ANTAGONIST.
cinchocaine [BAN, INN] (*cinchocaine hydrochloride* [BAN]; dibucaine [USAN]; dibucaine hydrochloride [USAN]; Nupercaine hydrochloride™) is an amide series LOCAL ANAESTHETIC, which has been used by topical application for local pain relief. It is often combined with GLUCOCORTICOIDS as a cream. It is an experimental mitochondrial cytochrome C oxidase inhibitor.
cinchocaine hydrochloride ➡ **cinchocaine**.
cinchophen [BAN, INN] is a quinolinecarboxylic acid, an ANALGESIC and ANTIINFLAMMATORY. It is no longer in widespread therapeutic use due to hepatotoxic effects.
cineole (eucalyptol [USAN]; 1,8-cineole) is a terpene, an oil with camphoraceous odour that occurs in eucalyptus, lavender and many other oils used in perfumery and flavour industries. It has ANTISEPTIC properties, can be used as an inhaled EXPECTORANT (veterinary use), and is incorporated into a preparation containing other terpenes that is claimed to aid the dissolution of bile stones (Rowachol™).
1,8-cineole ➡ **cineole**.
cinepazet ➡ **cinepazic acid**.
cinepazet maleate ➡ **cinepazic acid**.
cinepazic acid [INN] (ethyl ester: cinepazet [BAN, INN]; cinepazet maleate [USAN]; *ethyl derivative* ethyl cinepazate maleate) is a piperazine derivative related to **cinepazic acid**. It is a coronary VASODILATOR and ANTIANGINAL.
cinmetacin [INN, JAN] (S 1290; TVX 1764 and many other names) is one of the indoleacetic acid series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.
cinnamaverine [INN] is an aminodiphenylacrylate, a SMOOTH MUSCLE RELAXANT and ANTISPASMODIC with some LOCAL ANAESTHETIC activity.
cinnamedrine [INN, USAN] (cinnamylephedrine) is a cinnamylmethylamino derivative reported to have SYMPATHOMIMETIC actions similar to **ephedrine**, and also some LOCAL ANAESTHETIC activity. It was formerly used, in combination with analgesics, as an ANTISPASMODIC to treat dysmenorrhoea.
cinnamylephedrine ➡ **cinnamedrine**.
cinnarizine [BAN, INN, JAN, USAN] (Stugeron™) is a member of the piperazine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS. It is used as an antinauseant (and thus an ANTIEMETIC), for example, in the treatment of vestibular balance disorders (especially vertigo, tinnitus, nausea and vomiting in Ménière's diseases) and for motion sickness. Quite separately, it has vasodilator properties that affect the blood vessels of the hands and feet and so may be used orally to improve the circulation in peripheral vascular disease.
Cinobac™ ➡ **cinoxacin**.
cinolazepam [INN] is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It has been used orally to treat insomnia and anxiety.
cinoxacin [BAN, INN, JAN, USAN] (Cinobac™) is an ANTIMICROBIAL, one of a 4-quinolone family related to **nalidixic acid**, which, though synthetic, are sometimes described as ANTIBIOTICS. It can be used clinically as an ANTIBACTERIAL, mainly used orally for gut infections.
cinoxate [INN, USAN] is a cinnamic acid derivative and can be used in topical sunscreen preparations.
Cin-Quin™ ➡ **quinidine**.
cipamfylline [INN] (BRL 61063) is a purine derivative, a (type IV) PHOSPHODIESTERASE INHIBITOR. It is reported to be a selective inhibitor of **tumour necrosis factor** production.
Cipramil™ ➡ **citalopram**.
Cipro™ ➡ **ciprofloxacin**.
ciprofibrate [BAN, INN, USAN] (Win 35833; Modalim™) is one of the fibrate group and is used as an ANTIHYPERLIPIDAEMIC; effective in type IIa, IIb, III and IV hyperlipoproteinaemias and raises high-density lipoprotein.
ciprofloxacin [BAN, INN, USAN] (ciprofloxacin hydrochloride

[JAN, USAN]; Ciloxan™; Cipro™; Ciproxin™) is an ANTIMICROBIAL, one of a 4-quinolone family related to **nalidixic acid**, which, though synthetic, are sometimes described as ANTIBIOTICS. It can be used clinically as a wide-spectrum ANTIBACTERIAL used orally or systemically against a number of bacterial infections, including Legionnaire's disease.

ciprofloxacin hydrochloride ➡ **ciprofloxacin**.

ciproquazone [INN] is a quinazolinone, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

ciprostene [INN] (ciprostene calcium [USAN]; 9β-methylcarbacyclin) is a prostaglandin, a stable analogue of **epoprostenol**, and is a PROSTANOID RECEPTOR AGONIST with VASODILATOR and PLATELET AGGREGATION INHIBITOR activity.

ciprostene calcium ➡ **ciprostene**.

Ciproxin™ ➡ **ciprofloxacin**.

ciramadol [INN, USAN] (ciramadol hydrochloride [USAN]; Wy 15705) is a cyclohexylphenol derivative, with mixed OPIOID RECEPTOR AGONIST and OPIOID RECEPTOR ANTAGONIST activity. It can be used as an OPIOID ANALGESIC.

ciramadol hydrochloride ➡ **ciramadol**.

cisapride [BAN, INN, JAN, USAN] (Prepulsid™) is a 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST (at 5-HT_4 receptors). It is a GASTRIC MOTILITY STIMULANT (a prokinetic agent) used in therapeutics in the management of oesophageal reflux.

cisatracurium besylate [BAN] is a complex bisquaternary amine compound, one of the isomers of **atracurium besylate**, and is a NICOTINIC CHOLINOCEPTOR ANTAGONIST and a (competitive) NEUROMUSCULAR BLOCKING AGENT, which can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia.

cisclomiphene ➡ **clomiphene**.

cis-DDP ➡ **cisplatin**.

cisplatin [BAN, INN, JAN, USAN] (Peyrone's salt; Peyrone's chloride; cis-DDP; NSC 119875; Platinol™ and many other names) is the first of the organic platinum-containing ANTICANCER AGENTS. It is a cytotoxic that works by damaging the DNA of replicating cells, and is used by injection in the treatment of certain solid tumours, including ovarian cancer and testicular teratomas. It is a powerful emetic, and is normally administered concurrently with an ANTIEMETIC.

cistinexine [INN] is a substituted dithiobiscyclohexylcarbamate being investigated as an EXPECTORANT and ANTITUSSIVE.

citalopram [BAN, INN] (nitalapram; Lu 10-171; Cipramil™) is a carbonitrile, a selective serotonin UPTAKE INHIBITOR and a recently introduced ANTIDEPRESSANT of the SSRI (selective serotonin (re) uptake inhibitor) group. It is used orally to treat depressive illness and panic disorders.

Citanest™ ➡ **prilocaine**; **primaquine**.

Citanest with Octapressin™ ➡ **felypressin**; **prilocaine**.

citicoline [INN, JAN] (cytidine diphosphate choline; cytidine diphosphocholine; CDP-choline) is a derivative of choline and cytidine involved in the biosynthesis of lecithin and sphingomyelin, and the formation of plasmologen in the liver and brain. It has been used to treat cerebrovascular disorders.

citrovorum factor ➡ **folinic acid**.

citrulline is an endogenous amino acid involved in the urea cycle. Clinically, it can be used as an **arginine** substitute in the treatment of inborn errors of urea synthesis, including carbamyl phosphate synthetase and ornithine transcarbamylase. It is also a DIURETIC.

CL 45 ➡ **eticyclidine**.

CL 369 ➡ **ketamine**.

CL 639C ➡ **dioxadrol**.

CL 13900 ➡ **puromycin**.

CL 14377 ➡ **methotrexate**.

CL 16536 ➡ **puromycin**.

CL 54998 ➡ **brocresine**.

CL 62362 ➡ **loxapine**.

CL 71563 ➡ **loxapine**.

CL 82204 ➡ **fenbufen**.

CL 83544 ➡ **felbinac**.

CL 115347 ➡ **viprostol**.

CL 184116 ➡ **porfimer sodium**.

CL 216942 ➡ **bisantrene**.

CL 286558 ➡ **zeniplatin**.

CL 318952 ➡ **verteporfin**.

cladribine [BAN, INN] (Leustat™; Leustatin™) is a synthetic deoxyadenosine derivative and an antimetabolite ANTICANCER AGENT used to treat leukaemia.

Claforan™ ➡ **cefotaxime**.

clarithromycin [BAN, INN, USAN] (Biaxin™; Klaricid™) is the 6-O-methyl derivative of **erythromycin**, a macrolide, and has superior pharmacokinetic properties. It can be used clinically as an oral or parenteral ANTIBACTERIAL to treat a wide variety of infections, including skin, soft tissue and respiratory tract infections. It is usually given to patients who are allergic to penicillin.

Claritin™ ➡ **loratadine**.

Clarityn™ ➡ **loratadine**.

clavulanic acid [BAN, INN] (potassium clavulanate [BAN]) is an ANTIBIOTIC from *Streptomyces* spp. with a β-lactam structure similar to the penicillin group nucleus, except that the fused thiazolidine ring of the latter is substituted by oxazolidine ring. It has only weak ANTIBACTERIAL activity, but acts as an ENZYME INHIBITOR, a β-LACTAMASE INHIBITOR ('penicillinase' inhibitor), acting against enzymes produced by Gram-positive and -negative bacteria. Clinically, it can be used co-administered with β-lactamase susceptible penicillins and cephalosporins, enhancing their antibacterial actions. The extensively used preparation **co-amoxiclav** (Augmentin™) is a combination of **amoxycillin** with clavulanic acid (as potassium salt).

Clearasil™ ➡ **benzoyl peroxide**.

clebopride [INN, USAN] (clebopride malate [JAN]) is a substituted benzamide, a (D_2) DOPAMINE RECEPTOR ANTAGONIST, and has activity as a visceral ANTISPASMODIC and antinauseant and ANTIEMETIC.

clebopride malate ➡ **clebopride**.

clemastine [BAN, INN, USAN] (clemastine fumarate [JAN, USAN]; Aller-eze™; Tavegil™; Tavist™) is a methylpyrrolidine, a HISTAMINE H_1-RECEPTOR ANTAGONIST, with some MUSCARINIC CHOLINOCEPTOR ANTAGONIST and SEDATIVE activity. It can be used orally for the symptomatic relief of allergic symptoms, such as hay fever and urticaria.

clemastine fumarate ➡ **clemastine**.

clemizole [BAN, INN] is a benzimidazole, a HISTAMINE H_1-RECEPTOR ANTAGONIST with SEDATIVE actions. It has been used for hypersensitivity reactions, particularly as an antipruritic.

clenbuterol [BAN, INN] is a β-ADRENOCEPTOR AGONIST, which can be used as BRONCHODILATOR and uterine SMOOTH MUSCLE RELAXANT. It also has been used as an ANABOLIC.

Cleosin™ ➡ **clindamycin**.

Clexane™ ➡ **enoxaparin**.

clibucaine [INN] is an amide series LOCAL ANAESTHETIC, which has been used topically for local pain relief.

clidanac [INN, JAN] (TAI 284) is an indanecarboxylic acid, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

Climaval™ ➡ **oestradiol**.
clindamycin [BAN, INN, JAN, USAN] (clindamycin hydrochloride [USAN]; clindamycin phosphate [USAN]; clindamycin palmitate [USAN]; Dalacin™; Cleosin™) is a semisynthetic ANTIBIOTIC, a derivative of **lincomycin**. Clinically, it shows ANTIBACTERIAL activity against many anaerobic bacteria.
clindamycin hydrochloride ➡ **clindamycin**.
clindamycin palmitate ➡ **clindamycin**.
clindamycin phosphate ➡ **clindamycin**.
Clinicide™ ➡ **carbaryl**.
clinofibrate [INN, JAN] (S 8527) is one of the fibrate group and is an ANTIHYPERLIPIDAEMIC.
Clinoril™ ➡ **sulindac**; **tenoxicam**.
clioquinol [BAN, INN] (Vioform™) is a hydroxyquinoline ANTIBACTERIAL and ANTIFUNGAL topical agent. Oral use as an amoebicide is now prohibited due to toxic reactions.
clioxanide [BAN, INN, USAN] is a veterinary ANTHELMINTIC.
clobazam [BAN, INN, USAN] (Frisium™) is one of the [1,5]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam** (a [1,4]benzodiazepine). It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It has been used orally for short-term treatment of anxiety, and as an adjunct ANTIEPILEPTIC.
clobenpropit (VUF 9153) is a substitued imidazolyl-carbamidothioate, a HISTAMINE H_3-RECEPTOR ANTAGONIST. It is used as a pharmacological tool.
clobenzorex [INN] is an **amphetamine** analogue with SYMPATHOMIMETIC properties used as an APPETITE SUPPRESSANT. This substance is banned by the International Olympic Committee.
clobetasol [BAN, INN] (clobetasol propionate [JAN, USAN]; clobetasone [BAN, INN]; clobetasone butyrate [JAN, USAN]; Dermovate™; Temovate™ and many other names) is a very potent CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically to treat severe, non-infective inflammation of the skin caused by conditions such as eczema and psoriasis, especially where less-powerful steroid treatments have failed.
clobetasol propionate ➡ **clobetasol**.
clobetasone ➡ **clobetasol**.
clobetasone butyrate ➡ **clobetasol**.
clocinizine [INN] (R 522) is one of the piperazine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS with SEDATIVE actions. It has been used orally in the treatment of rhinitis.
clocortolone [INN] (clocortolone acetate [USAN]; clocortolone pivalate [USAN]; clocortolone trimethylacetate; clocortolone caproate; Cloderm™) is a moderately potent CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically to treat severe, non-infective inflammation of the skin caused by conditions such as eczema and psoriasis.
clocortolone acetate ➡ **clocortolone**.
clocortolone caproate ➡ **clocortolone**.
clocortolone pivalate ➡ **clocortolone**.
clocortolone trimethylacetate ➡ **clocortolone**.
Cloderm™ ➡ **clocortolone**.
clodronate ➡ **clodronic acid**.
clodronate disodium ➡ **clodronic acid**.
clodronic acid [BAN, INN, USAN] (sodium clodronate [BAN]; clodronate; clodronate disodium; BM 6011; Bonefos™; Loron™) is one of the bisphosphonate series of CALCIUM METABOLISM MODIFIERS used to treat disorders of bone metabolism, reducing calcium-resorption from the bone. It is particulary used orally to treat high calcium levels associated with malignant tumours and bone tumoural bone disease. It induces apoptosis in osteoclasts and macrophages. It is also of value as a pharmacological tool for the depletion of macrophages (monocytes).
clofenotane ➡ **dicophane**.
clofenvinfos ➡ **chlorfenvinphos**.
clofibrate [BAN, INN, JAN, USAN] (ICI 28257; NSC 79389; AY 61123; Atromid S and many other names) is the archetypal member of the fibrate group and an oral ANTIHYPERLIPIDAEMIC extensively used as a 'lipid-lowering' drug. It is available in various other forms including: aluminium clofibrate [BAN, INN, JAN]; calcium clofibrate [INN]; clofibric acid [INN]; an ester with hydroxydimethyl-butyramide, clofibride [INN]; magnesium clofibrate [INN]; a compound with xanthinol, xantifibrate [INN]. The etophylline ester is **etofylline clofibrate**.
clofibric acid ➡ **clofibrate**.
clofibride ➡ **clofibrate**.
clofilium phosphate [INN, USAN] is a POTASSIUM-CHANNEL BLOCKER, CARDIAC DEPRESSANT and (Class III) ANTIARRHYTHMIC.
cloforex [INN] is an **amphetamine** analogue which was used as an APPETITE SUPPRESSANT.
clometacin [INN] (C 1656; R 3959) is one of the indoleacetic acid series of CYCLOOXYGENASE INHIBITORS, with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.
clomethiazole ➡ **clormethiazole**.
clometocillin [INN] is a semisynthetic (penicillin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat certain infections.
Clomid™ ➡ **clomiphene**.
clomifene ➡ **clomiphene**.
clomiphene [BAN] (clomifene [INN]; clomiphene citrate [USAN]; NSC 35770; Clomid™; Serophene™) is chemically related to **chlorotrianisene**, and acts both as an OESTROGEN and an ANTIOESTROGEN. It is used orally as a fertility treatment in women whose condition is linked to the persistent presence of oestrogens and a consequent failure to ovulate. It exerts its therapeutic effect by stimulating the secretion of pituitary gonadotrophins (which cause ovulation) probably by blocking the effect of oestrogens at receptor sites in the hypothalamus and pituitary. The (*E*)-form is: enclomiphene [USAN]; enclomifene [INN]; cisclomiphene; RMI 16289. The (*Z*)-form is zuclomiphene [USAN]; zuclomifene [INN]; transclomiphene; ICI 46476; RMI 16312.
clomiphene citrate ➡ **clomiphene**.
clomipramine [BAN, INN] (clomipramine hydrochloride [JAN, USAN]; chlorimipramine; G 34586; Anafranil™ and many other names) is one of the tricyclic class of amine UPTAKE INHIBITORS and is used as an ANTIDEPRESSANT with SEDATIVE properties.
clomipramine hydrochloride ➡ **clomipramine**.
clomocycline [BAN, INN] is a semisynthetic (tetracycline) ANTIBIOTIC. It can be used clinically as a broad-spectrum ANTIBACTERIAL.
clonazepam [BAN, INN, JAN, USAN] (Clonopin™; Rivotril™) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with general properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It is used orally as an ANTIEPILEPTIC, though it commonly has SEDATIVE side-effects.
clonazoline [INN] is an imidazole SYMPATHOMIMETIC, an α-ADRENOCEPTOR AGONIST which can be used as a VASOCONSTRICTOR and nasal DECONGESTANT.

clonidine [BAN, INN, USAN] (clonidine hydrochloride [INN, USAN]; Catapres™; Dixarit™) is an imidazoline derivative, a (selective α_2-subtype) **α-ADRENOCEPTOR AGONIST**. It can be used (orally or transdermally) as an **ANTIHYPERTENSIVE** (probably acting within the CNS). It has formerly been used in **ANTIMIGRAINE** prophylaxis.

clonidine hydrochloride ➡ **clonidine**.

clonitazene [BAN, INN] (Ciba 19390; NIH 7586) is a benzimidazole derivative, an **OPIOID RECEPTOR ANTAGONIST**.

clonixin [INN, USAN] (CBA 93626; Sch 10304) is a pyridinecarboxylic acid derivative, a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity. It is also used in the form of a lysine salt, lysine clonixinate; also the dihydroxypropyl ester, clonixeril [INN, USAN].

Clonopin™ ➡ **clonazepam**.

clopamide [BAN, INN, USAN] (Viskaldix™) is a (thiazide-related) **DIURETIC**. It can be used in **ANTIHYPERTENSIVE** therapy.

clopenthixol ➡ **zuclopenthixol**.

clopidogrel [BAN, INN] (clopidogrel sulfate [BAN, INN]) is a pyridine derivative, an analogue of **ticlopidine**. It is a **PLATELET AGGREGATION INHIBITOR**, specific against ADP-induced aggregation (activity dependent on hepatic conversion), and is an **ANTITHROMBOTIC**.

clopidogrel sulfate ➡ **clopidogrel**.

clopidol [BAN, INN, USAN] is a chloropyridinone derivative with **ANTIPROTOZOAL** activity which has veterinary use.

clopirac [BAN, INN, USAN] (BRL 13856) is a pyrroleacetic acid, a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity.

Clopixol™ ➡ **zuclopenthixol**.

cloprednol [BAN, INN, USAN] (RS 4691) is a **CORTICOSTEROID**, a **GLUCOCORTICOID** with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties.

cloprostenol [BAN, INN] (cloprostenol sodium [USAN]) is a prostaglandin, a **PROSTANOID RECEPTOR AGONIST**, and is a **LUTEOLYTIC AGENT**.

cloprostenol sodium ➡ **cloprostenol**.

cloquinate [BAN, INN] is a **chloroquine** derivative with **AMOEBICIDAL** properties. Clinically, it can be used as an **ANTIMALARIAL** prophyaxis and treatment.

cloracetadol [INN] is one of the para-aminophenol series, a weak **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity.

cloranolol [INN] is a **β-ADRENOCEPTOR ANTAGONIST** with (coronary) **VASODILATOR** activity.

clorazepate dipotassium ➡ **clorazepic acid**.

clorazepate monopotassium ➡ **clorazepic acid**.

clorazepic acid [BAN] (dipotassium clorazepate [INN, JAN]; clorazepate dipotassium [USAN]; clorazepate monopotassium [USAN]; Tranxene™) is one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST**, with most properties similar to **diazepam**. It has **HYPNOTIC, ANTICONVULSANT** and **ANXIOLYTIC** activity. It was used orally to treat insomnia (by injection in some countries).

clorexolone [BAN, INN, JAN, USAN] is a (thiazide-related) **DIURETIC** which can be used in **ANTIHYPERTENSIVE** therapy.

clorgiline ➡ **clorgyline**.

clorgyline [BAN] (clorgiline [INN]) is a **MONOAMINE-OXIDASE INHIBITOR** (MAOI), an **ANTIDEPRESSANT**.

cloricromen [INN] is a benzopyran derivative, a **NITRIC OXIDE SYNTHASE INHIBITOR**, coronary **VASODILATOR, PLATELET AGGREGATION INHIBITOR** and antischaemic. It has possible **ANTIINFLAMMATORY / IMMUNOSUPPRESSANT** properties, and has been used to treat arterial vascular disorders where there is a risk of thrombosis.

cloridarol [INN] is a benzofurane, a coronary **VASODILATOR** and **ANTIHYPERLIPIDAEMIC**.

clormethiazole [BAN] (clomethiazole [INN, USAN]) is a thiazole, (CNS-acting) **SKELETAL MUSCLE RELAXANT**, with **ANTICONVULSANT, HYPNOTIC** and **SEDATIVE** properties. It is used in some countries as a hypnotic in the elderly, for preoperative medication and in the managment of withdrawal from alcohol.

clorofene [INN] (clorophene [USAN]; benzochlorophene) is a chlorophenol derivative that can be used as a **DISINFECTANT**.

clorophene ➡ **clorofene**.

clorprenaline [BAN, INN] (clorprenaline hydrochloride [JAN, USAN]) is a **β-ADRENOCEPTOR AGONIST** that can be used therapeutically as a **BRONCHODILATOR**.

clorprenaline hydrochloride ➡ **clorprenaline**.

clorsulon [BAN, INN, USAN] is an antiparasitic, **ANTHELMINTIC** and weak **CARBONIC ANHYDRASE INHIBITOR**.

clortermine [INN] (clortermine hydrochloride [USAN]) is an **amphetamine** analogue with **SYMPATHOMIMETIC** properties, including CNS stimulation. It has been used as an **APPETITE SUPPRESSANT**.

clortermine hydrochloride ➡ **clortermine**.

closantel [BAN, INN, USAN] is an **ANTHELMINTIC** used against sheep liver flukes.

clostebol ➡ **clostebol acetate**.

clostebol acetate [BAN] (clostebo, [INN]; chlorotestosterone caproate [JAN]; clostebol propionate; 4-chlorotestosterone) is a steroid, an **ANABOLIC**, and has been given by intramuscular injection. It has also been used topically in skin and eye preparations.

clostebol propionate ➡ **clostebol acetate**.

clotiazepam [INN, JAN] is one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST**, with most of its properties similar to **diazepam**. It has **HYPNOTIC, ANTICONVULSANT** and **ANXIOLYTIC** activity, and has been used orally to treat insomnia and anxiety.

clotrimazole [BAN, INN, JAN, USAN] (Canesten™) is an (imidazole group) **ANTIFUNGAL**. Clinically, it can be used by topical application.

clove oil ➡ **eugenol**.

clovoxamine [INN] (DU 23811) is an oxime, a serotonin **UPTAKE INHIBITOR**. It has been used as an oral **ANTIDEPRESSANT**.

cloxacillin [BAN, INN] (cloxacillin sodium [USAN]; Orbenin™; Tegapen™) is a semisynthetic (penicillin) **ANTIBIOTIC**. It can be used clinically as an oral **ANTIBACTERIAL**, resistant to β-lactamase, to treat certain infections.

cloxacillin sodium ➡ **cloxacillin**.

cloxazolam [INN, JAN] is one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST**, with most properties similar to **diazepam**. It has **HYPNOTIC, ANTICONVULSANT** and **ANXIOLYTIC** activity, and has been used orally to treat anxiety.

cloxiquin ➡ **cloxiquine**.

cloxiquine [INN] (cloxiquin [USAN]) is a hydroxyquinoline **ANTIBACTERIAL** and **ANTIFUNGAL** topical agent.

clozapine [BAN, INN, USAN] (HF 1854; LX 100-129; W 108; Clozaril™) is a dibenzo[1,4]diazepine, an **ANTIPSYCHOTIC** with 'atypical' properties. It is a (D_1 and D_4) **DOPAMINE RECEPTOR ANTAGONIST**, a ($5HT_2$) **5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST**, an **α-ADRENOCEPTOR ANTAGONIST** and a **MUSCARINIC CHOLINOCEPTOR ANTAGONIST**. It has **SEDATIVE** properties. It was shown to be an effective antipsychotic in the early 1970s with fewer extrapyramidal side-effects than other antipsychotics, but was withdrawn because of a high incidence of (reversible) agranulocytosis. However, recently

it was reintroduced (with appropriate blood monitoring) to treat cases resistant to other drugs.

Clozaril™ ➡ **clozapine**.

CLY 503 ➡ **simfibrate**.

CM 6912 ➡ **ethyl loflazepate**.

CM 9155 ➡ **difluprednate**.

CM 9357 ➡ **somatostatin**.

CM 52372-2 ➡ **ketamine**.

CM 57755 ➡ **ramixotidine**.

CM 57862 ➡ **ramixotidine**.

CN (1-chloroacetophenone) is a riot tear gas and incapacitating agent, a sensory irritant that causes ocular and other irritation.

CNP ➡ **atrial natriuretic peptides**; **C-type natriuretic peptide**.

CNS DEPRESSANTS depress the CNS. In practice, very diverse agents can be grouped under this heading and it does not describe any specific type of drug action. Most of the agents that depress neuronal activity in the brain or spinal cord are dealt with under specific headings. The properties of some of these classes will be summarized here.

GENERAL ANAESTHETICS are either inhaled or injected agents and produce insensibility, mostly to alleviate pain during surgical procedures (e.g. **halothane**, **thiopentone sodium**).

HYPNOTICS induce sleep and a wide range of chemical types may be used. The older agents, such as the barbiturates, were often SEDATIVE agents used at a higher dose, but they readily produced dangerous respiratory depression and are now much less commonly used (e.g. **amylobarbitone**, **chloral hydrate**, **chlormethiazole**, **triclofos**). Increasingly, the drugs of choice are anxiolytic/minor tranquillizers at a somewhat higher dosage (*vide infra*).

Tranquillizers depress the CNS. The need for the term came with the introduction of drugs having rather more subtle effects on mood and behaviour than the barbiturates. However, it soon became necessary to divide the category into minor tranquillizers and major tranquillizers. Currently, it is thought simpler to describe the drugs largely according to usage, so the term minor tranquillizers is used more or less synonymously with ANXIOLYTIC AGENTS. The major tranquillizers have had other words coined to describe their sort of activity (e.g. neuroleptic, 'thymoleptic') but are largely used as ANTIPSYCHOTICS, though some members have actions making them valuable for tranquillizing severely agitated patients (e.g. **chlorpromazine**).

ANTICONVULSANTS are normally used as antiepileptic agents, which produce very little generalized depression of the brain and instead target only hyperexcitable groups of neurons that are producing inappropriate bursts of firing. However, some may produce drowsiness. Examples include **carbamazepine**, **ethosuximide**, **phenobarbitone** and **valproic acid**. Some of the agents used as anticonvulsants to treat stimulant drug or chemical poisoning are, at the doses used, rather more depressant, e.g. **diazepam**.

Narcotic analgesics may be depressant at higher doses. Indeed, **morphine** can be very sedative and may induce sleep. However, with some it is feasible to produce good analgesia without generalized depression of the CNS. See OPIOID ANALGESICS.

Many other therapeutic or non-therapeutic agents may produce CNS depression at some part of their dosage range. For instance, many antihistamines (HISTAMINE H_1-RECEPTOR ANTAGONISTS), when used as antiallergic agents or in the treatment of motion sickness, may cause drowsiness or sleep, which can be a considerable disadvantage. In overdose, many agents may cause dangerous depression, particularly in combination with socially-used depressants such as ethanol.

CNS STIMULANTS stimulate the CNS. Some of those with a predominant effect on mood and behaviour – psychomotor stimulants – have some medical use in treating patients who suffer from narcolepsy. There is a tendency for those who use psychomotor stimulant drugs on a regular basis to become dependent and show a withdrawal syndrome when they stop taking the drug.

Dexamphetamine is one of the most powerful and best known psychomotor stimulants, and other similar agents include **dexfenfluramine**, **diethylpropion** and **fenfluramine**. All these are on the controlled drugs list, and have a limited medical use as APPETITE SUPPRESSANTS. Such drugs work by interacting with the release of monoamines within the central (and peripheral) nervous system, and can be regarded as indirect SYMPATHOMIMETICS. Recently, there has been some use of the weak amphetamine-like stimulant **methylphenidate** to treat attention-deficient hyperactivity disorder (ADHD) in children.

Cocaine is a powerful psychomotor stimulant, commonly used as a drug of abuse. Its actions are very like those of the amphetamines. It works by blocking reuptake of catecholamines within the central (and peripheral) nervous systems and is an indirect sympathomimetic.

Caffeine, **theobromine** and **theophylline**, and related methylxanthine compounds, are mild stimulants and have everyday use, e.g. in tea, coffee, chocolate and some soft drinks. Methylxanthines work in part as PHOSPHODIESTERASE INHIBITORS and in part as antagonists at P_1-purinoceptors (see ADENOSINE RECEPTOR ANTAGONISTS).

Convulsant drugs (also called analeptics) are a diverse group of agents, sometimes with poorly understood mechanisms of action. **Strychnine**, a plant alkaloid present in nux vomica, acts through blocking the actions of the inhibitory amino acid neurotransmitter **glycine**, mainly at spinal cord level, and is a powerful convulsant (see GLYCINE RECEPTOR ANTAGONISTS). **Bicuculline** and **picrotoxin** (active constituent, picrotoxinin) are plant alkaloids that block the action of endogenous GABA at the $GABA_A$ receptor chloride channels (see GABA RECEPTOR ANTAGONISTS; NEUROTOXINS). **Tetanus toxin** is a protein toxin produced by the anaerobic bacterium *Clostridium tetani*. It is transported along sensory neurons and within the CNS and blocks the action of glycine and so has a convulsant action. The synthetic agents **nikethamide** and **pentetrazol** (leptazol; pentamethylenetetrazole) are convulsants with a poorly understood mechanism of action. They were previously used as RESPIRATORY STIMULANTS as they act more to stimulate respiration. **Doxapram** is similar, but has a greater margin of safety – it is sometimes used by intravenous infusion in patients with acute respiratory failure.

Nehlig, A. *et al.* (1992) Caffeine and the central nervous system: mechanism of action, biochemical, metabolic and psychostimulant effects. *Brain Res. Rev.*, **17**, 139-170.

Silverstone, T. (1992) Appetite suppressants. A review. *Drugs*, **43**, 820-836.

Woolverton, W.L. *et al.* (1992) Neurobiology of cocaine abuse. *Trends Pharmacol. Sci.*, **13**, 193-200.

Rang, H.P. *et al.* (1995) *Pharmacology*, 3rd edn., Churchill Livingstone, Edinburgh

CNU-ethanol ➡ **elmustine**.

CO 063 ➡ **esaprazole**.

COA ➡ **chloroxymorphamine**.

co-amoxiclav (Augmentin™) is a an official name (UK) for a combination of the (penicillin) ANTIBIOTIC **amoxycillin** (used as a broad-spectrum ANTIMICROBIAL) with the penicillinase ENZYME INHIBITOR **clavulanic acid**.

Cobalin-H™ ➡ **hydroxycobalamin.**
cobalt chloride ($CoCl_2$; cobaltous chloride) has been tried as an ANTIANAEMIC and haemopoietic to increase reticulocytosis in certain types of anaemia. Also, $^{57}CoCl_2$ and $^{60}CoCl_2$ are used medicinally as radiolabelled agents (cobaltous chloride Co 57 [USAN]; cobaltous chloride Co 60 [USAN]) and as diagnostic agents.
cobaltous chloride ➡ **cobalt chloride.**
cobaltous chloride Co 57 ➡ **cobalt chloride.**
cobaltous chloride Co 60 ➡ **cobalt chloride.**
cobamin ➡ **cyanocobalamin.**
co-beneldopa ➡ **benserazide; levodopa.**
cocaine [BAN, USAN] (cocaine hydrochloride [JAN, USAN]) is an ester of benzoic acid and methylecgonine and the principal alkaloid of *Erythroxylum coca* and other *Erythroxylum* spp. (Erythroxylaceae). It is a LOCAL ANAESTHETIC (used topically because of toxicity), and has pronounced indirect-acting SYMPATHOMIMETIC actions by virtue of being an UPTAKE INHIBITOR (interferes with U_1 active uptake of noradrenaline into noradrenergic nerve terminals). It is a VASOCONSTRICTOR and can be used as a topical MYDRIATIC and ocular diagnostic agent. It is a powerful CNS STIMULANT (similar in action to **amphetamine**), with considerable abuse potential.
cocaine hydrochloride ➡ **cocaine.**
co-careldopa ➡ **carbidopa; levodopa.**
cocculin ➡ **picrotoxin.**
$CoCl_2$ ➡ **cobalt chloride.**
$COCl_2$ ➡ **phosgene.**
codactide [BAN, INN] (octodecactide; Ba 41795) is a synthetic peptide, a structural CORTICOTROPHIN ANALOGUE, which has been used clinically. Its *in vivo* steroidogenic activity is significantly greater than that of native ACTH. See also CORTICOTROPHIN.
Codafen Continus™ ➡ **codeine.**
co-danthramer ➡ **danthron; poloxamer 188.**
co-danthrusate ➡ **danthron; docusate sodium.**
codeine [BAN, USAN] (codeine phosphate [BAN, JAN, USAN]; codeine sulfate [USAN]; methylmorphine; Diarrest™; Famel™; Galcodine™) is an opium alkaloid (from the poppy *Papaver somniferum*; Papaveraceae), one of the phenanthrene series. It is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC, ANTITUSSIVE and ANTIDIARRHOEAL activity. It is a relatively non-addictive opiate, and as an analgesic it is often combined with NSAID ANALGESICS. For example, in numerous brands with **paracetamol**, e.g. Solpadol™, Parake™ and Tylex™, and **ibuprofen**, e.g. Codafen Continus™ and Nurofen Plus™.
codeine nicotinate ➡ **nicocodine.**
codeine phosphate ➡ **codeine.**
codeine sulfate ➡ **codeine.**
codeinone methyl enol ether ➡ **thebaine.**
co-dergocrine mesylate is a mixture of mesylate salts of dihydroergocornine, **dihydroergocristine** and **α-dihydroergocryptine** and **β-dihydroergocryptine** (which have α-ADRENOCEPTOR ANTAGONIST actions). It has VASODILATOR actions on cerebral blood vessels, and has been claimed to be a NOOTROPIC AGENT (cognition enhancer), improving brain function, e.g. in senile dementia.
coenzyme F ➡ **folic acid.**
coenzyme R ➡ **biotin.**
co-fluampicil (Magnapen™) is an official name (UK) for a combination of equal parts of the broad-spectrum, ANTIBACTERIAL (penicillin) ANTIBIOTIC **ampicillin** and the penicillinase-resistant penicillin antibiotic and antibacterial **flucloxacillin**. Clinically, it can be used to treat severe infection where the causative organism is not known but Gram-positive staphylococcal infection is suspected, or where penicillin-resistant bacterial infection is probable.
Cogentin™ ➡ **benztropine.**
Cognex™ ➡ **tacrine.**
Colazide™ ➡ **balsalazide.**
colchiceine methyl ether ➡ **colchicine.**
colchicine [JAN, USAN] (colchiceine methyl ether; NSC 757) is the chief alkaloid from *Colchicum autumnale*, and also from many other *Colchicum* spp., several *Merendera* spp., *Gloriosa superba* and others (Liliaceae). It is thought to act by binding to tubulin, a protein of the microtubules, arresting cell division at metaphase. It also inhibits many cell transport systems. It is used in acute antigout as an ANTIINFLAMMATORY and ANALGESIC, but is not a uricosuric agent: probably it inhibits the migration of leucocytes into the joint. It is an antimitotic used to induce polyploidy in plant breeding and as an experimental tool studying cell division. Its toxicity has precluded exploitation of these properties for ANTICANCER use. It is a potential ANTI-HIV AGENT.
colecalciferol ➡ **cholecalciferol.**
Colestid™ ➡ **colestipol.**
colestipol [INN] (colestipol hydrochloride [USAN]; U 26597A; Colestid™) is an insoluble high molecular-weight ion-exchange resin, used as an ANTIHYPERLIPIDAEMIC.
colestipol hydrochloride ➡ **colestipol.**
colestyramine ➡ **cholestyramine.**
Colifoam™ ➡ **hydrocortisone.**
Colimycin™ ➡ **colistin.**
colistimethate sodium ➡ **colistin.**
colistin [BAN, INN] (colistin sulphomethate sodium [BAN]; colistimethate sodium [INN, USAN]; polymyxin E; Colimycin™; Colymycin™) is a lipopeptide (polymyxin) ANTIBIOTIC complex (a mixture of colistin A, B and C) isolated from *Bacillus colistinus* etc., used as soluble salts. Clinically, it has ANTIBACTERIAL activity against certain Gram-negative organisms only. It can be used orally for a local action on the gut (it is not absorbed) and also by topical application, but nephrotoxic and neurotoxic adverse effects limit its systemic use.
colistin sulphomethate sodium ➡ **colistin.**
Colofac™ ➡ **mebeverine.**
colony-stimulating factor 2 ➡ **regramostim.**
colony-stimulating factors (CSFs) are glycopeptide factors containing 100-224 amino acid residues. They are endogenous factors produced by many cell types and act as IMMUNOMODULATORS that stimulate proliferation and differentiation of progenitor cells in the monocyte/macrophage white blood cell lineage *in vitro*.There are different forms that act as haemopoietic agents and stimulate different cell lines. Granulocyte-macrophage-colony-stimulating factor (GM-CSF) is a (GM-CSF subtype) CYTOKINE RECEPTOR AGONIST, and stimulates production of monocytes, neutrophils, eosinophils, erythrocytes and platelets. The granulocyte-colony-stimulating factor (G-CSF) is a (G-CSF subtype) cytokine receptor agonist, and stimulates neutrophil production. Biosynthetic forms are now generally used therapeutically.
Colymycin™ ➡ **colistin.**
Combidol™ ➡ **chenodeoxycholic acid; ursodeoxycholic acid.**
Compazine™ ➡ **prochlorperazine.**
conantokin G ➡ **conotoxin GV.**
Concordin™ ➡ **protriptyline.**
Condyline™ ➡ **podophyllotoxin.**
Condylox™ ➡ **podophyllotoxin.**

Congo red (C.I. Direct red 28; direct red; C.I. 22120) is an azo dye, often used as the disodium salt. It inhibits neurotoxic effects of fibrillar β-amyloid peptides (implications for treatment of Alzheimer's disease). It also inhibits replication and accumulation of the agent responsible for scrapie. It is an indicator used as a diagnostic agent for amyloidosis. It is also used to detect acute-phase serum proteins.

7-con-omen ➡ **menogaril**.

conorfone [INN] (conorphone hydrochloride [USAN]; TR 5109) is one of the phenanthrene series. It has mixed OPIOID RECEPTOR AGONIST and OPIOID RECEPTOR ANTAGONIST activity, and can be used as an OPIOID ANALGESIC.

conorphone hydrochloride ➡ **conorfone**.

conotoxin GI is a 13 amino residue peptide venom isolated from the fish-hunting sea snail *Conus geographus*. It is a paralytic TOXIN/NEUROTOXIN that acts as a NICOTINIC CHOLINOCEPTOR ANTAGONIST, including those at vertebrate neuromuscular junctions; used as a pharmacological tool.

μ-conotoxin GIIIA (geographutoxin I) is a 22 amino acid residue amidated peptide venom isolated from the fish-hunting sea snail *Conus geographus*. It is a TOXIN/NEUROTOXIN, a paralytic poison acting as a SODIUM-CHANNEL BLOCKER selective for the voltage-dependent channels of skeletal muscle (not smooth or cardiac muscle); used as a pharmacological tool.

μ-conotoxin GIIIB (geographutoxin II) is a 20 amino acid residue amidated peptide venom isolated from the fish-hunting sea snail *Conus geographus*. It is a TOXIN/NEUROTOXIN, a paralytic poison acting as a SODIUM-CHANNEL BLOCKER selective for the voltage-dependent channels of skeletal muscle (not smooth or cardiac); used as a pharmacological tool.

conotoxin GV (conantokin G) is a 17 amino acid residue peptide venom isolated from the fish-hunting sea snail *Conus geographus*. It is a NEUROTOXIN acting as a GLUTAMATE RECEPTOR ANTAGONIST selective at the NMDA subtype. It is a 'sleeper-peptide' that induces a sleep-like state in young mice when injected intracerebrally, though it induces hyperactivity in adult mice. It is used as a pharmacological tool.

ω-conotoxin GVIA is a peptide with 27 amino acid residue and 3 disulphide bridges. It is a venom isolated from the fish-hunting sea snail *Conus geographus*. It is a NEUROTOXIN, a paralytic poison acting as a CALCIUM-CHANNEL BLOCKER selective for neuronal N-type channels; used as a pharmacological tool.

conotoxin KK0 ➡ **δ-Conotoxins TxVIA**.

conotoxin MI ➡ **α-conotoxin MI**.

α-conotoxin MI (conotoxin MI) is an amidated 14 amino acid residue peptide isolated from the venom of the sea snail *Conus magnus*. It is a paralytic TOXIN/NEUROTOXIN that acts as a NICOTINIC CHOLINOCEPTOR ANTAGONIST, including at vertebrate neuromuscular junctions; used as a pharmacological tool.

ω-conotoxin MVIIA (ω-conotoxin MVIIA; SNX III) is a *25* amino acid residue peptide venom isolated from the fish-hunting sea snail *Conus magus*. It is a NEUROTOXIN, a paralytic poison acting as a CALCIUM-CHANNEL BLOCKER selective for neuronal N-type channels; used as a pharmacological tool. It is also in clinical trials as a NEUROPROTECTIVE AGENT against hypoxic neurodegeneration.

conotoxin SI ➡ **α-conotoxin SI**.

α-conotoxin SI (conotoxin SI) is an amidated 13 amino acid residue peptide isolated from the venom of the sea snail *Conus striatus*. It is a TOXIN/NEUROTOXIN and acts as a nicotinic cholinoceptor antagonist, including at vertebrate neuromuscular junctions; used as a pharmacological tool.

δ-conotoxins TxVIA (conotoxin KK0; King Kong peptide; Conus textile neovicarius toxin IA; TxIA) is a 27 amino acid peptide, a venom isolated from a sea snail *Conus textile*. It is a NEUROTOXIN with actions that depend on species. It is toxic in molluscs, produces behavioural effects (dominant behaviour) in lobsters. It acts at *Aplysia* neurons to cause firing followed by hyperpolarization, but in mammals it binds at Na^{+} channels with no physiological effects, though blocking binding by a number of toxic blockers. It is used as a pharmacological tool.

Conotrane™ ➡ **benzalkonium chloride**.

contact factor ➡ **factor XII**.

CONTRACEPTIVES are the means of preventing conception, and chemical methods are outlined here. Methods that involve drugs include oral contraceptives (the 'Pill') which contain either a hormonal combination of a progestogen plus an oestrogen (Combined Oral Contraceptive pill; COC), or just a progestogen (Progesterone-Only contraceptive Pill; POP). There are also parenteral contraceptives given by injection or implantation, and these are normally progesterone-only preparations (renewable every 3 months or longer). Post-coital contraception is also possible by use of a high-dose combined preparation (the 'morning-after pill'). Examples of oestrogens incorporated into oral contraceptives are **oestriol**, **ethinyloestradiol**, **mestranol**; of progestogens **ethynodiol**, **levonorgestrel**, **norethisterone**. Spermicidal preparations contain agents, which are generally chemically an alcohol ester (e.g. **monalazone**, **nonoxinol 9**) within a jelly liquid or cream base, that kill sperm and/or prevent sperm motility within the vagina or cervix.

Baird, D.T. *et al.* (1993) Hormonal contraception. *N. Engl. J. Med.*, **328**, 1543-1549.

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Drife, J. (1989) The benefits of combined oral contraceptives. *Br. J. Obstet. Gynaecol.*, **96**, 1255-1258.

Lidegaard, O. (1993) Oral contraception and risk of a cerebral thromboembolic attack: results of a case-control study. *Br. Med. J.*, **306**, 956-963.

Conus textile neovicarius toxin IA ➡ **δ-conotoxins TxVIA**.

Convulex™ ➡ **valproic acid**.

co-phenotrope ➡ **atropine sulphate**; **diphenoxylate**.

copper sulphate ➡ **cupric sulfate**.

corbadrine ➡ **levonordefrin**.

Cordarone™ ➡ **amiodarone**.

Cordilox™ ➡ **verapamil**.

Cordran™ ➡ **flurandrenolone**.

cordycepic acid ➡ **mannitol**.

Corgard™ ➡ **nadolol**.

Corlan™ ➡ **hydrocortisone**.

corticoliberin ➡ **corticotrophin-releasing factor**.

corticorelin ➡ **corticotrophin-releasing factor**.

CORTICOSTEROIDS as a family are natural steroid hormones secreted by the adrenal cortex, or are synthetic substances that closely resemble them. There are two main types:

GLUCOCORTICOIDS (**corticosterone**, **cortisone** and **hydrocortisone**) are essential for utilization of carbohydrate, fat and protein in the body, and in the normal response to stress. Naturally occurring and synthetic glucocorticoids have a powerful antiinflammatory effect.

MINERALOCORTICOIDS (e.g. **aldosterone**) are necessary for regulating the body's salt and water balance. The differing mechanisms of action of the glucocorticoids and mineralocorticoids are discussed under their appropriate headings.

Corticosteroids can be used in HRT, e.g. the glucocorticoid

hydrocortisone and the mineralocorticoid **fludrocortisone** can be given to patients for replacement therapy where there is a deficiency, in Addison's disease, or following adrenalectomy or hypopituitarism. The glucocorticoids are potent **ANTIINFLAMMATORY** and **ANTIALLERGIC AGENTS**, frequently used to treat inflammatory and/or allergic reactions of the skin, airways and elsewhere.

corticotrophin [BAN, INN] (adrenocorticotrophic hormone; ACTH; α1-39-corticotropin (human); adrenocorticotrophin; corticotropin; adrenomone; adrenocorticotropin; Acthar™) is a pituitary endocrine hormone which shows minor differences in sequence between mammalian species. It is derived from pro-opiomelanotropin by proteolytic cleavage and released from the anterior lobe of the pituitary gland, generally as a response to stress, to cause release of several cortical hormones from the adrenal cortex. The amino terminal 1–19 sequence is necessary for corticotropic activity. It has been used in clinical treatment, as an **ANIINFLAMMATORY** for rheumatoid arthritis and as an **ANTIASTHMIC**. It is used as a diagnostic agent to investigate adrenocortical insufficiency, sometimes as a suspension with zinc hydroxide (corticotrophin-zinc hydroxide [INN]). More commonly synthetic **CORTICOTROPHIN ANALOGUES** (e.g. **tetracosactrin**) are administered to make up for hormonal deficiency in the pituitary gland, to cause the production of extra corticosteroids in the treatment of inflammatory conditions, such as rheumatoid arthritis and Crohn's disease, or to test the function of the adrenal glands.

CORTICOTROPHIN ANALOGUES are related to **corticotrophin** (commonly referred to as adrenocorticotrophic hormone (ACTH)), a 39 residue peptide produced and secreted by the pituitary gland, which controls the production and secretion of other hormones. Its major role is to control the release of corticosteroids from the adrenal glands, generally in response to stress (see **CORTICOSTEROIDS**). This physiological release response is under the control of corticotrophin-releasing factor (CRF) (also called corticotrophin-releasing hormone (CRH)), a hypothalamic factor. See **CORTICOTROPHIN-RELEASING FACTOR RECEPTOR AGONISTS**. Therapeutically, synthetic corticotrophin, or more commonly its analogues (e.g. **tetracosactrin**), may be administered to make up for hormonal deficiency in the pituitary gland and to cause increased production of corticosteroids in the treatment of inflammatory conditions, such as rheumatoid arthritis and Crohn's disease. However, their main use is in testing the function of the adrenal glands. Tetracosactrin is a synthetic analogue of the pituitary hormone corticotrophin (actually $ACTH_{1-24}$), which is used instead of ACTH as it is less immunogenic. It is used to test adrenal function, administered by injection. Structurally, any deletions from the *N*-terminal end of the 39 residues of ACTH leads to loss of activity, but deletions may be made from the *C*-terminal end.

Vinson, G.P. *et al.* (1994) The neuroendocrinology of the adrenal cortex. *J. Neuroendocrinol.*, **6**, 235-246.

Behan, D.P. *et al.* (1995) Displacement of corticotrophin releasing factor from its binding protein as a possible treatment for Alzheimer's disease. *Nature*, **378**, 284-287.

Cammas, F.M. *et al.* (1995) Cloning, characterisation and expression of a functional mouse ACTH receptor. *Biochem. Biophys. Res. Commun.*, **212**, 912-918.

corticotrophin-releasing factor (corticorelin [INN]; corticoliberin; CRF; corticotropin-releasing hormone; CRH) is a polypeptide containing 41 amino acid residues, isolated from the hypothalamus. It is a **HYPOTHALAMIC HORMONE** (factor) that stimulates release of ACTH by the adenohypophysial (anterior) tissue of the pituitary gland and maintains its integrity. It also releases β-endorphin from the anterior pituitary. Its receptors have now been defined, so it can be regarded as a **CORTICOTROPHIN-RELEASING FACTOR RECEPTOR AGONIST**. CRF acts synergistically with vasopressin, and its actions and release are inhibited by glucocorticoids. It is released in response to stress, emotional disturbance, infections, cold and heat, injury etc., and in turn stimulates ACTH release. It can be used as a diagnostic agent to evaluate hypothalamic–pituitary function after therapy for Cushing's syndrome. There are species variants in structure, but the ovine form is active in man. Corticorelin ovine triflutate [INN, USAN] (Acthrel™) is a synthetic version of the ovine sequence, and can be used for diagnostic purposes.

CORTICOTROPHIN-RELEASING FACTOR RECEPTOR AGONISTS act at receptors recognizing corticotrophin-releasing factor (CRF; also called corticotrophin-releasing hormone (CRH)), which is a 41 amino acid peptide first isolated from mammalian brain. It has a critical role in the regulation of the pituitary–adrenal axis, with an increasingly appreciated role in coordinating overall bodily responses to stressors, including stress-related endocrine, autonomic and behavioural responses. It is a hypothalamic factor and its 'classical' control of the pituitary gland is achieved through release from CRF-containing neurons projecting from the paraventricular hypothalamic nucleus to the portal capillary zone of the median eminence, which act to stimulate release of corticotrophin (ACTH) from the anterior pituitary. It acts at two subtypes of receptor that have recently been cloned, CRF_1 and CRF_2.

CRF_1 receptors (formerly called CRF-RA or PC-CRF) have been cloned from several species. The species homologues are 98% identical over their 415 amino acid sequences. There are a number of potential phosphorylation and glycosylation sites within the sequences that would allow regulation. An alternative transcript form of this receptor has been identified in human pituitary, which contains an additional 29 amino acids in the first intracellular loop; the significance of this form is not known.

CRF_2 receptors are divided into two isoreceptors, $CRF_{2\alpha}$ and $CRF_{2\beta}$ (also known as CRF-RB, HM-CRF, PC-CRF). The first-described is a 411 amino acid form, $CRF_{2\alpha}$, differs from the $CRF_{2\beta}$ form (cloned from rat and mouse) only in that the first 34 amino acids in the *N*-terminal domain are replaced in $CRF_{2\beta}$ by a longer 54 amino acid sequence. The two forms are thought to be splicing isoforms, and show similar general pharmacology.

Both CRF_1 and CRF_2 subtypes of receptor are of the seven-transmembrane-segment G-protein-coupled superfamily type. Although CRF_1 receptors show only 71% identity with CRF_2 receptors, there are nevertheless large areas of identity in the fifth and sixth transmembrane loops, and both couple via G_s (positively-coupled to adenylyl cyclase, raising cAMP). Both subtypes are activated both by CRF (human/rat or ovine) and the recently identified mammalian (rat) peptide **urocortin** (that has 45% sequence identity with CRF) and which is related to fish **urotensin I** (63% identity) and amphibian peptide **sauvagine**. The fact that urocortin is more active than CRF itself at CRF_2 receptors, and that in the CNS the distribution of urocortin corresponds more closely with the CRF_2 receptor distribution, has prompted the suggestion that urocortin is the preferred endogenous ligand at the CRF_2 receptor subtype. There is now a body of evidence suggesting a 'non-classical' pharmacology mediated via the CRF_2 receptor subtype.

There is a further CRF-binding protein that has been identified (CRF-BP) to which both CRF and urocortin bind. Whilst it does not appear to be a conventional transducing receptor with a corresponding functional correlate, the site may well be involved in modulating effective concentrations of CRF. Levels of the protein are raised in certain conditions where there is a reduced responsiveness to CRF (for instance, in the third trimester of pregnancy).

There is increasing evidence for the involvement of CRF in a number of neurological and inflammatory disorders, and hence interest in manipulation of CRF and its receptors as targets in novel drug development.

Certain neurological states have indications of reduced CRF secretion. In Alzheimer's disease there are decreases in CRF content of certain central neurons and a corresponding upregulation of receptors. However, in the potential treatment of this condition, delivery of CRF-mimetics to the brain would depend on the development of low molecular weight non-peptide stable agonists. In respect of enhancing effective concentrations of existing release of CFR, it might be envisaged that agents inactivating the CRF-binding proteins could possibly be developed.

In relation to affective disorders, such as anxiety and depression, there is clinical evidence of hypersecretion of CRF, with blunted responses to CRF administration. Further, in rodents, injection of CRF into the locus coeruleus produces anxiogenic responses, and CRF receptor antagonists have an anxiolytic profile in animals. Also, eating disorders have some aetiology in common, and are often associated, with clinical depression. Anorectics, like depressives, show an attenuated ACTH response to administered CRF. Also, central administration of CRF in animals potently attenuates food consumption. This evidence suggests possible applications for CRF receptor antagonists (see below).

Vaughan, J. *et al.* (1995) Urocortin, a mammalian neuropeptide related to fish urotensin I and to corticotropin-releasing factor. *Nature*, **378**, 287-292.
Chalmers, D.T. *et al.* (1996) Corticotrophin-releasing factor receptors: from molecular biology to drug design. *Trends Pharmacol. Sci.*, **17**, 166-172.
Yu, J. et al (1996) Molecular cloning of a type A chicken corticotropin-releasing factor receptor with high affinity for urotensin I. *Endocrinology*, **137**, 192-197.
Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

CORTICOTROPHIN-RELEASING FACTOR RECEPTOR ANTAGONISTS inhibit the actions of agents related to corticotrophin-releasing factor (CRF). Two subtypes of receptor, CRF_1 and CRF_2, have recently been identified and cloned, and there is interest in these as therapeutic targets. See CORTICOTROPHIN-RELEASING FACTOR RECEPTOR AGONISTS.

Some peptide antagonists that have some affinity for both CRF_1 and CRF_2 receptors have been developed by making modifications of the CRF sequence, and these include; α-helical CRE_{9-41}, DPhe-CRF_{12-41} and the peptide **astressin**. Recently, some related non-peptides that act selectively at CRF_1 receptors have been developed including CP 154526, NB 127914 and **antalarmin**. A number of other agents are currently the subject of patent applications.

Some possibly clinical applications of CRF receptor ligands are discussed in relation to evidence about the role of CFG; see CORTICOTROPHIN-RELEASING FACTOR RECEPTOR AGONISTS. It might be hypothesized that CRF antagonists could be used clinically to treat panic and generalized anxiety disorders, and possibly also to treat clinical depression and anorexia. Similarly, there is some evidence suggesting that stroke might be treatable with CRF receptor antagonists acting on the cerebral vasculature. Inflammatory disorders offer tempting targets for CRF-related novel drugs. In experimental models, CRF is pro-inflammatory, and a number of animal models of inflammation show increased CRF expression. Further, there is enhanced expression of immunoreactive CRF in the synovium of the joints of patients with rheumatoid arthritis. It remains to be seen whether CRF receptor antagonists might be of value in the treatment of rheumatic conditions. However, it is not yet clear which receptor subtypes are involved in these inflammatory responses or in other components of inflammation, such as pyrexia.

Chen, C. *et al.* (1996) Design and synthesis of a series of non-peptide high-affinity human corticotropin-releasing factor 1 receptor antagonists. *J. Med. Chem.*, **39**, 4358-4360.
Lundkvist, J. *et al.* (1996) A non peptidic corticotropin releasing factor receptor antagonist attenuates fever and exhibits anxiolytic-like activity. *Eur. J. Pharmacol.*, **309**, 195-200.
Webster, E.L. *et al.* (1996) In vivo and in vitro characterization of antalarmin, a nonpeptide corticotropin-releasing hormone (CRH) receptor antagonist: suppression of pituitary ACTH release and peripheral inflammation. *Endocrinology*, **137**, 5747-5750.

corticotrophin-releasing hormone ➡ **corticotrophin-releasing factor**.

corticotropin ➡ **corticotrophin**.

α^{1-39}-corticotropin (human) ➡ **corticotrophin**.

cortisol ➡ **hydrocortisone**.

Δ^1-cortisol ➡ **prednisolone**.

cortisone [BAN, INN] (cortisone acetate [USAN]; Kendall's compound E; Reichstein's Substance Fa; Wintersteiner's compound F; NSC 9703; Cortisyl™) is a natural adrenal cortical hormone, a CORTICOSTEROID, which is converted to **hydrocortisone** in the liver. It has both GLUCOCORTICOID and MINERALOCORTICOID activity. It can therefore be used orally to make up for hormonal deficiency (especially mineral balance), for instance, following surgical removal of the adrenal glands. It can also be used for its ANTIINFLAMMATORY and ANTIALLERGIC properties in treating rheumatoid arthritis and in rheumatic fever therapy.

cortisone acetate ➡ **cortisone**.

Cortisyl™ ➡ **cortisone**.

cortivazol [INN, USAN] (H 3625; MK 650) is a CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It has been used orally and by injection to treat inflammatory conditions.

Corvert™ ➡ **ibutilide**.

Corwin™ ➡ **xamoterol**.

co-simalcite ➡ **hydrotalcite**.

Cosmegen™ ➡ **dactinomycin**.

Cosmegen Lyovac™ ➡ **dactinomycin**.

Cosuric™ ➡ **allopurinol**.

cosyntropin ➡ **tetracosactrin**.

cotinine [INN] is an alkaloid from leaf tobacco (*Nicotiana tabacum*) and is also detected in *Duboisia hopwoodii* (Solanaceae). It is a **nicotine** metabolite, used as a biomarker for exposure to cigarette smoke. It shows ANTIDEPRESSANT and other behavioural effects in animals.

cothromboplastin ➡ **factor VII**.

Cotolone™ ➡ **prednisolone**.

co-trimoxazole ➡ **sulfamethoxazole**; **trimethoprim**.

coumafos ➡ **coumaphos**.

coumaphos [BAN, BSI, ISO] (coumafos [INN]) is a (organophosporous) ANTICHOLINESTERASE which can be used as an INSECTICIDE and ACARICIDE, e.g. for flies and cattle ticks.

coumarin (coumarinic anhydride; α-benzopyrone) occurs in woodruff (*Coumarouna odorata*) melilot, tonka beans, lavender oil and other plants. It shows ANTICANCER, ANTIINFLAMMATORY and ANTIHYPERGLYCAEMIC activity. It has

been used for treatment of lymphoedema, and is extensively incorporated in perfumery.

coumarin 4 ➡ **hymecromone**.

coumarinic anhydride ➡ **coumarin**.

coumazoline [INN] is an imidazole, a SYMPATHOMIMETIC used as a nasal DECONGESTANT.

COUNTER-IRRITANTS (rubefacients or topical analgesics) when rubbed in topically to the skin cause a feeling of warmth, and offset the pain from underlying muscle and joints or viscera. A number of these agents are aromatic or volatile oils. How they act is uncertain, but the reddening of the skin (indicated by the name rubefacient) indicates a dilatation of the blood vessels of the skin, which gives a soothing feeling of warmth. The term counter-irritant refers to the idea that irritation or stimulation of the sensory nerve endings alters or offsets pain in the underlying muscle or joints that are served by the same nerves, and that local axon-reflex neurogenic mechanisms induce the release of sensory mediators (e.g. **calcitonin gene-related peptide** and tachykinins) that are responsible for the observed vascular and other local effects. This concept is discussed further elsewhere (see SENSORY IRRITANTS). Examples of drugs with some counter-irritant action include **ammonium salicylate**, **camphor**, **capsaicin** (and capsicum oleoresin), **choline salicylate**, **diethylamine salicylate**, **ethyl salicylate**, **glycol salicylate**, **methyl salicylate**, **menthol**, **salicylamide**, **salicylic acid** and turpentine oil. A number of agents otherwise regarded as NSAID ANALGESICS, such as **benzydamine**, **felbinac**, **ibuprofen**, **piroxicam**, the various **salicylates** and **salicylamide**, are available as preparations for topical application, where they may act more through a local counter-irritant mechanism.

Cioli, V. *et al.* (1985) Review of pharmacology on benzydamine. *Int. J. Tissue React.*, **7**, 205-213.

Maggi, C.A. *et al.* (1988) The sensory-efferent function of capsaicin-sensitive sensory neurons. *Gen. Pharmacol.*, **19**, 1-43.

Maggi, C.A. (1991) Capsaicin and primary afferent neurons: From basic science to human therapy. *J. Auton. Nerv. Syst.*, **33**, 1-14.

Zhang, W.Y. *et al.* (1994) The effectiveness of topically applied capsaicin. A meta-analysis. *Eur. J. Clin. Pharmacol.*, **46**, 517-522.

Coversyl™ ➡ **perindoprilat**.

Cozaar™ ➡ **losartan**.

CP 20 ➡ **deferiprone**.

CP 73 ➡ **norclostebol**.

CP 1044 ➡ **alclofenac**.

CP 10188 ➡ **fenclonine**.

CP 16171 ➡ **piroxicam**.

CP 20961 ➡ **avridine**.

CP 34089 ➡ **sulprostone**.

CP 44001-1 ➡ **nantradol**.

CP 50556-1 ➡ **levonantradol**.

CP 51974-01 ➡ **sertraline**.

CP 66248 ➡ **tenidap**.

CP 93129 is a complex pyridinone derivative, a selective (5-HT_{1B}-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST. It is used as a pharmacological tool.

CP 96345 is a substituted quinuclidine, a substituted isoindole, a TACHYKININ RECEPTOR ANTAGONIST selective for the NK_1-receptor subtype. It also has ion channel-blocking properties, and is used as a pharmacological tool.

CPT 11 ➡ **irinotecan**.

CR (dibenzoxazepine) is a riot tear gas and incapacitating agent. It is a SENSORY IRRITANT that causes ocular and other irritation.

CR 242 ➡ **proglumide**.

CR 604 ➡ **proglumetacin**.

CR 662 ➡ **tipepidine**.

CR 1392 ➡ **tomoglumide**.

CR 1409 ➡ **lorglumide**.

CR 1505 ➡ **loxiglumide**.

Cremalgin™ ➡ **ethyl salicylate**; **glycol salicylate**.

Creon™ ➡ **pancreatin**; **rizolipase**.

CRF ➡ **corticotrophin-releasing factor**.

CRH ➡ **corticotrophin-releasing factor**.

crilvastatin [INN, USAN] (PMD 387) is a glutamic acid lactam derivative, a HMG-COA REDUCTASE INHIBITOR, which has been used as an ANTIHYPERLIPIDAEMIC.

crisantaspase [BAN] (asparaginase [USAN]; L-asparaginase; asparagine amidohydrolase; MK 965; NSC 109229; Re 82-TAD-15; Elspar™; Erwinase™ and many other names) is an ENZYME isolated from *E. coli*, and is used in combination with other drugs in antileukaemia therapy.

Cristapen™ ➡ **benzylpenicillin**.

Crixivan™ ➡ **indinavir**.

cromakalim [BAN, INN] is a pyrrolidinylbenzopyrancarbonitrile derivative that is a ($I_{K(ATP)}$) POTASSIUM-CHANNEL ACTIVATOR. It can be used as a SMOOTH MUSCLE RELAXANT, VASODILATOR, ANTIHYPERTENSIVE and ANTIASTHMATIC. It may be used in the form of its most active isomer: levcromakalim.

cromoglicate lisetil ➡ **cromoglycic acid**.

cromoglicic acid ➡ **cromoglycic acid**.

cromoglycic acid [BAN] (cromoglicic acid [INN]; cromolyn sodium [USAN]; sodium cromoglicate [JAN]; cromoglicate lisetil [INN]; Gastrocrom™; Intal™; Nasalcrom™; Rynacrom™; Eurax™ and many other names) is a chromone (benzopyrone), a structure elaborated in development terms to improve on the pharmacological activity of the natural chromone **khellin**. It is an ANTIALLERGIC that can be used in ANTIASTHMATIC prophylaxis (by inhalation), as eye-drops to treat allergic symptoms in the eye (e.g. allergic conjunctivitis), orally for food allergy, as nasal-drops and elsewhere. It is not yet clear how it works, but its ANTIINFLAMMATORY activity appears to involve a reduction in the release of inflammatory mediators.

cromolyn sodium ➡ **cromoglycic acid**.

crotamiton [BAN, INN] (Eurax™) is clinically used as an INSECTICIDE, mainly as a SCABICIDE, and also as a topical dermatological preparation as an antipruritic agent.

crotoxyfos [BAN] (crotoxyphos [BSI, ISO]) is an (organophosphate group) ANTICHOLINESTERASE formerly used as an INSECTICIDE.

crotoxyphos ➡ **crotoxyfos**.

crystal violet (gentian violet; methyl violet; chloride is methylrosanilinium chloride [INN]) is a topical ANTISEPTIC, ANTHELMINTIC used to kill *Trypanosoma cruzi* (causative agent of Chagas' disease) in blood supplies, and as a biological stain.

Crystodigin™ ➡ **digitoxin**.

CS (*o*-chlorobenzylidenemalononitrile) is a riot tear gas and incapacitating agent, a SENSORY IRRITANT that causes ocular irritation and acute burns with high exposure.

CS 300 ➡ **oxazolam**.

CS 310 ➡ **carboquone**.

CS 386 ➡ **mexazolam**.

CS 430 ➡ **haloxazolam**.

CS 439 ➡ **nimustine**.

CS 500 ➡ **mevastatin**.

CS 514 ➡ **pravastatin**.

CS 600 ➡ **loxoprofen**.

CS 684 ➡ **plaunotol**.

CB 8075 ➡ **oxandrolone**.

CSC (8-(3-chlorostyryl)caffeine) is a (P1 purinoceptor)

ADENOSINE RECEPTOR ANTAGONIST selective for the A_{2A}-subtype. It is used as a tool in adenosine receptor studies, and is reported to be neuroprotective in animal model of cerebral ischaemia.

CSF 2 ➡ **molgramostim**.

CSF-HU ➡ **mirimostim**.

CSFs ➡ **colony-stimulating factors**.

C-strychnotoxine I ➡ **calebassine**.

C-toxiferine II ➡ **calebassine**.

C-type natriuretic peptide (CNP) the newest member of the natriuretic peptide family, was first isolated from porcine brain, and later found in other mammals and non-mammals. It is processed from a pre-pro-CNP molecule, which gives rise to CNP-22 and its *N*-terminally elongated form, CNP-53. The CNP's share considerable sequence homology with ATRIAL NATRIURETIC PEPTIDES (ANP) and **brain natriuretic peptides** (BNP). CNP's are ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONISTS but are more active at the type-B subtype, whereas ANP's are more active at the type-A subtype.

CTX ➡ **cholera toxin**.

cumotocopherol ➡ **β-tocopherol**.

cupric sulfate [USAN] (copper sulphate) has actions as a topical molluscicide ANTIFUNGAL. It is a phosphorus ANTIDOTE, and is used with cupric hydroxide as Bordeaux mixture.

Cuprimine™ ➡ **penicillamine**.

curane B ➡ **metocurine iodide**.

Curatin™ ➡ **doxepin**.

Cutivate™ ➡ **fluticasone**.

CV 2619 ➡ **idebenone**.

CV 4151 ➡ **isbogrel**.

CV 11974 ➡ **candesartan cilexetil**.

CX 59 ➡ **psilocine**.

CY 39 ➡ **psilocybine**.

cyacetacide ➡ **cyacetazide**.

cyacetazide [BAN] (cyacetacide [INN]) was formerly used as an ANTITUBERCULAR and ANTHELMINTIC.

cyamemazine [INN] (RP 7204) is one of the phenothiazine group of drugs with general properties similar to **chlorpromazine**, which was used as an oral ANTIPSYCHOTIC for the short-term management of agressive behaviour. It is also active as a HISTAMINE H_1 RECEPTOR ANTAGONIST.

cyanamide ➡ **calcium carbimide**.

cyanamide (carbamic acid nitrile; hydrogen cyanamide; carbimide) is an ALDEHYDE DEHYDROGENASE INHIBITOR. It also shows herbicidal properties.

cyanocobalamin [BAN, INN, USAN] (vitamin B_{12}; cobamin; factor II; Cytacon™; Cytamen™) is a cobalt-containing complex, an antipernicious anaemia factor isolated from liver extracts; now obtained commercially from fermentation liquors of *Streptomyces griseus* and other microorganisms, e.g. *Propionibacterium shermanii, Pseudomonas denitrificans.* It is a VITAMIN that acts as a haemopoietic factor. A deficiency of vitamin B_{12} eventually causes megaloblastic anaemia, degeneration of nerves in the central and peripheral nervous systems and abnormalities of epithelia. Apart from poor diet, deficiency can also be caused by the lack of an intrinsic factor necessary for absorption in the stomach (pernicious anaemia) and by various malabsorption syndromes in the gut (sometimes due to drugs). Deficiency may be rectified by giving **hydroxocobalamin** and supplements of vitamin B_{12} by injection. Isotopic variants containing ^{57}Co ($t_{1/2}$ 270 d), ^{58}Co ($t_{1/2}$ 71.3 d) and ^{60}Co ($t_{1/2}$ 5.26 y) are prepared by fermentation in the presence of radiocobalt and are used as diagnostic agents.

N-cyanobenzylamphetamine ➡ **amfetaminil**.

***cyc*$^{30\text{-}33}$[D**Phe**^{12},**Nle**^{21,38},**Glu**^{30},**Lys**^{33}]**CRF**$_{12\text{-}41}$** ➡ **astressin**.

cyclandelate [BAN, INN, JAN] (Cyclospasmol™) is a methylcyclohexyl mandelate, a VASODILATOR that can be used for a variety of vascular disorders.

cyclacillin ➡ **ciclacillin**.

cyclazocine [INN, USAN] (NIH 7981; NSC 107429; UM 407; Win 20740) is one of the benzomorphan series, a (mixed κ & μ) OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC. It also has activity at σ-receptors and PSYCHOTROPIC potential

cyclic AMP (adenosine cyclic 3',5'-monophosphate; cAMP) is found in most animal cells and numerous higher plants and bacteria. It is formed by action of the enzyme adenylyl cyclase on ATP *in vivo*. It is an intracellular regulator of several cellular processes, involved in hormone-mediated biological systems as a 'second messenger'. Measured cAMP levels are used as an end-response in receptor studies. Application of the more stable analogue **dibutyrylcyclic AMP** is prefered as a pharmacological analytical tool.

Cyclimorph™ ➡ **cyclizine tartrate; morphine tartrate**.

cyclizine [BAN, INN] (cyclizine hydrochloride [USAN]; cyclizine tartrate; BW 47-83; Valoid™) is one of the piperazine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS, and a MUSCARINIC CHOLINOCEPTOR ANTAGONIST with SEDATIVE actions. It can be used orally or systemically as an ANTIEMETIC in the treatment of nausea, vomiting, vertigo, motion sickness and disorders of the balance function of the inner ear. It is available in preparation together with morphine (e.g. Cyclimorph™).

cyclizine hydrochloride ➡ **cyclizine**.

cyclizine tartrate ➡ **cyclizine**.

cyclobarbitone [BAN] (cyclobarbital [INN]) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone**. It has been used as a hypnotic.

cyclobendazole ➡ **ciclobendazole**.

cyclobenzaprine [INN] (cyclobenzaprine hydrochloride [USAN]; Flexeril™) is a dibenzocycloheptenylidene derivative, with inhibitory effects on serotonergic neurons, and can be used as a (CNS-acting) SKELETAL MUSCLE RELAXANT.

cyclobenzaprine hydrochloride ➡ **cyclobenzaprine**.

cyclobutyrol [INN] is a cyclohexaneacetic acid derivative, which has been used as a CHOLERETIC AGENT.

cyclocholine is a quaternary methylaziridinium derivative, a choline UPTAKE INHIBITOR (alkylates the choline carrier), so eventually it acts as a NEUROTRANSMITTER-RELEASE-MODIFYING AGENT, decreasing release of the neurotransmitter **acetylcholine**, and has general anticholinergic actions and is a NEUROMUSCULAR BLOCKING AGENT. It is a NEUROTOXIN and pharmacological tool for studying choline transport.

Cyclocort™ ➡ **amcinonide**.

cyclofoxy (6-deoxy-6-fluoronaltrexone) is a fluorinated analogue of the phenanthrene series antagonist **naltrexone**, a (μ and κ) OPIOID RECEPTOR ANTAGONIST. The ^{18}F-labelled compound is used for PET imaging of opioid receptors.

Cyclogest™ ➡ **progesterone**.

cycloguanil embonate [BAN, INN] (cycloguanil pamoate [USAN]) is an AMOEBICIDE which can be used in ANTIMALARIAL treatment.

cycloguanil pamoate ➡ **cycloguanil embonate**.

Cyclogyl™ ➡ **cyclopentolate**.

cyclohexamine ➡ **eticyclidine**.

Cyclokapron™ ➡ **tranexamic acid**.

cycloleucine (CB 1639; NSC 1026; WR 14997) is an amino acid derivative, a (NMDA) GLUTAMATE RECEPTOR ANTAGONIST and *S*-adenosylmethionine transferase inhibitor. It is a NEUROTOXIN, causing degeneration of motor nerve terminals. It is used as a pharmacological tool to produce experimental model of subacute degeneration of spinal cord.

CYCLOOXYGENASE INHIBITORS bind reversibly or irreversibly to the enzyme cyclooxygenase (originally referred to as the prostaglandin synthase system or 'prostaglandin H_2 synthase'; (PGHS)-1 and (PGHS)-2). Members of the prostaglandin family have a number of proinflammatory or hyperalgesic actions, and consequently many cyclooxygenase inhibitors are used as ANTIINFLAMMATORIES and ANALGESICS.

Prostanoids are members of the eicosanoid family of phospholipid mediators, and are comprised of the **thromboxanes** and the **prostaglandins**, both of which are formed by the complex cyclooxygenase system. They share common precursors in the form of a series of unstable cyclic endoperoxides. The first stage of the transformation of arachidonic acid has the enzyme endoperoxide synthase oxygenate arachidonate, followed by cyclization to give a cyclic endoperoxide called $\mathbf{PGG_2}$. These reactions are inhibited by cyclooxygenase inhibitors. Subsequently, $\mathbf{PGG_2}$ is converted by a peroxidase action to $\mathbf{PGH_2}$. This is a common precursor for a number of different pathways, forming **prostacyclin** (by prostacyclin synthase), the various prostaglandins or thromboxanes (by thromboxane synthase). See THROMBOXANE SYNTHASE INHIBITORS. The conversion depends somewhat on the cell type. For instance, the conversion of PGH_2 to thromboxane (by thromboxane synthase) is a prominent pathway in the blood platelets, whereas prostacyclin synthesis is predominant in the vascular endothelium. The eicosanoids are synthesized and released on demand. See PLATELET AGGREGATION INHIBITING AGENTS.

Cyclooxygenase inhibition is thought to underlie the mechanism of action of one of the two main groups of ANALGESICS the *non-steroidal antiinflammatory drugs* (NSAIDs) – typified by **aspirin**. The NSAIDs vary in their spectrum of activity, differing in their ability to reduce inflammation, hyperalgesia, raised body temperature, and in some instances inhibit platelet aggregation. It is now believed that the rather different pharmacology can, in part, be accounted for by their different activities against two recently discovered cyclooxygenase isoenzymes. One, COX-1, is constitutively expressed; but the other, COX-2, is inducible. Individual NSAIDs have different ratios of activity against the two forms of the enzyme, and this accounts partly for their side-effects when used for a particular purpose. For most antiinflammatory uses, a relatively high activity against the induced enzyme is desirable – whereas for antiplatelet-aggregation purposes, high activity at the constitutive form is required. A main difference is that **paracetamol** (acetaminophen, USA) is an effective antipyretic, but has no appreciable antiinflammatory activity and its efficacy as an analgesic depends on the source of pain. Of the many other NSAID drugs, their use is determined in part by how well their side-effects – particularly gastrointestinal disturbances ranging from dyspepsia to serious haemorrhage – are tolerated. It appears that cytotoxicity in the stomach is in part a result of diminished prostanoid synthesis – which has adverse effects on the microcirculation of the gastric mucosa. Preparations are now available that combine a prostaglandin with an NSAID (e.g. **misoprostol** and **naproxen**). Details of agents such as **diclofenac**, **ibuprofen**, **indomethacin**, **piroxicam** etc. are given under NSAID ANALGESICS, ANTIINFLAMMATORY AGENTS and ANTIPYRETICS. An important action of aspirin, not shared with the majority of NSAIDs, is as a platelet aggregation inhibiting agent. The explanation seems to be that aspirin is relatively active at COX-1, irreversibly alkylating its active site. This reduces **thromboxane A_2** (TXA_2) synthesis in platelets, and platelets cannot synthesize new enzyme, so activity does not return until new platelets are formed (which takes about a week). In contrast, the vascular endothelium is able to generate more enzyme; further, a higher concentration of aspirin is required in these cells. Thus aspirin may be given intermittently at low doses.

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Frolich, J.C. (1997) A classification of NSAIDs according to the relative inhibition of cyclooxygenase isoenzymes. *Trends Pharmacol. Sci.*, **18**, 30-34.

cyclopentamine [BAN, INN] (cyclopentamine hydrochloride [USAN]) is a SYMPATHOMIMETIC amine with VASOCONSTRICTOR properties, formerly used as a nasal DECONGESTANT.

cyclopentamine hydrochloride ➡ **cyclopentamine**.

cyclopentaminine is a carboxylic acid, an UPTAKE INHIBITOR, active against GABA uptake and binding.

cyclopenthiazide [BAN, INN, USAN] (Navidrex™) is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy (often in combination with other classes of diuretics, or β-ADRENOCEPTOR ANTAGONISTS).

cyclopentolate [BAN, INN] (cyclopentolate hydrochloride [USAN]; Cyclogyl™; Mydrilate™) is a tertiary amine, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST. It is used as a MYDRIATIC and ANTISPASMODIC.

cyclopentolate hydrochloride ➡ **cyclopentolate**.

cyclophosphamide [BAN, INN, JAN, USAN] (Cytoxan™; Neosar™ and many other names) is an alkylating cytotoxic which can be used in ANTICANCER chemotherapy, either orally or by injection, for the treatment of chronic lymphatic leukaemia, lymphomas and some solid tumours. It can also be used as an IMMUNOSUPPRESSANT in the treatment of complicated rheumatoid arthritis (unlicenced use).

cycloprolol [BAN] (cicloprolol [INN]; cicloprolol hydrochloride [USAN]) is a β-ADRENOCEPTOR ANTAGONIST which has some intrinsic β_1-partial agonist activity. It has ANTIHYPERTENSIVE properties, but is not marketed.

cyclopropane [INN, USAN] (trimethylene) is an explosive gas with an ethereal odour, which is used clinically as an inhalation GENERAL ANAESTHETIC.

cycloserine [BAN, INN, USAN] (Seromycin™) is a broad-spectrum ANTIBIOTIC which clinically can be used as an ANTIBACTERIAL especially in ANTITUBERCULAR treatment in cases of drug resistance.

Cyclospasmol™ ➡ **cyclandelate**.

cyclosporin [BAN] (ciclosporin [INN, JAN]; cyclosporine [USAN]; cyclosporin A; Neoral™; Sandimmune™) is a cyclic polypeptide ANTIBIOTIC, possessing IMMUNOSUPPRESSIVE properties (with a specific action on T-lymphocytes). It also has ANTIFUNGAL activity and can be used clinically as an immunosuppressant after transplant surgery, and to treat severe autoimmune diseases including rheumatoid arthritis.

cyclosporin A ➡ **cyclosporine**.

cyclothiazide [BAN, INN, USAN] is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.

cyclovalone [INN] (DVC) is a cyclohexanone, a CHOLERETIC

and cholagogic agent.

Cycrin™ ➡ **medroxyprogesterone**.

cyfluthrin [BAN, BSI, ISO] is a pyrethroid INSECTICIDE.

Cylert™ ➡ **pemoline**.

Cymevene™ ➡ **ganciclovir**.

cyprenorphine [INN] (NIH 8112) is a morphinan derivative, an OPIOID RECEPTOR ANTAGONIST.

cyprodime is a morphinan derivative, a (μ) OPIOID RECEPTOR ANTAGONIST.

cyproheptadine [BAN, INN] (cyproheptadine hydrochloride [USAN]; Periactin™) is a cycloheptenyl-methylpiperidine derivative, a HISTAMINE H_1-RECEPTOR ANTAGONIST and 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It also has MUSCARINIC CHOLINOCEPTOR ANTAGONIST, CALCIUM-CHANNEL BLOCKER and SEDATIVE activity. It can be used as an antipruritic, for ANTIMIGRAINE propylaxis and in the treatment of anorexia.

cyproheptadine hydrochloride ➡ **cyproheptadine**.

Cyprostat™ ➡ **cyproterone**.

cyproterone [INN] (cyproterone acetate [JAN, USAN]; NSC 81430; SH 714; SH 80714; Androcur™; Cyprostat™) is a steroid, an ANTIANDROGEN with some PROGESTOGEN activity. It is used as an oral ANTICANCER AGENT for cancer of the prostate gland. It can also be used for the treatment of hypersexuality or sexual deviation in men; in whom the drug causes a condition of reversible sterility. Additionally, it can be used (in a preparation with the oestrogen **ethinyloestradiol**) to treat female acne and hirsutism (Dianette™).

cyproterone acetate ➡ **cyproterone**.

cysteamine [BAN, USAN] (mercaptamine [INN]; cysteinamine; thioethanolamine; 2-aminoethanethiol; NSC 25116) is a radioprotective agent also used as an ANTIDOTE to paracetamol poisoning. It is also an antiurolithic agent, PROLACTIN RELEASE INHIBITOR and has ANTICANCER properties.

cysteinamine ➡ **cysteamine**.

Cytacon™ ➡ **cyanocobalamin**.

Cytadren™ ➡ **aminoglutethimide**.

Cytamen™ ➡ **cyanocobalamin**.

cytarabine [BAN, INN, JAN, USAN] (cytarabine hydrochloride [USAN]; Ara C; Cytosar™;Cytosar-U™) is an antimetabolite cytotoxic ANTICANCER and ANTIVIRAL AGENT isolated from the mushroom *Xerocomus nigromaculatus*. It works by interfering with pyrimidine synthesis. Clinically, it can be used systemically in anticancer treatment mainly of acute leukaemia.

cytidine diphosphate choline ➡ **citicoline**.

cytidine diphosphocholine ➡ **citicoline**.

cytisine is an alkaloid with CNS STIMULANT, RESPIRATORY STIMULANT and psychoactive properties. It has been used clinically as a respiratory stimulant in Russia. It is a common cause of poisoning by the seeds of *Cytisus laburnum*.

cytochalasins (A, B, C, D, E, F, G & H) are metabolites of *Helminthosporium dematioideum* and other spp., and have ANTICANCER and ANTIBIOTIC activity. Their cytokinesis-blocking properties are used in micronucleus assays for detecting numerical and structural chromosome changes.

CYTOKINE RECEPTOR AGONISTS act at one or more of the extremely diverse group of sites recognizing cytokine mediators. Cytokines are peptide inflammatory mediators belonging to a superfamily with a number of classes. Included are the interferons, the interleukins, tumour necrosis factor and mammalian growth factors, and also a number of further factors. The cytokines are mainly produced by macrophages and lymphocytes, and also by other leucocytes, fibroblasts and endothelial cells. They act by activating recruiting and regulating processes and cells within the inflammatory and immune system, and differentiation and multiplications of cells in the repair process. The term lymphokine was formerly applied to cytokines produced by lymphocytes. The chemokines are a subset of cytokines that are chemotactic to leucocytes.

Cytokine receptor studies are still evolving, but several subfamilies of receptors and putative ligands have been proposed. Currently, over 30 receptors have been identified, and some of these have been cloned. Given this state of flux, only an outline account of these receptors is given.

Chemokine family. The mediators are divided into four subclasses according to chemical characteristics of the ligands, namely the number or positions of cyteine residues, as follows: CC chemokines; CXC chemokines; CX3C chemokine; C chemokines. These chemokines act at receptors largely named after the peptides themselves, and include CCCR1–8 and CXR1–4. Chemokines recognized include MIP-1α; MIP-1β; MCP-1; MCP-2; MCP-3; MCP-4; MIP-5; RANTES; LCR1; leukotactin-1; eotaxin, eotaxin-1; and some other chemokines.

Interleukin-1 receptor family. The mediators themselves include IL-1α, IL-1β, and the receptors include at least two types; IL-1R1 and IR-1RII.

Tumour necrosis factor (TNF) receptor family. The mediators themselves include TNF (α & β) and lymphotoxin α, and there are at least four receptor subtypes.

Haematopoetin receptor family. The mediators themselves include IL-2 through to IL-15, with one receptor each at which they are preferred ligands; also there are GM-CSF and G-CSF and other mediators.

Receptor coupling mechanisms. A number are G-protein coupled (Gi/o), but others involve JAK/STAT, i.e. signalling depends upon receptor association with Janus kinases (JAKs), which couple ligand binding to tyrosine phosphorylation of signalling proteins recruited to the receptor complex.

Individual mediators. A number of cytokines with immunomodulatory, antiviral and anticancer activities are discussed elsewhere (see IMMUNOMODULATORS). These include **interferon α** (INF-α; actually a family of peptides), **interferon β** (INF-β), **interferon γ** (INF-γ), **interleukin-1** (IL-1), **interleukin-2** (IL-2), **interleukin-3** (IL-3), **interleukin-4** (IL-4), **interleukin-5** (IL-5), **interleukin-6** (IL-6), **interleukin-8** (IL-8), **tumour necrosis factor** and the **colony-stimulating factors** granulocyte-macrophage-colony-stimulating factor (GM-CSF), granulocyte-colony-stimulating factor (G-CSF) (TNFα & β). Some other cytokines mentoned above are; macrophage inhibitory protein 1 (MIP-1α & MIP-1β, MIP-5 etc.), monocyte chemotactic proteins (MCP-2, MCP-3 etc.), RANTES (Regulated upon Activation, Normal T Cell Expressed and Secreted); leukotactin-1; eotaxin, eotaxin-1.

Clearly, there is enormous therapeutic potential in the manipulation of cell-signalling via the cytokines, as well as better understanding pathophysiology as their roles unfold.

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CYTOKINE RECEPTOR ANTAGONISTS act to inhibit at one or more of the extremely diverse group of sites

recognizing cytokines. A naturally occurring interleukin receptor antagonist is the interleukin **IL-1ra**. It is available as **anakinra**, a recombinant nonglycosylated human active against IL-1. It was isolated from human monocytes and cloned and expressed in *E. coli*. It has ANTIINFLAMMATORY activity, and can be used in the treatment of inflammatory bowel disease. Also, a number of experimental compounds are under development that are active at one or more of the diverse group of cytokine receptors. See CYTOKINE RECEPTOR AGONISTS.

Cytomel™ ➡ **liothyronine**.
Cytosar™ ➡ **cytarabine**.
Cytosar-U™ ➡ **cytarabine**.
Cytospaz™ ➡ **hyoscyamine**.
Cytotec™ ➡ **misoprostol**.
Cytovine™ ➡ **ganciclovir**.
Cytoxan™ ➡ **cyclophosphamide**.

D

D 138 ➡ **norgestimate**.
D 9998 ➡ **flupirtine**.
D 18506 ➡ **miltefosine**.
722 D ➡ **pirozadil**.
DA 4577 ➡ **mifentidine**.
DA 7591 ➡ **methoxyflurane**.
DA 50470 ➡ **bisfentidine**.
DAC ➡ **azacosterol**.

dacarbazine [BAN, INN, JAN, USAN] (NSC 45388; DIC; DTIC; imidazolecarboxamide; DTIC™; DTIC-Dome™) is a cytotoxic ANTICANCER AGENT used comparatively rarely because of its high toxicity. It may be used by injection to treat the skin (mole) cancer melanoma and, in combination with other anticancer agents, in some soft-tissue sarcomas and the lymphatic cancer Hodgkin's disease.

dacopafant [INN] (RP 48740) is a complex pyridinyl-pyrrolothiazolecarboxamide that shows PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST activity and is a **tumour necrosis factor** α inhibitor. It also shows ANTI-HIV-1 activity.

dactinomycin [BAN, INN] (actinomycin D [JAN]; actinomycin IV; actinomycin AIV; actinomycin B1; actinomycin BIV; actinomycin C1; actinomycin DIV; actinomycin Fo; meractinomycin; NSC 3053; Cosmegen™; Cosmegen Lyovac™) is a (depsipeptide and chromopeptide) ANTIBIOTIC isolated from *Actinomyces* spp. It is active against Gram-positive bacteria. It is used as an intravenous ANTICANCER AGENT mainly for cancers in children.

dacuronium bromide [BAN, INN] is a bisquaternary amine complex heterocyclic compound, which acts as a NICOTINIC CHOLINOCEPTOR ANTAGONIST, a (competitive) NEUROMUSCULAR BLOCKING AGENT. It can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia.

DAGO ➡ **DAMGO**.

daidzein (K 251-6; dimethylbiochanin B; 4′,7-dihydroxy-isoflavone) is a widespread isoflavone in the Leguminosae (Papilionoideae), e.g. in *Chamaecytisus* spp., *Cytisus* spp., *Phaseolus* spp. and also from *Streptomyces xanthophaeus*. It has calmodulin antagonist and ANTIOXIDANT properties.

Daktarin™ ➡ **miconazole**.
Dalacin™ ➡ **clindamycin**.
dalbraminol [INN] is a β-ADRENOCEPTOR ANTAGONIST.
Dalgan™ ➡ **dezocine**.
Dalmane™ ➡ **flurazepam**.
dalteparin ➡ **heparin**.

dalteparin sodium [BAN, INN, USAN] (Fragmin™) is a (parenteral) ANTICOAGULANT, chemically a low-molecular weight form (average MW *c.* 5000) of **heparin**. It can be used in the treatment of deep-vein thrombosis.

daltroban [INN, USAN] (BM 13505; SKF 96148) is a sulphonylbenzeneacetic acid derivative, a (thromboxane; TP) PROSTANOID RECEPTOR ANTAGONIST. It has ANTIINFLAMMATORY/IMMUNOSUPPRESSANT properties.

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ANTIHYPERLIPIDAEMIC.

DAM 57 ➡ **lysergide**.

DAMGO (DAMGOL; DAGO; RX 783006) is a synthetic **enkephalin** pentapeptide analogue, a selective (μ-subtype) OPIOID RECEPTOR AGONIST, used as a pharmacological tool.

DAMGOL ➡ **DAMGO**.

DAN 2163 ➡ **amisulpride**.

danaparoid sodium ➡ **heparin**.

danazol [BAN, INN, JAN, USAN] (Danocrine™; Danol™ and many other names) is a steroid, an 'attenuated' or weak ANDROGEN, an anterior pituitary suppressant (so has indirect ANTIOESTROGEN and ANTIPROGESTOGEN actions), used for the oral treatment of endometriosis, menorrhagia and premenstrual syndrome. It can also be used to treat hereditary angio-oedema.

Daneral SA™ ➡ **pheniramine**.

Danocrine™ ➡ **danazol**.

Danol™ ➡ **danazol**.

danthron [BAN] (dantron [INN]) is a (stimulant) LAXATIVE, of the anthraquinone group. Its glycoside derivatives are contained in plants, e.g. senna, cascara, rubarb and aloes. In most countries danthron itself has been withdrawn or has limited use because of tumorigenic activity in laboratory rodents. It is therapeutically available in official generic compound preparations, including **co-danthrusate** 50/60 (danthron and docusate sodium) and various **co-danthramer** preparations (danthron and poloxamer 188).

Dantrium™ ➡ **dantrolene**.

dantrolene [BAN, INN, USAN] (dantrolene sodium [JAN, USAN]; Dantrium™) is an imidazolidinedione derivative, which acts directly on the sarcoplasmic reticulum to modify calcium release. It can be used as a directly acting SKELETAL MUSCLE RELAXANT in spastic states, and also to treat malignant hyperthermia.

dantrolene sodium ➡ **dantrolene**.

dantron ➡ **danthron**.

Daonil™ ➡ **glibenclamide**.

DAP ➡ **amylin**.

dapiprazole [INN] (dapiprazole hydrochloride [USAN]; Rev-Eyes™) is a piperazinyltriazolopyridine derivative, an (α_1-subtype) α-ADRENOCEPTOR ANTAGONIST, used in ANTIGLAUCOMA TREATMENT (to reverse iatrogenic mydriasis). It may also have ANTIPSYCHOTIC activity.

dapiprazole hydrochloride ➡ **dapiprazole**.

dapitant [INN] (RPR 100893) is a substituted isoindole, a TACHYKININ RECEPTOR ANTAGONIST, selective for the NK_1-receptor subtype. It has potential as an ANTIMIGRAINE AGENT.

dapsone [BAN, INN, USAN] is a sulphone with actions similar to SULPHONAMIDES and with ANTIBACTERIAL activity. It can be used as an ANTILEPROTIC and for infective dermatitis herpetiformis, and is being investigated for the treatment and prevention of *Pneumocystis carinii* pneumonia (e.g. in AIDS).

daptomycin [BAN, INN, USAN] is an (aminoglycoside) ANTIBIOTIC. It has ANTIBACTERIAL properties.

Daranide™ ➡ **dichlorphenamide**.

Daraprim™ ➡ **pyrimethamine**.

darodipine [INN, USAN] is a dihydropyridine CALCIUM-CHANNEL BLOCKER. It acts as a BRONCHODILATOR, and a coronary and peripheral VASODILATOR.

Darvon™ ➡ **dextropropoxyphene**.

daturamine ➡ **anisodine**.

daunorubicin [BAN, INN] (leukaemomycin C; rubidomycin; rubomycin C; daunorubicin hydrochloride [JAN, USAN]; Cerubidin™; Cerubidine™) is an (anthracycline group) ANTIBIOTIC isolated from *Streptomyces peucetius*. It used as an antineoplastic, particularly in the treatment of leukaemia, and also shows ANTIVIRAL activity (ANTI-HIV).

daunorubicin hydrochloride ➡ **daunorubicin**.

Davenol™ ➡ **carbinoxamine**.

dazmegrel [BAN, INN, USAN] (UK 38485) is an imidazolylindole derivative, a THROMBOXANE SYNTHETASE INHIBITOR, PLATELET AGGREGATION INHIBITOR and ANTITHROMBOTIC. It has a protective effect in cyclosporin-induced nephrotoxicity.

dazoxiben [BAN, INN] (UK 37248) is an imidazolylbenzoic acid derivative, a THROMBOXANE SYNTHETASE INHIBITOR, PLATELET AGGREGATION INHIBITOR and ANTITHROMBOTIC.

DB 2182 ➡ **lofepramine**.

DBM ➡ **mitobronitol**.

DC 13116 ➡ **lanreotide**.

DCF ➡ **pentostatin**.

DD 3480 ➡ **timiperone**.

DDAVP™ ➡ **desmopressin**.

ddC ➡ **zalcitabine**.

DDC ➡ **zalcitabine**.

DDI ➡ **didanosine**.

ddi ➡ **didanosine**.

DDVP ➡ **dichlorvos**.

DE 019 ➡ **bucillamine**.

deacetyllanatoside C ➡ **deslanoside**.

deanol [BAN] (norcholine; N-dimethylethanolamine) is isolated from a *Neurospora crassa* strain and is a residue present in the alkaloids cassaine and cassaidine. It is a choline precursor and has been used to enhance central acetylcholine formation. It has been used as a CNS STIMULANT (nootropic agent) to enhance mental function, and as an ANTIDEPRESSANT.

debrisoquine [BAN, INN] (debrisoquine sulfate [USAN]; Declinax™) is a tetrahydroisoquinoline ADRENERGIC NEURON BLOCKING AGENT, which can be used as an ANTISYMPATHETIC with ANTIHYPERTENSIVE activity.

debrisoquine sulfate ➡ **debrisoquine**.

Decadron™ ➡ **dexamethasone**.

Deca-Durabolin™ ➡ **nandrolone**.

decamethonium bromide ➡ **decamethonium iodide**.

decamethonium iodide [BAN] (decamethonium bromide [INN]; Syncurine™) acts as a non-depolarizing SKELETAL MUSCLE RELAXANT, a NICOTINIC CHOLINOCEPTOR ANTAGONIST by virtue of acting as a channel blocker. It is also a potassium channel (K_{SR}; sarcoplasmic reticulum) blocker. It has previously been used as a NEUROMUSCULAR BLOCKING AGENT in anaesthesia.

1,1-decamethylenediguanidine (decanediylbisguanidine; 1,10-diguanidinodecane; BISG 10) is an (NMDA) GLUTAMATE RECEPTOR ANTAGONIST, a potent POTASSIUM-CHANNEL BLOCKER and also an ANTIDIABETIC and ANTIARRHYTHMIC AGENT.

decanediylbisguanidine ➡ **1,1-decamethylenediguanidine**.

De-capeptyl sr™ ➡ **triptorelin**.

Decazate™ ➡ **fluphenazine**.

decitabine [BAN, INN, USAN] (NSC 127716) is a **cytarabine** analogue that is a cytotoxic DNA methylation inhibitor. It has been used as an ANTICANCER AGENT for the treatment of acute leukaemias.

Declinax™ ➡ **debrisoquine**.

DECONGESTANTS are drugs administered to relieve or reduce the symptoms of congestion of the nose or upper airways. VASOCONSTRICTORS are commonly used as decongestants, and they are generally applied topically in the

form of nose-drops or as a nasal spray, which avoids the tendency of such drugs to cause side-effects such as raising blood pressure (although some can be administered orally). Most decongestants are **SYMPATHOMIMETIC AGENTS**, which work by constricting blood vessels in general, including those within the mucous membranes of the airways and nasal cavity, so reducing the membranes' thickness, improving drainage (and possibly decreasing mucus and fluid secretions). *Direct-acting sympathomimetics* commonly used, mostly by topical application, are α-adrenoceptor agonists, e.g. **oxymetazoline**, **phenylephrine**, **tramazoline** and **xylometazoline** (see **α-ADRENOCEPTOR AGONISTS**). *Indirect sympathomimetics* are also used, often by mouth, and these include **ephedrine** and **pseudoephedrine**. Allergic rhinitis is inflammation of the mucous membrane of the nose caused by allergy (e.g. in hay fever) and causes nasal congestion. Here antihistamines may be valuable and inhibit the detrimental and congestive effects of histamine released by the allergic response, e.g. **acrivastine, astemizole, azelastine, brompheniramine, cetirizine, chlorpheniramine, clemastine, cyproheptadine** and **diphenhydramine** (see **HISTAMINE H_1-RECEPTOR ANTAGONISTS**). Similarly, **ANTIALLERGIC AGENTS**, which inhibit the allergic response itself, are valuable (and may be applied topically), e.g. **CORTICOSTEROIDS** or **sodium cromoglycate**.

decoquinate [BAN, INN, USAN] is a quinolinecarboxylate with **ANTIPROTOZOAL** activity. It can be used as a veterinary **ANTICOCCIDIAL**.

deferiprone [BAN, INN] (CP 20) is a dimethylpyridinone derivative, a **CHELATING AGENT**, used in the treatment of thalassaemia and as a metal poisoning **ANTIDOTE**.

deferoxamine ➡ **desferrioxamine**.

deferoxamine hydrochloride ➡ **desferrioxamine**.

Defibrase™ ➡ **batroxobin**.

defibrotide [BAN, INN] is composed of polydeoxyribonucleotides from bovine lung (MW 45–55,000). It is a **FIBRINOLYTIC, ANTITHROMBOTIC** and antiischaemic agent. It acts as a (P1 purinoceptor) **ADENOSINE RECEPTOR AGONIST**, and stimulates prostacyclin production by endothelial cells. It can be used parenterally or orally to treat a variety of peripheral obliterative vascular diseases.

deflazacort [BAN, INN, USAN] (MDL 458; Calcort™) is a recently introduced **CORTICOSTEROID**, a **GLUCOCORTICOID** with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties. It has been used orally to treat inflammatory conditions.

dehydrocholate sodium ➡ **dehydrocholic acid**.

dehydrocholic acid [BAN, INN, USAN] (dehydrocholate sodium [USAN]; Richlyn™ and many other names) is a steroid bile acid and oxidation product of **cholic acid**. It is a **CHOLERETIC** and is used as a **LAXATIVE** and diagnostic agent.

1-dehydrocortisol ➡ **prednisolone**.

dehydroemetine [BAN, INN] is an emetine derivative, with **ANTIPROTOZOAL** activity.

dehydroisoandrosterone ➡ **prasterone**.

DEHYDROPEPTIDASE INHIBITORS act on the dehydropeptidase (dehydropeptidase-I; dipeptidase) enzyme that is the form found in the brush-border of the proximal tubules of the kidney. It breaks down **imipenem**, a carbapenem antibiotic that has a valuable wide spectrum of antibacterial activity compared with many others of the β-lactamase class (and is β-lactamase resistant). Since the formimidoyl derivative, **cilastatin**, inhibits the dehydropeptidase enzyme, it is given in a preparation that combines it with imipenem which extends its half-life to about 1 hour. Co-administration also prevents proximal tubular necrosis, which has been observed in sensitive animals receiving imipenem alone in high doses.

Birnbaum, J. *et al.* (1985) Carbapenems, a new class of β-lactam antibiotics. Discovery and development of imipenem/cilastatin. *Am. J. Med.*, **78**, 3-21.
Keynan, S. *et al.* (1990) Isolation and characterisation of the cDNA, sequence conservation, expression and processing *in vitro*. *Biochem. J.*, **267**, 517-525.
Keynan, S. *et al.* (1995) The renal membrane dipeptidase (dehydropeptase I) inhibitor, cilastatin, inhibits the bacterial metallo-b-lactamase enzyme CphA. *Antimicrob. Agents Chemother.*, **39**, 1629-1631.

1-dehydrotestosterone ➡ **boldenone**.

delapril [INN] (delapril hydrochloride [JAN, USAN]) is a pseudopeptide **ACE INHIBITOR** which can be used as an **ANTIHYPERTENSIVE AGENT**.

delapril hydrochloride ➡ **delapril**.

Delatestryl™ ➡ **testosterone**.

delavirdine mesylate [USAN] (Rescriptor™) is a (non-nucleoside) **REVERSE TRANSCRIPTASE INHIBITOR** and an **ANTIVIRAL**. Its use is being explored as an **ANTI-HIV AGENT**.

Delfen™ ➡ **nonoxinol 9**.

delmadinone [BAN, INN] (delmadinone acetate [BAN, USAN]; RS 1310) is a synthetic steroid, a progestogen with **ANTIANDROGEN** and **ANTIOESTROGEN** activity. It has been used as an antiandrogen in veterinary practice.

delmadinone acetate ➡ **delmadinone**.

delorazepam [INN] (Ro 5-3027) is one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST**, with most properties similar to **diazepam**. It has **HYPNOTIC, ANTICONVULSANT** and **ANXIOLYTIC** activity, and has been used orally or by injection to treat anxiety. The 3-hydroxy derivative is **lorazepam**.

delprostenate [BAN, INN] (A 2774; ONO 1052) is a prostaglandin and **PROSTANOID RECEPTOR AGONIST**. It is a veterinary **LUTEOLYTIC AGENT**.

deltacortisone ➡ **prednisone**.

Deltacortril™ ➡ **prednisolone**.

Deltanyne™ ➡ **dronabinol**.

delta sleep-inducing peptide (DSIP) is a nonapeptide, originally isolated from the extracorporeal dialysate of cerebral venous blood of rabbits, and subsequently was synthesized. It induces sleep when administered intravenously in animal models. It can cross the blood–brain-barrier and has **ANTICONVULSANT** and **HYPNOTIC** actions; it also inhibits pituitary ACTH secretion.

Deltasone™ ➡ **prednisone**.

Deltastab™ ➡ **prednisolone**.

Demadex™ ➡ **torasemide**.

demecarium bromide [BAN, INN, JAN] (BC 48; Humorsol™) is a bisquaternary ammonium compound, a reversible **ANTICHOLINESTERASE** used topically as a **MIOTIC AGENT** in **ANTIGLAUCOMA TREATMENT**.

demeclocycline [BAN, INN] (demeclocycline hydrochloride [USAN]; Deteclo™; Ledermycin™) is a semisynthetic (tetracycline) **ANTIBIOTIC**. It is a starting material for manufacture of semisynthetic tetracyclines, and can be used clinically as an oral broad-spectrum **ANTIBACTERIAL**.

demeclocycline hydrochloride ➡ **demeclocycline**.

demecolcine [BAN, INN] (N-methyldeacetylcolchicine; Alkaloid F; Santavy's Substance F; NSC 3096; Ciba 12669A) is an alkaloid from *Colchicum speciosum*, several other *Colchicum* spp., *Merendera jolantae* (Liliaceae), *Merendera persica* and *Androcymbium melanthioides*. It is an antitubulin which induces apoptosis. It has activity as an **ANTICANCER AGENT** and an antimitotic.

demegestone [INN] (R 2453) is a synthetic steroid, a **PROGESTOGEN** structurally related to **PROGESTERONE**.

dememethyldiazepam ➡ **nordazepam**.

Demerol™ ➡ **pethidine**.

demethyldihydrothebaine acetate ➡ **thebacon**.

demexiptiline [INN] is one of the tricyclic class of ANTIDEPRESSANTS with properties similar to **amitriptyline**.

demoxytocin [INN] (deaminooxytocin; desaminooxytocin; ODA 914) is a synthetic analogue of **oxytocin** and agonist at oxytocin receptors ((OT) VASOPRESSIN RECEPTOR AGONIST) that is more active than oxytocin and can also be used as an OXYTOCIC AGENT or as buccal tablets for promoting lactation.

Demser™ ➡ **metirosine**.

denbufylline [BAN, INN] is a theophylline derivative, a (type IV) PHOSPHODIESTERASE INHIBITOR, that is a peripheral VASODILATOR investigated for treatment of dementia.

dencichin (β-L-ODAP) is isolated from seeds of *Lathyrus sativus* and other spp., *Crotalaria* spp., and *Panax notoginseng*. It is a NEUROTOXIN identified as an excitotoxin and major causative agent of human neurolathyrism, a disease characterized by permanent spastic paralysis, in India. It is a selective non-NMDA GLUTAMATE RECEPTOR AGONIST and HAEMOSTATIC. It is used as a pharmacological tool.

dendrotoxin is a peptide with 59 amino-acid residues (3 intramolecular disulphide bridges) existing in various forms (α, β_1, β_2, γ, δ). It is isolated from the venom of the green mamba (*Dendroaspis angusticeps* and *D. polylepsis*). It is a NEUROTOXIN that acts as a NEUROTRANSMITTER-RELEASE-MODIFYING AGENT, enhancing acetylcholine release at neuromuscular junctions so resulting in convulsant activity. The various forms block different subsets of voltage-gated K^+-channels.

denopamine [INN, JAN] is a β-ADRENOCEPTOR AGONIST selective for the β_1-subtype which can be used as a positive INOTROPIC AGENT.

Dentinox™ ➡ **dimethicone**.

6-deoxyacyclovir ➡ **desciclovir**.

deoxycholic acid (choleic acid; cholorebic acid) is a steroid bile acid that occurs in bile of man, ox, goat and sheep; a faecal secondary bile acid. It has CHOLERETIC and ANTIINFLAMMATORY activity.

deoxycoformycin ➡ **pentostatin**.

deoxycortone [BAN] (desoxycortone [INN]; deoxycortone acetate [BAN]; deoxycortone pivalate [BAN]; desoxycortone enanthate; Kendall's desoxy compound B; Reichstein's substance Q) is a natural adrenal cortical hormone, a CORTICOSTEROID with MINERALOCORTICOID activity. It has therefore been used orally to make up for hormonal deficiency (especially mineral balance), e.g. in Addison's disease.

deoxycortone acetate ➡ **deoxycortone**.

deoxycortone pivalate ➡ **deoxycortone**.

deoxyephedrine ➡ **methylamphetamine hydrochloride**.

6-deoxy-6-fluoronaltrexone ➡ **cyclofoxy**.

Depakene™ ➡ **valproic acid**.

Depakote™ ➡ **valproic acid**.

Depixol™ ➡ **flupenthixol**.

Depo-Medrone™ ➡ **methylprednisolone**.

Depo-provera™ ➡ **medroxyprogesterone**.

Depostat™ ➡ **gestronol**.

Depot-Trestosterone™ ➡ **testosterone**.

Depren™ ➡ **penicillamine**.

Deprenaline™ ➡ **selegiline**.

***l*-deprenyl** ➡ **selegiline**.

Deprivan™ ➡ **propofol**.

deproceptin ➡ **morphiceptin**.

deprolorphin is a heptapeptide enkephalin analogue, a (μ) OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC.

deprostil [INN, USAN] (AY 22469) is a prostaglandin and PROSTANOID RECEPTOR AGONIST, with potential as a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.

deptropine [BAN, INN] is a dibenzheptropine, a HISTAMINE H_1-RECEPTOR ANTAGONIST with pronounced MUSCARINIC CHOLINOCEPTOR ANTAGONIST properties. It was formerly used in ANTIASTHMA and bronchitis treatment, and for rhinitis.

Derbac-C™ ➡ **carbaryl**.

Dequadin™ ➡ **dequalinium chloride**.

dequalinium chloride [BAN, INN] (natralinium chloride; Dequadin™; Labosept™) is a bisquaternary quinolinium ANTISEPTIC, with some ANTIFUNGAL and ANTIBACTERIAL activity. Clinically, it may be used topically, commonly as throat lozenges.

Dermacin™ ➡ **fluocinolone acetonide**.

Dermalex™ ➡ **hexachlorophane**.

DERMATOLOGICAL AGENTS are used for a wide variety of purposes and some of the more important pharmacological types and terms will be discussed.

ANTIINFLAMMATORY AGENTS are frequently used to treat inflammatory and/or allergic reactions of the skin. The commonest agents used are CORTICOSTEROIDS (of the GLUCOCORTICOID type), which have potent antiinflammatory and ANTIALLERGIC properties. There is a range of steroids available as creams or ointments, which vary in concentration and the strength of the antiinflammatory action of the particular corticosteroid: the choice depends on the severity of the skin condition. Some preparations are available without prescription for minor skin inflammation, whereas at the other extreme some preparations are reserved for severe outbursts of eczema or psoriasis. There are many corticosteroids used clinically for dermatological conditions.

Inflammatory skin conditions are sometimes complicated by a coexisting infection, and there are many compound preparations available containing ANTIBACTERIAL or ANTIFUNGAL AGENTS together with an antiinflammatory corticosteroid.

ANTIPERSPIRANTS are substances that help to prevent sweating. Medically, they are needed only in cases of severe hyperhidrosis when some disorder of the sweat glands causes constant and streaming perspiration. In such cases, **aluminium chloride** solution is an effective treatment.

ASTRINGENTS precipitate proteins and are used in lotions to harden and protect skin where there are minor abrasions. They can also be used in lozenges, mouthwashes, eye-drops and antiperspirants. Examples include **zinc oxide**, and salts of aluminium (**aluminium acetate**, **aluminium hydroxide**).

Barrier creams are used to protect the skin against irritants, urine and toxic substances. They are normally applied as an ointment or cream and often incorporating a silicone (e.g. **dimethicone**).

Emollients/hydrating agents soothe and soften the skin. They are incorporated into ointments and skin creams that are used to treat conditions where the skin is dry or flaky (e.g. eczema). They are usually fats or oils, such as lanolin and liquid paraffin, and can be combined with other hydrating agents, e.g. **urea**.

Antipsoriatic agents are used to treat psoriasis, a serious chronic skin condition characterized by scaly pink patches. A number of agents may be used in treatment, but there is no cure. KERATOLYTIC (desquamating) AGENTS are used extensively, including **coal tar**, **dithranol**, **etretinate**, **ichthammol** and **salicylic acid**; also retinoids (see below); and corticosteroids.

Retinoids (derivatives of **retinol** or **vitamin A**) are used to

treat severe psoriasis resistant to other treatments, and certain other skin conditions (including severe Darier's disease). They include **acitretin**, **isotretinoin**, which can be given by mouth, and **tretinoin**, which is used topically. Retinoids have a marked effect on differentiation of dermal cells of the epithelium of the skin.

Dithranol (an anthracene compound) is incorporated in a number of preparations, and is the most powerful drug presently used to treat chronic or milder forms of psoriasis in topical application. It is thought to work by inhibiting cell division (antimitotic) and may be used in combination with direct keratolytics.

Photosensitizers are agents that sensitize cells to radiation in the visible and near ultraviolet region of the radiation spectrum. Therapeutic use has been made of naturally occurring psoralens to treat vitiligo and psoriasis, in so-called photodynamic therapy. With newly developed UV irradiation systems that emit high-intensity UVA radiation, the principle has been extended to the treatment of severe psoriasis, mycosis fungoides and many other skin diseases. Agents used in psoralen photochemistry (PUVA) medicine include **methoxypsoralen** (8-MOP), **trioxysalen** and other synthetic psoralens.

Gupta, A.K. *et al.* (1987) Psoralen photochemotherapy. *J. Am. Acad. Deratol.*, **17**, 703-734.
Layton, A.M. *et al.* (1992) Guidelines for optimal use of isotretinoin in acne. *J. Am. Acad. Dermatol.*, **27**, S2-S7.
Pilkington, T. *et al.* (1992) Acitretin. A review of its pharmacology and therapeutic use. *Drugs*, **43**, 597-627.
Dodd, W.A. (1993) Tars. Their role in the treatment of psoriasis. *Dermatol. Clin.*, **11**, 131-135.

Dermovate™ ➡ **clobetasol**.

derris ➡ **rotenone**.

DES ➡ **stilboestrol**.

desaminooxytocin ➡ **demoxytocin**.

desamino[Asn⁴,D-Arg⁸]vasopressin ➡ **argipressin**.

desamino[Dab⁸]vasopressin ➡ **argipressin**.

desamino[Thr⁴,D-Arg⁸]vasopressin ➡ **argipressin**.

desaspidin [INN] is a phloroglucinol isolated from male ferns (*Dryopteris* spp.) and is used as an **ANTHELMINTIC**.

desciclovir [INN, USAN] (6-deoxyacyclovir) is a prodrug of **aciclovir**, a synthetic nucleoside analogue antiviral. Clinically, it can be used orally against herpes.

Deseril™ ➡ **methysergide**.

deserpidine [BAN, INN] (Harmonyl™) is an ester alkaloid from *Rauwolfia* spp., with properties similar to **reserpine**. It can be used as an **ANTIHYPERTENSIVE** and **ANTIPSYCHOTIC**.

Desferal™ ➡ **desferrioxamine**.

desferrioxamine [BAN] (deferoxamine [INN, USAN]; deferoxamine hydrochloride [USAN]; desferrioxamine mesilate [BAN, JAN]; Ba 33112; Ba 29837; Ciba 33112; NSC 527604; Desferal™) is isolated from *Streptomyces pilosus*. It is a **CHELATING AGENT** for iron mobilization, with low oral toxicity. It is used in the treatment of β-thalassaemia and as an **ANTIDOTE** to iron poisoning (e.g. iron overload following repeated venisection). It also chelates aluminium, and is of interest with respect to treatment of Alzheimer's disease. It shows anti-HIV and anticancer activity.

desferrioxamine mesilate ➡ **desferrioxamine**.

desfluorotriamcinolone ➡ **desonide**.

desflurane [INN, USAN] (I 653; Suprane™) is a halogenated ether, a volatile liquid, used as an inhalation **GENERAL ANAESTHETIC**.

desglugastrin [INN] is a peptide, an analogue of gastrin, that is a (CCK_B/gastrin receptor subtype) **CHOLECYSTOKININ RECEPTOR AGONIST**. It is a gastric acid secretion stimulator used as a diagnostic agent.

desipramine [BAN, INN] (desipramine hydrochloride [JAN, USAN]; desmethylimipramine; norimipramine; AW 1151129; G 35020; JB 8181; NSC 114901; Pertofran™; Norpramin™ and many other names) is one of the tricyclic class of **ANTIDEPRESSANTS**, the principal active metabolite of imipramine. It is a noradrenaline **UPTAKE INHIBITOR**. It is used as an oral antidepressant with antimuscarinic and **SEDATIVE** effects when used therapeutically.

desipramine hydrochloride ➡ **desipramine**.

desitriptyline ➡ **nortriptyline**.

deslanoside [BAN, INN] (deacetyllanatoside C; deslanoside C) is a **CARDIAC GLYCOSIDE** isolated from *Digitalis lanata*, a **CARDIAC STIMULANT** and **ANTIARRHYTHMIC** that has been used in congestive **HEART FAILURE TREATMENT**.

deslanoside C ➡ **deslanoside**.

deslorelin [BAN, INN, USAN] is a synthetic nonapeptide analogue of **gonadorelin** (**gonadotrophin-releasing hormone**), a potent **LH-RH RECEPTOR AGONIST**, with similar properties. It can be used as an **ANTICANCER AGENT** for prostate cancer and endometriosis. Also used to treat growth-problems in LH-RH-dependent precocious puberty. For further details see gonadotrophin-releasing hormone.

des-lysine¹⁰-α-neoendorphin ➡ **β-neoendorphin**.

desmethylimipramine ➡ **desipramine**.

desmethylmethadone ➡ **normethadone**.

desmethylmoramide [INN] is a morpholinopyrrolidine, an **OPIOID RECEPTOR AGONIST** with **OPIOID ANALGESIC** activity.

desmethylmorphine ➡ **normorphine**.

desmethyl muramyl dipeptide ➡ **almurtide**.

desmopressin [BAN, INN] (desmopressin acetate [JAN, USAN]; Stimate™; DDAVP™; Desmospray™ and several other names) is a synthetic analogue of **arginine vasopressin**. It is a (V) **VASOPRESSIN RECEPTOR AGONIST**, an **ANTIDIURETIC** used by mouth or nasal spray (absorbed from nasal mucosa) to treat nocturnal enuresis and as a **DIABETES INSIPIDUS TREATMENT**. As a **HAEMOSTATIC AGENT** it is used to boost the blood concentration of blood-clotting factors in the treatment of mild haemophilia A and von Willebrand's disease. It can also be used as a diagnostic agent for some tests.

desmopressin acetate ➡ **desmopressin**.

Desmospray™ ➡ **desmopressin**.

desocriptine [INN] is a combined **α-ADRENOCEPTOR ANTAGONIST** and **β-ADRENOCEPTOR ANTAGONIST**. Chemically, an ergot alkaloid (α-dihydro-β-ergocryptine) derivative, it has **ANTIHYPERTENSIVE** and **ANTIANGINAL** activity; never marketed.

desogestrel [BAN, INN, USAN] (Org 2969) is a synthetic steroid related to **levonorgestrel**, a **PROGESTOGEN** that is used as a constituent of the combined oral **CONTRACEPTIVES** that contain an **OESTROGEN**.

desomorphine [BAN, INN] (dihydrodeoxymorphine) is a **morphine** analogue, an **OPIOID RECEPTOR AGONIST**, with **OPIOID ANALGESIC** activity.

desonide [BAN, INN, USAN] (acetonide; desfluorotriamcinolone; prednacinolone; Desowen™; Tridesilon™) is a potent **CORTICOSTEROID**, a **GLUCOCORTICOID** with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties. It is used topically to treat severe, non-infective inflammation of the skin caused by conditions such as eczema and psoriasis.

Desowen™ ➡ **desonide**.

desoximetasone ➡ **desoxymethasone**.

desoxycortone ➡ **deoxycortone**.

desoxycortone enanthate ➡ **deoxycortone**.

desoxyepinephrine ➡ **epinine**.

desoxymethasone [BAN] (desoximetasone [INN, USAN]; Hoe 304; R 2113; Stiedex™; Topicort™ and many other

names) is a moderately potent CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically to treat severe, non-infective inflammation of the skin caused by conditions such as eczema and psoriasis.

Desquam™ ➡ **benzoyl peroxide**.

destromoramide ➡ **dextromoramide**.

Desyrel™ ➡ **trazodone**.

Deteclo™ ➡ **demeclocycline**.

deterenol [INN] (deterenol hydrochloride [USAN]) is a β-ADRENOCEPTOR AGONIST which can be used in ANTIGLAUCOMA TREATMENT.

deterenol hydrochloride ➡ **deterenol**.

detirelix [INN] (detirelix acetate [USAN]; RS 68439) is a pseudopeptide with an alaninamide *C*-terminus, an LH-RH RECEPTOR ANTAGONIST with some structural similarities to the LH-RH receptor antagonists **cetrorelix**, **ganirelix** and **ramorelix**. It can, in principle, be used as a LUTEOLYTIC AGENT to inhibit ovulation. A projected use is for the treatment of sex hormone-related diseases, e.g. as part of ANTICANCER hormone therapy of sex-hormone-dependent tumours.

detirelix acetate ➡ **detirelix**.

detrothyronine [INN] (dextrothyronine) is the (*R*)-(D)-form of triiodothyronine (**liothyronine**), and has ANTIHYPERLIPIDAEMIC actions.

devazepide [INN, USAN] (L 364 718; MK 329) is a benzodiazepine and analogue of **YM 022**, a (CCK_A-subtype) CHOLECYSTOKININ RECEPTOR ANTAGONIST. It is a pharmacological tool and also [^{3}H]-devazepide is used as a selective radioligand at this receptor subtype.

Dexacort™ ➡ **dexamethasone**.

dexamethasone [BAN, INN] (dexamethasone acetate, [USAN]; dexamethasone acefurate [INN]; dexamethasone sodium phosphate [USAN]; dexamethasone pivalate; dexamethasone phosphate; dexamethasone metasulphobenzoate [BAN]; Dexacort™; Decadron™; Hexadrol™; Stiedex™ and many other names) is a potent CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically to treat severe, non-infective inflammation of the skin caused by conditions such as eczema and psoriasis. It can be used systemically or orally for adrenocortical insufficiency.

dexamethasone acefurate ➡ **dexamethasone**.

dexamethasone acetate ➡ **dexamethasone**.

dexamethasone phosphate ➡ **dexamethasone**.

dexamethasone pivalate ➡ **dexamethasone**.

dexamethasone metasulphobenzoate ➡ **dexamethasone**.

dexamethasone sodium phosphate ➡ **dexamethasone**.

dexamisole [BAN, INN] (levamisole hydrochloride [USAN]; Ergamisol™) is the (*S*)-form of a phenylimidazothiazole derivative, and shows ANTHELMINTIC and IMMUNOMODULATOR properties (it potentiates **fluorouracil** in anticancer chemotherapy).

dexamphetamine [BAN, INN] (dexamphetamine sulphate [BANM]; dextroamphetamine [USAN]; dextroamphetamine sulfate [USAN]; Dexedrine™) is the (*S*)-form of **amphetamine**. The base, dexamphetamine, is a volatile oil that can be inhaled; the sulphate is water-soluble. It is an (indirect-acting) SYMPATHOMIMETIC with marked CNS stimulating actions and also peripheral stimulating actions. It can be used orally as an APPETITE SUPPRESSANT, an antinarcolepsy treatment, and for hyperkinesis or attention-deficit hyperactivity disorder in children. It is a drug of abuse with a history of habituation liability and of illicit use. It is on the controlled drugs list.

dexamphetamine sulphate ➡ **dexamphetamine**.

Dexa-Rhinaspray™ ➡ **tramazoline**.

dexbrompheniramine maleate ➡ **brompheniramine**.

dexchlorpheniramine ➡ **chlorpheniramine**.

dexecadotril ➡ **acetorphan**; **ecadotril**.

Dexedrine™ ➡ **dexamphetamine**.

dexetimide [BAN, INN, USAN] (benzetimide [INN]; benzetimide hydrochloride [USAN]) is a tertiary amine substituted piperidine, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST and ANTIPARKINSONIAN AGENT. It is the (*S*)-form, the pharmacologically more active enantiomer. The (*R*)-form is **levetimide**.

dexfenfluramine [BAN, INN] (Adifax™) is the (*S*)-form of **fenfluramine hydrochloride** and is an (indirect-acting) SYMPATHOMIMETIC, chemically and pharmacologically related to **amphetamine** (though it has SEDATIVE actions). Clinically, it is used as an APPETITE SUPPRESSANT that acts at the level of the CNS. (Drugs of this class have recently been withdrawn in some countries because of proposed association with heart valve disease.)

dexibuprofen ➡ **ibuprofen**..

dexibuprofen lysine ➡ **ibuprofen**.

dexindoprofen ➡ **indoprofen**.

dexketoprofen ➡ **ketoprofen**.

dexloxiglumide ➡ **loxiglumide**.

dexmedetomidine [BAN, INN, USAN] is the (*R*)-form, the pharmacologically active isomer of **medetomidine**.

dexnorgestrel acetime ➡ **norgestimate**.

dexnotgestril ➡ **norgestrel**.

dexoxadrol ➡ **dioxadrol**.

dexoxadrol hydrochloride ➡ **dioxadrol**.

dexpanthenol [BAN, INN, USAN] (Dexol™; Ilopan™; Vigranon B™) is an alcoholic analogue of the VITAMIN **pantothenic acid**. It has been given in the treatment of paralytic ileus and postoperative distension. The (±) form is panthenol [BAN, INN, USAN].

dexpropranolol ➡ **propranolol**.

dexpropranolol hydrochloride ➡ **propranolol**.

dexrazoxane ➡ **razoxane**.

dexsotalol [INN] is a (class III) ANTIARRHYTHMIC. Chemically, it is the (+)-*S*-form, of which the racemate is **sotalol**.

dextran [BAN, INN] (Reomacrodex™;Hyskon™) is a range of bacterial polysaccharides of units differing only in chain length and degree of branching which occurs through branch points. It is available in a number of average size versions: dextran 40, MW 40,000; dextran 70, MW 70,000. It is used as a plasma volume expander, for prophylaxis of pulmonary embolism and as a molecular sieve in a modified form. It can also be used in labelled form as a pharmacological tool to measure plasma extravasation.

dextran 40 ➡ **dextran**.

dextran 70 ➡ **dextran**.

dextriferron [BAN, INN] is a mixture of iron(III) hydroxide with dextran, and is used as an ANTIANAEMIC AGENT in the treatment of iron-deficiency anaemia.

dextroamphetamine ➡ **dexamphetamine**.

dextroamphetamine sulfate ➡ **dexamphetamine**.

dextrodiphenopyrine ➡ **dextromoramide**.

dextroindobufen ➡ **indobufen**.

dextromethorphan [BAN, INN, USAN] (dextromethorphan hydrobromide [USAN]; Franolyn ™; Nirolex™; Robitussin™;

Tancolin™ and many other names) is the methyl ester of **dextrorphan**. It is an OPIOID RECEPTOR AGONIST and weak OPIOID ANALGESIC, but is widely used as an ANTITUSSIVE. It has experimental ANTICONVULSANT and NEUROPROTECTIVE properties. It is most commonly used as a component of cough mixtures (e.g. Actifed™, Benylin™, Lotussin™, Sudafed™ and numerous others).

dextromethorphan hydrobromide ➡ **dextromethorphan**.

dextromoramide [BAN, INN] (destromoramide; dextrodiphenopyrine; Palfium™) is the (*R*)-form of **moramide**, one of the methadone series, which is an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC. It can be used to treat severe and intractable pain, particularly in the final stages of terminal illness. It is less sedating and shorter acting than morphine.

dextronatrin (rat [DTyr6]ANP6-28) is a 23 amino acid peptide, a truncated-substituted analogue of rat ATRIAL NATRIURETIC PEPTIDE, an ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONIST and shows vasodilator and natriuretic activity.

dextropropoxyphene [BAN, INN] (propoxyphene hydrochloride [USAN]; propoxyphene napsylate [USAN]; Darvon™; Doloxene™) is one of the methadone series, and activity resides in the (2S,3R)-(+)-isomer of **propoxyphene**. It is an OPIOID RECEPTOR AGONIST, OPIOID ANALGESIC and ANTITUSSIVE. It is used as a weak analgesic, comparable to or weaker than **codeine**, to treat mild to moderate pain. It is also available in compound preparations together with non-opioid analgesics (e.g. with **paracetamol** in Distalgesic™; with **aspirin** in Doloxene Compound™).

dextrorphan [BAN, INN] (Ro 1-6794) is the (+)-form of **hydroxy-N-methylmorphinan** and is an OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC. It is usually used in the form of its methyl ester, **dextromethorphan**.

dextrothyronine ➡ **detrothyronine**.

dextrothyroxine [BAN] (dextrothyroxine sodium [INN, USAN]; Choloxin™) is the (*R*)-(+)-form of **thyroxine** and is an ANTIHYPERLIPIDAEMIC, used particularly to reduce LDL levels in cases of primary hypercholesterolaemia.

dextrothyroxine sodium ➡ **dextrothyroxine**.

dezocine [INN, USAN] (Wy 16225; Dalgan™) is a novel aminotetralin, a mixed OPIOID RECEPTOR AGONIST and OPIOID RECEPTOR ANTAGONIST, used as an OPIOID ANALGESIC.

DFP ➡ **dyflos**.

d4T ➡ **stavudine**.

5-DFUR ➡ **doxifluridine**.

DH 245 ➡ **furazabol**.

DH 581 ➡ **probucol**.

DHA 245 ➡ **amiphenazole**.

DHE45™ ➡ **dihydroergotamine**.

DHEAS ➡ **prasterone**.

DHT™ ➡ **dihydrotachysterol**.

diabetes associated peptide ➡ **amylin**.

DIABETES INSIPIDUS TREATMENT involves the administration of drugs to counteract the under-production of **antidiuretic hormone** (ADH; vasopressin) by the pituitary gland, which is a characteristic of diabetes insipidus. ADH itself (**arginine vasopressin** or **lysine vasopressin**) can be used, as can the analogues **desmopressin** and **terlipressin**. These are all (V subtype) VASOPRESSIN RECEPTOR AGONISTS. These agents are discussed in more detail under ANTIDIURETIC AGENTS.

Diabinese™ ➡ **chlorpropamide**.

diacephin ➡ **diamorphine**.

diacetamate [BAN, INN, USAN] is the diacetate derivative of **paracetamol**, one of the para-aminophenol series. It is a weak CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC and ANTIPYRETIC activity.

diacetazotol (diacetylaminoazotoluene; pellidol) is a relative of the dye, scarlet red, and is an ANTISEPTIC used as a topical dermatological agent to stimulate wound healing.

diacetolol [BAN, INN] (diacetolol hydrochloride [USAN]) is a β-ADRENOCEPTOR ANTAGONIST.

diacetolol hydrochloride ➡ **diacetolol**.

diacetylaminoazotoluene ➡ **diacetazotol**.

diacetylmorphine ➡ **diamorphine**.

Dialar™ ➡ **diazepam**.

diallyl trisulphide ➡ **allyl trisulfide**.

diamfenetide ➡ **diamphenethide**.

DIAMINE OXIDASE INHIBITORS act on the non-selective enzyme diamine oxidase (histaminase), which has as substrate such diverse substances as **histamine**, cadaverine and putrescine. As with the monoamine-oxidase enzyme, an intermediate complex is formed to yield the aldehyde, and this is then oxidized. The enzyme has been studied in relation to histamine metabolism, and is found to be released in certain circumstances from eosinophils and other tissues, and can be used as a marker in thyroid and ovarian carcinoma. Blood levels are raised in pregnancy, and heparin raises these levels. Amounts of the enzyme are high in the intestinal mucosa, liver and kidney of most species. A preparation of the enzyme itself (Torantil™) was once available for use in therapeutics for conditions in which a deficiency of histamine was implicated.

Inhibition of the enzyme has been shown with pentamidine and other aminoguanidine compounds – specifically **aminoguanidine** (pimagedine), some **amiloride** analogues, the alkaloid nazlinin and some derivatives, and **metronidazole**. Of these, aminoguanidine has mostly been used as a pharmacological tool in the past, but interpretation of findings is complicated by the recent demonstration that it is a potent nitric oxide synthase inhibitor.

Baylin, S.B. (1977) Histaminase (diamine oxidase) activity in human tumours: an expression of a mature genome. *Proc. Natl. Acad. Sci. U. S. A.*, **74**, 883-887.

Conner, J.W. *et al.* (1992) Active-site directed irreversible inhibition of diamine oxidase by a homologous series of aziridinylalkylamines. *Biochem. Pharmacol.*, **44**, 1229-1232.

Befani, O. *et al.* (1995) Inhibition of diamine oxidase activity by metronidazole. *Biochem. Biophys. Res. Commun.*, **212**, 589-594.

diamine sky blue FF ➡ **azovan blue**.

diaminoazobenzenesulfonamide ➡ **prontosil**.

diammonium carbonate ➡ **ammonium carbonate**.

diamorphine [BAN] (heroin; diacetylmorphine; acetomorphin; diacephin; diaphorin; morphine diacetate and many other names) is one of the phenanthrene series, obtained by acetylation of natural **morphine**. It is a (μ) OPIOID RECEPTOR AGONIST which can be used as an OPIOID ANALGESIC in the control of severe pain, especially in terminal illnesses. It is a drug of abuse.

Diamox™ ➡ **acetazolamide**.

diamphenethide [BAN] (diamfenetide [INN]) is a veterinary ANTHELMINTIC.

diamthazole [BAN] (dimazole [INN]) is a benzothiazolamine derivative used as a topical ANTIFUNGAL.

Dianette™ ➡ **cyproterone; ethinyloestradiol**.

diaphorin ➡ **diamorphine**.

Diapid™ ➡ **lypressin**.

Diareze™ ➡ **loperamide**.

Diarphen™ ➡ **atropine sulphate; diphenoxylate**.

Diarrest™ ➡ **codeine**.

diaveridine [BAN, INN, USAN] has ANTIBACTERIAL and

ANTIPROTOZOAL activity. It can be used as a veterinary ANTICOCCIDIAL.

diazepam [BAN, INN, JAN, USAN] (Atensine™; Dialar™; Valium™; Tensium™ and many other names) is the archetype [1,4]benzodiazepine, a BENZODIAZEPINE BINDING-SITE AGONIST. It has SEDATIVE/HYPNOTIC, ANTICONVULSANT, SKELETAL MUSCLE RELAXANT and ANXIOLYTIC activity. It has been used orally or by injection for short-term treatment of anxiety, for insomnia, as an ANTIEPILEPTIC in status epilepticus and as a sedative in preoperative medication, as a muscle relaxant to treat a variety of muscle spasms, and to assist in the treatment of alcohol withdrawal symptoms.

diazinon [ANSI, BAN, BSI, ISO, JMAF] is an (organophosporous) ANTICHOLINESTERASE used as a non-systemic INSECTICIDE for rice and fruit trees and against animal ectoparasites.

diaziquone [INN, USAN] (aziridinyl benzoquinone; AZQ; CI 904; NSC 182986) is an ANTICANCER AGENT under investigation for the treatment of leukaemia.

diazoxide [BAN, INN, USAN] (Eudemine™) is a benzothiadiazine derivative with a number of actions and uses. It has peripheral VASODILATOR, SMOOTH MUSCLE RELAXANT and ANTIHYPERTENSIVE actions, and can be used to treat hypertensive crisis. It is used as an oral ANTIHYPOGLYCAEMIC in the treatment of chronic hypoglycaemia from excess endogenous insulin secretion (islet cell tumour or islet cell hyperplasia), but has no place in the management of acute hypoglycaemia. It also has ANTIDIURETIC activity.

dibekacin [BAN, INN, JAN] is a semisynthetic (aminocyclitol) ANTIBIOTIC with ANTIBACTERIAL activity against some kanamycin-resistant bacteria.

dibenamine is a β-chloroalkylamine that acts as an irreversible (covalent) receptor alkylator acting as an (α_1) α-ADRENOCEPTOR ANTAGONIST (and at a number of other receptors). It is used as a pharmacological analytical tool.

dibenzepin [BAN, INN] (dibenzepin hydrochloride [JAN, USAN]) is one of the tricyclic class of monoamine UPTAKE INHIBITORS and has been used as an oral ANTIDEPRESSANT.

dibenzepin hydrochloride ➡ **dibenzepin**.

dibenzoxazepine ➡ **CR**.

dibenzoyl peroxide ➡ **benzoyl peroxide**.

Dibenzyline™ ➡ **phenoxybenzamine**.

dibromomannitol ➡ **mitobronitol**.

dibromopropamidine [BAN] (dibrompropamidine [INN]; isethionate derivative = Brolene™) is an aromatic diamidine with activity as a topical ANTIBACTERIAL and ANTIFUNGAL.

dibucaine ➡ **cinchocaine**.

dibucaine hydrochloride ➡ **cinchocaine**.

dibutyrylcyclic AMP ➡ **bucladesine**.

DIC ➡ **dacarbazine**.

DICA ➡ **lonidamine**.

dichlofenthion [BAN, BSI] is an ANTICHOLINESTERASE used as a non-systemic soil INSECTICIDE and non-systemic nematocide.

dichloralphenazone ➡ **chloral hydrate**.

dichlorisone [INN] (Sch 5350) is a moderately potent CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It has been used topically to treat severe, non-infective inflammation of the skin caused by conditions such as eczema and psoriasis.

dichlorophen [BAN, BSI, INN, ISO] is an ANTIBACTERIAL for cosmetics and for protection of textiles, an ANTHELMINTIC and agricultural fungicide.

dichlorophenarsine [BAN, INN] is an arsenical with ANTIBACTERIAL and ANTIFUNGAL activity. It was formerly an important drug in the treatment of syphilis.

dichlorophos ➡ **dichlorvos**.

dichloroxylenol [BAN, INN] is an ANTIBACTERIAL.

dichlorphenamide [BAN, USAN] (diclofenamide [INN]; Daranide™) is a chlorobenzene SULPHONAMIDE derivative with CARBONIC ANHYDRASE INHIBITOR activity. Clinically, it is used for ANTIGLAUCOMA TREATMENT, and is a weak DIURETIC.

dichlorvos [BAN, BSI, INN, ISO] (dichlorophos; DDVP; NSC 6738; Vapona™) is an (organophosphate group) ANTICHOLINESTERASE, used as a household and public health fumigant, for crop protection and as an ANTHELMINTIC in animal feeds.

dicirenone [INN, USAN] (SC 26304) is a steroid, an ALDOSTERONE-ANTAGONIST (potassium-sparing) DIURETIC, which can be used in ANTIHYPERTENSIVE therapy.

diclofenac [BAN, INN] (diclofenac sodium [JAN, USAN]; Diclomax™; Diclozip™; Motifene™; Voltarol™; Voltarol Optha™; Voltaren™) is a phenylacetic acid derivative with similarities to other members of the heteroaryl acetic acid series, and has CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It is used orally to treat pain and inflammation in rheumatic disease and other musculoskeletal disorders, also topically for ocular inflammation. It is also a URICOSURIC AGENT and can be used as an antigout agent for actute attacks. It is being increasingly used to treat pain immediately after surgical procedures, and for renal colic, usually by injection (or suppositories). It can be used as the carboxymethyl ester, aceclofenac [INN]. It can be combined in combination therapy with the prostaglandin **misoprostol** in order to reduce gastric erosion (Arthrotec™). In 1995, diclofenac was worldwide the 9th best-selling prescription drug.

diclofenac sodium ➡ **diclofenac**.

diclofenamide ➡ **dichlorphenamide**.

diclofensine [INN] (moxifensine; Ro 8-4650) is an isoquinoline, a monoamine UPTAKE INHIBITOR, ANTIDEPRESSANT and ANTIPARKINSONIAN. Never marketed.

Diclomax™ ➡ **diclofenac**.

diclondazolic acid ➡ **lonidamine**.

dicloxacillin [BAN, INN, USAN] (dicloxacillin sodium [JAN, USAN]; Dynapen™) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an oral ANTIBACTERIAL to treat certain infections.

dicloxacillin sodium ➡ **dicloxacillin**.

Diclozip™ ➡ **diclofenac**.

dicobalt edetate [BAN, USAN] (Kelocyanor™) is used by injection as an ANTIDOTE to acute cyanide poisoning. It acts as a CHELATING AGENT by binding to cyanide to form a compound that can be excreted from the body.

dicolinium iodide [INN] is a quaternary ammonium derivative that is a GANGLION BLOCKING AGENT, formerly used as an ANTIHYPERTENSIVE.

dicophane [BAN] (clofenotane [INN]) is an organohalogen INSECTICIDE now banned or discouraged in many countries.

dicoumarol [INN] (dicumarol) is a coumarin isolated from *Melilotus alba* and *Anthoxanthum* spp. It is a vitamin K antagonist and thus after a period of medication is an oral ANTICOAGULANT. It also has ANTIBACTERIAL activity. It is the agent that causes 'sweet clover' disease in cattle.

dicrotalic acid ➡ **meglutol**.

dicumarol ➡ **dicoumarol**.

dicyclomine [BAN] (dicycloverine [INN]; dicyclomine hydrochloride [USAN]; Bentyl™; Merbentyl™) is a tertiary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which is used as a visceral ANTISPASMODIC, especially in irritable bowel syndrome.

dicyclomine hydrochloride ➡ **dicyclomine.**
dicycloverine ➡ **dicyclomine.**
Dicynene™ ➡ **ethamsylate.**
didanosine [BAN, INN, USAN] (DDI; ddi; NSC 612049; BMY 40900;Videx™) is a synthetic **REVERSE TRANSCRIPTASE INHIBITOR**, active as an **ANTIVIRAL** and used in **ANTI-HIV** treatment. It is mainly administered to patients who are intolerant to, or have not benefited from, **zidovudine.**
didehydroproline oxytocin ([Δ^3-Pro^7]oxytocin) is an analogue of **oxytocin** and an agonist at oxytocin receptors (i.e. an (OT) **VASOPRESSIN RECEPTOR AGONIST**) with greater **OXYTOCIC** activity than oxytocin.
Didrex™ ➡ **benzphetamine.**
Didronel™ ➡ **etidronic acid.**
Didronal PMO™ ➡ **etidronic acid.**
dieldrin [BAN, BSI, INN] (the stereoisomeric of endrin) is an organochlorine, non-systemic persistent **INSECTICIDE**; now superseded.
dienestrol ➡ **dienoestrol.**
dienoestrol [BAN] (dienestrol [INN, USAN]; Ortho-Dienestrol™) is a synthetic non-steroid **OESTROGEN** and metabolite of **stilboestrol**, and is used topically as part of HRT.
diethazine [BAN, INN] is chemically a phenothiazine, a **MUSCARINIC CHOLINOCEPTOR ANTAGONIST**. It has been used as an **ANTIPARKINSONIAN AGENT.**
diethenyl ether ➡ **vinyl ether.**
diethoxyphosphinylthiocholine ➡ **ecothiopate iodide.**
diethylcarbamazine [BAN, INN] is an **ANTHELMINTIC** used in treating muchereriasis, loasis, onchocerciasis, ascariasis and ankylostomiasis.
diethyl ether (ether; ethyl ether; diethyl oxide) is a highly volatile liquid formerly used widely as an inhalation **GENERAL ANAESTHETIC**. It is used as a veterinary anaesthetic and in emergency surgery in humans.
diethyl oxide ➡ **diethyl ether.**
diethylpropion [BAN, USAN] (amfepramone [INN]; diethylpropion hydrochloride [USAN]; Tenuate™ and many other names) is an **amphetamine**-like agent with **SYMPATHOMIMETIC** properties formerly used as an **APPETITE SUPPRESSANT.**
diethylpropion hydrochloride ➡ **diethylpropion.**
diethylstilbestrol ➡ **stilboestrol.**
diethylthiambutene [BAN, INN] (BW 49-191; BW 19C49; NIH 4185) is a dithienylamine, an **OPIOID RECEPTOR AGONIST** and (veterinary) **OPIOID ANALGESIC.**
difemerine [INN] is a tertiary amine **MUSCARINIC CHOLINOCEPTOR ANTAGONIST**, which can be used as a visceral **ANTISPASMODIC.**
difemetorex [INN] is an **amphetamine**-like agent with **SYMPATHOMIMETIC** properties. It has been used as an **APPETITE SUPPRESSANT.**
difenidol ➡ **diphenidol.**
difenidol hydrochloride ➡ **diphenidol.**
difenoxin [BAN, INN, USAN] (difenoxylic acid; McN JR 15403-11; R 15403) is a major metabolite of **diphenoxylate**, a phenylpiperidine series **OPIOID RECEPTOR AGONIST**, with reported **5-HYDROXYTRYPTAMINE RECEPTOR AGONIST** activity. It is used as an **ANTIDIARRHOEAL.**
difenoxylic acid ➡ **difenoxin.**
difetarsone [BAN, INN] is a pentavalent organic arsenical with **AMOEBICIDAL** properties, used in some countries orally to treat intestinal amoebiasis.
Differene™ ➡ **adapalene.**
differenol A ➡ **genistein.**
Difflam™ ➡ **benzydamine.**
diflorasone ➡ **flumethasone.**
diflorasone diacetate ➡ **flumethasone.**
difloxacin [INN] (difloxacin hydrochloride [USAN]) is a quinolinecarboxylic acid **ANTIBACTERIAL** (a DNA gyrase enzyme inhibitor).
difloxacin hydrochloride ➡ **difloxacin.**
Diflucan™ ➡ **fluconazole.**
diflucortolone [BAN, INN, USAN] (diflucortolone pivalate [USAN]; Ro 10-7614; Nerisone™ and many other names) is a very potent **CORTICOSTEROID**, a **GLUCOCORTICOID** with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties. It is used topically in the treatment of severe, acute inflammatory skin disorders, such as eczema and psoriasis, that are unresponsive to less potent corticosteroids.
diflucortolone pivalate ➡ **diflucortolone.**
diflunisal [BAN, INN, JAN, USAN] (Dolobid™) is one of the salicylate series, a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity. It is used orally in the treatment of pain and inflammation (especially in rheumatic disease and other musculoskeletal disorders) and for dysmenorrhoea.
difluorophate ➡ **dyflos.**
diflupredate [INN, USAN] (CM 9155; W 6309) is a **CORTICOSTEROID**, a **GLUCOCORTICOID** with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties. It is used topically in the treatment of severe, acute inflammatory skin disorders, such as eczema and psoriasis.
digenic acid ➡ **kainic acid.**
DIGESTIVE AGENTS are taken to mean any of a variety of agents that aid in some way the digestive process. (See also **NUTRITIONAL AGENTS.**)

Digestive enzymes may be given by mouth to make up deficiencies; e.g. **chymotrypsin** and **pancreatin**, which are currently used in human therapeutics to make up for deficiencies in secretions from the pancreatic exocrine gland (e.g. in cystic fibrosis and following pancreatectomy or chronic pancreatitis). They help digestion of starch, fat and protein. **Cellulase** was also once used, which is a concentrate of cellulose-splitting enzymes isolated from *Aspergillus niger*, and as a digestive adjunct. **Papain**, a purified proteolytic enzymic principle derived from *Carica papaya*, is essentially a vegetable pepsin. It is now not normally applied to food because of its adverse action on the gastrointestinal tract.

ANTACIDS are used to neutralize gastric acid, by raising gastric pH, so inhibiting peptic enzyme activity, which is greatly inhibited above pH 5. Although antacids are used to give symptomatic relief of dyspepsia, oesophagitis and gastritis, there is little objective evidence of accelerated healing of peptic ulcers (gastric or duodenal). Examples of antacids include **aluminium hydroxide**, **calcium carbonate**, **magnesium carbonate**, **magnesium hydroxide**, **magnesium trisilicate** and **sodium bicarbonate**.

Demulcents are agents or preparations that protect the mucous membranes and relieve pain and irritation. They are thought to work by forming a protective film and are commonly incorporated into antacid preparations for protecting the gastric mucosa of the mouth. The most commonly used is **alginic acid** or one of its alginate salts.

CARMINATIVES and *antifoaming agents* (defoaming agents) help relieve flatulence, and are used to reduce gastric discomfort and colic. They may work by helping to bring up of wind, or eructation (belching). There are many agents used, but the mode of action or efficacy is not well established; examples include extracts or volatile oils of

caraway, cardamom, camomile, cinnamon, cloves, dill, fennel, ginger, nutmeg and peppermint. A more recent approach is to use a polymer with a defoaming action agent, which helps gas coalesce, e.g. **simethicone** (a name for activated **dimethicone**).

Non-nutrient sweetening agents, with no calorific value, are widely used as sucrose substitutes. They are also valuable in masking unpalatable tastes, e.g. in oral liquid medicines. Examples include **aspartame**, **cyclamates** and **saccharin**.

Digibind™ is a proprietary preparation for infusion of digoxin-specific antibody fragments (Fab) which react with CARDIAC GLYCOSIDES, and can be used for emergency use as an ANTIDOTE to treat overdosage by **digoxin** and **digitoxin**.

digitoxigenin is a widely distributed aglycone, with CARDIAC STIMULANT actions similar to other CARDIAC GLYCOSIDES.

digitoxin [BAN, INN, JAN, USAN] (Crystodigin™ and many other names) is a CARDIAC GLYCOSIDE, a deoxy derivative of **digoxin**, an (inotropic) CNS STIMULANT and ANTIARRHYTHMIC used in treating congestive heart failure treatment.

digoxin [BAN, INN, JAN, USAN] (Lanoxin™ and many other names) is a CARDIAC GLYCOSIDE isolated from *Digitalis purpurea*, *Digitalis lanata* and other *Digitalis* spp. It is an (inotropic) CNS STIMULANT and ANTIARRHYTHMIC used in congestive HEART FAILURE TREATMENT.

1,10-diguanidinodecane ➡ 1,1-decamethylenediguanidine.

dihexyverine [INN] (dihexyverine hydrochloride [USAN]) Is a tertiary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used is a visceral ANTISPASMODIC.

dihexyverine hydrochloride ➡ dihexyverine.

dihydralazine [BAN, INN] is similar to **hydralazine**. It is a VASODILATOR with ANTIHYPERTENSIVE properties.

dihydrocapsaicin ➡ capsaicin.

dihydrocodeine [INN] (hydrocodeine) is one of the phenanthrene series, an OPIOID RECEPTOR AGONIST, which can be used as an OPIOID ANALGESIC and ANTITUSSIVE.

dihydrocodeinone ➡ hydrocodone.

dihydrodeoxymorphine ➡ desomorphine.

dihydroergocristine is the 9,10-dihydro derivative of **ergocristine**. It is a peripheral and cerebral VASODILATOR, mainly used as a mixture with other dihydroergot alkaloids (e.g. as **co-dergocrine mesylate**) to improve brain function in senile dementia.

α-dihydroergocryptine ➡ ergotoxine.

β-dihydroergocryptine ➡ ergotoxine.

dihydroergotamine [BAN, INN] (dihydroergotamine mesylate [JAN, USAN]; DHE45™) is a semisynthetic dihydro derivative of **ergotamine**, with diminished OXYTOCIC and VASOCONSTRICTOR effects compared to ergotamine. It is an α-ADRENOCEPTOR ANTAGONIST, weak vasoconstrictor, and ANTIMIGRAINE AGENT in the treatment of acute attacks. It can also be used together with heparin in the prophylaxis of postoperative deep-vein thrombosis.

dihydroergotamine mesylate ➡ dihydroergotamine.

DIHYDROFOLATE REDUCTASE INHIBITORS have as a target the enzyme dihydrofolate reductase, and are known as *folate antagonists*. These include ANTICANCER AGENTS ('antimetabolites') such as **methotrexate**, ANTIBACTERIAL AGENTS such as **trimethoprim**, and the ANTIPROTOZOALS **pyrimethamine** and **proguanil** (which are used to treat malaria). Folate is required for synthesis of purine nucleotides, which in turn are essential for DNA synthesis and cell division. In mammals it is necessary to convert body folates, through two separate enzyme-catalysed reduction stages, to tetrahydrofolate (FH_4). The first stage involves the enzyme dihydropteroate reductase, which catalyses the conversion of *p*-aminobenzoic acid to folate (and this stage can be inhibited by sulphonamides). The second stage is conversion of folate to tetrahydrofolate by the enzyme dihydrofolate reductase. Methotrexate, trimethoprim, pyrimethamine and proguanil inhibit this latter conversion and lead to depletion of folic acid.

Methotrexate is used as an oral anticancer agent, but resistance may develop in tumour cells, and there are a number of unwanted side-effects. It has a high affinity for the mammalian form of dihydrofolate reductase and cannot be used as an antibacterial or antimalarial drug. After use at high doses in humans, the extent of depletion of folic acid may be such, that 'rescue' with administration of folinic acid (a form of tetrahydrofolate) is necessary.

Pyrimethamine and proguanil are used as oral antimalarials,and inhibit the utilization of folate by the malarial parasite, so are valuable in chemoprophylaxis and in preventing the transmission of malaria. (See ANTIMALARIALS.) Trimethoprim is a useful antibacterial, and as an antiprotozoal in antimalarial therapy. The selectivity of these agents derives, in part, from the fact that whereas mammals can obtain folic acid from the diet, bacteria and the asexual forms of the malarial parasite must synthesize it. Also, the dihydrofolate reductase enzyme in humans is less sensitive to these drugs than that of the parasites.

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dihydroharmine ➡ harmaline.

dihydromorphine (hydromorphine) is one of the phenanthrene series and derived from **morphine**. It is an OPIOID RECEPTOR AGONIST which was formerly used as an OPIOID ANALGESIC.

dihydromuscimol is a conformationally restricted GABA analogue. It is an extensively investigated ($GABA_A$) GABA RECEPTOR AGONIST, used as a pharmacological tool.

5,6-dihydroprostacyclin ➡ prostaglandin I_1.

dihydrostilboestrol ➡ hexestrol.

dihydrostreptomycin [BAN, INN] (dihydrostreptomycin sulfate [USAN]) is an (aminoglycoside) ANTIBIOTIC with ANTIBACTERIAL properties.

dihydrostreptomycin sulfate ➡ dihydrostreptomycin.

dihydrotachysterol [BAN, INN] (dihydrotachysterol$_2$; DHT™; Hytakerol™) is a synthetic analogue that acts as a calcitriol-like VITAMIN and CALCIUM METABOLISM MODIFIER. Although chemically closely related to **calcitriol**, it has relatively weak activity. It is used in acute, chronic and latent tetany, idiopathic tetany and hypoparathyroidism.

dihydrotachysterol$_2$ ➡ dihydrotachysterol.

dihydrotestosterone ➡ stanolone.

dihydroxyaluminium aminoacetate ➡ basic aluminium glycinate.

dihydroxyaluminium sodium carbonate [USAN] (carbaldrate [INN]) can be used as an oral non-systemic ANTACID.

dihydroxybenzoic acid (3,4-dihydroxybenzoic acid; catechol-4-carboxylic acid; hypogallic acid; carbohydroquinonic acid) can be extracted from lignin, and is isolated in free state from various higher plants, e.g. *Fagopyrum* and *Alnus* spp. It is an ANTIOXIDANT & FREE-RADICAL SCAVENGER and dietary chemopreventive agent

(inhibits development of neoplasms in animal models), LDL oxidation inhibitor and PLATELET AGGREGATION INHIBITOR.

2,5-dihydroxybenzoic acid ➡ **gentisic acid.**

3,4-dihydroxybenzoic acid ➡ **dihydroxybenzoic acid.**

dihydroxybusulfan ➡ **treosulfan.**

1α,25-dihydroxycholecalciferol ➡ **calcitriol.**

3,4-dihydroxycinnamic acid ➡ **caffeic acid.**

4',7-dihydroxyisoflavone ➡ **daidzein.**

3,4-dihydroxyphenethylamine ➡ **dopamine.**

3,4-dihydroxyphenylalanine ➡ **levodopa.**

dihydroxypropyl PABA ➡ **roxadimate.**

2,6-dihydroxypurine ➡ **xanthine.**

dihydroxytyrosine ➡ **droxidopa.**

1α,25-dihydroxyvitamin D_3 ➡ **calcitriol.**

diiodohydroxyquinoline [BAN, INN] (iodoquinol [USAN]; Yodoquinol™) has AMOEBICIDAL, ANTIBACTERIAL and ANTIFUNGAL activity. It can be used orally to treat intestinal amoebiasis.

diiodotyrosine (iodogorgoic acid) is a precursor of both **thriiodothyronine** and **thyroxine**. It has been used as an ANTITHYROID AGENT to treat hyperthyroidism and some types of goitre. Labelled ^{125}I and ^{131}I compounds can be used in radiotherapy.

diisopromine [INN] is a substituted phenylpropylamine, which has been used as a CHOLERETIC and ANTISPASMODIC.

diisopropyl fluorophosphate ➡ **dyflos.**

diisopropyl fluorophosphonate ➡ **dyflos.**

diisopropylphenol ➡ **propofol.**

diisopropyl phosphorofluoridate ➡ **dyflos.**

Dijex™ ➡ **aluminium hydroxide; magnesium carbonate; magnesium hydroxide.**

Dilantin™ ➡ **phenytoin.**

Dilaudid™ ➡ **hydromorphone.**

dilazep [INN] (dilazep dihydrochloride [JAN]) is a diazepine, a coronary VASODILATOR, ANTIANGINAL, adenosine potentiator and PLATELET AGGREGATION INHIBITOR. Protective effects reported in immunologically-induced glomerular injuries.

dilazep dihydrochloride ➡ **dilazep.**

dilevalol [BAN, INN] (dilevalol hydrochloride [USAN]) is the (1'R,1''R)-form of **labetalol** and has the greatest activity as a β-ADRENOCEPTOR ANTAGONIST. No longer marketed due to hepatotoxic effects.

dilevalol hydrochloride ➡ **dilevalol.**

dill oil ➡ **carvone.**

diloxanide [BAN, INN] (Furamide™) is an ANTIPROTOZOAL and AMOEBICIDAL used orally to treat chronic infection of the intestine by amoebae *Entamoeba histolytica*, which causes amoebic dysentery.

diltiazem [BAN, INN] (diltiazem hydrochloride [JAN, USAN]; Dilzem™ etc.) is a CALCIUM-CHANNEL BLOCKER. It can be used therapeutically as an ANTIHYPERTENSIVE and ANTIANGINAL.

diltiazem hydrochloride ➡ **diltiazem.**

Dilzem™ ➡ **diltiazem.**

dimaprit is a thiourea, a HISTAMINE H_2-RECEPTOR AGONIST. It is used as a pharmacological tool.

dimazole ➡ **diamthazole.**

dimecrotic acid [INN] is a cinnamic acid derivative, which has been used as a CHOLERETIC and ANTISPASMODIC.

dimefline [BAN, INN] (dimefline hydrochloride [JAN, USAN]; DW 62; NSC 114650; Rec 7-0267) is a benzopyranone, with similar properties as **doxapram hydrochloride** as a CNS STIMULANT and RESPIRATORY STIMULANT. It was previously used orally or by injection, including for treatment of barbiturate and other CNS depressant overdose.

dimefline hydrochloride ➡ **dimefline.**

Dimelor™ ➡ **acetohexamide.**

dimenhydrinate ➡ **diphenhydramine.**

dimepheptanol [BAN, INN] (methadol; NIH 2933) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST, which is active as an OPIOID ANALGESIC. It is also elaborated in a number of close analogues, derivatives or diastereoisomers with similar properties. These include: methadyl acetate [BAN, USAN] = acetylmethadol [INN]; alphamethadol [BAN, INN]; alphacetylmethadol [INN]; levomethadyl; **levacetylmethadol** [INN] = levomethadyl acetate [USAN]; betamethadol [BAN, USAN]; betacetylmethadol [INN] = betacemethadone.

dimepropion [BAN] (metamfepramone [INN]) is an **ephedrine**-like agent with SYMPATHOMIMETIC and CNS STIMULANT properties. It can be used as an APPETITE SUPPRESSANT.

dimercaprol [BAN, INN, USAN] (BAL; British Anti-Lewisite) is a dithiol derivative, a therapeutic CHELATING AGENT, which was developed for treatment of the toxic effect of **Lewisite** (an arsenical war gas). It is used as an ANTIDOTE for heavy metal poisoning (As, Au, Hg), and in conjunction with **sodium calcium edetate** for the acute treatment of lead poisoning.

dimesna [INN] (mesna disulphide) is a metabolite of **mesna**, a mercaptosulphonic compound, which forms free thiol groups in solution that react like CHELATING AGENTS to bind toxic elements (e.g. arsenic poisoning) or toxic groups of certain drugs including ANTICANCER AGENTS, especially **cyclophosphamide**, to alleviate urotoxic side-effects. It also is a MUCOLYTIC AGENT.

dimetacrine [INN] is one of the tricyclic class of monoamine UPTAKE INHIBITORS and has been used as an oral ANTIDEPRESSANT.

dimetagrel (SC 41156) is an imidazolyl derivative, with PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST activity, and is an ANTITHROMBOTIC.

dimethicone [BAN] (dimeticone [INN, JAN]; polydimethyl siloxane; Dentinox™; Infacol™) is a water repellent and can be used as a dermatological agent in topical preparations (e.g. E45™; Siopel™). Orally, it is used as a DIGESTIVE and antiflatulent (carminative) antifoaming agent. It is a component of many compound ANTACID and indigestion preparations (e.g. Asilone™; Dioval™). A mixture of dimethicone with silicon dioxide is simethicone [USAN] (dimethicone activated; a component of Kolanticon™; Setlers™).

dimethicone activated ➡ **dimethicone.**

dimethindene [BAN] (dimetindene [INN]; dimethindene maleate [USAN]; dimetindene maleate [JAN]) is one of the alkylamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS. It has been used for the symptomatic relief of hypersensitivity reactions, including urticaria, angio-oedema and rhinitis. It has also been used in compound preparations including 'cold-cures'.

dimethindene maleate ➡ **dimethindene.**

dimethisoquin [BAN] (quinisocaine [INN]) is an ester series LOCAL ANAESTHETIC, which has been used by topical application.

dimethisterone [BAN, INN, USAN] (MJ 5048; P 5048) is a synthetic steroid, a PROGESTOGEN.

2,5-dimethoxyamphetamine is a 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST that has PSYCHOTROPIC (hallucinogenic) properties.

dimethoxystrychnine ➡ **brucine.**

dimethyladamantanamine ➡ **memantine.**

dimethylbiochanin B ➡ **daidzein.**

β-dimethylcysteine ➡ **penicillamine.**

1,1-dimethyl-4-diphenylpiperazinium iodide ➡ DMPP.
dimethylergometrine ➡ **methysergide**.
N-dimethylethanolamine ➡ **deanol**.
dimethylnortestosterone ➡ **mibolerone**.
dimethylthiambutene [BAN, INN] is a dithienylamine, an OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC.
7,8-dimethyltocol; **E308** ➡ **γ-tocopherol**.
dimethyltryptamine ➡ **DMT**.
1,3-dimethylxanthine ➡ **theophylline**.
3,7-dimethylxanthine ➡ **theobromine**.
dimeticone ➡ **dimethicone**.
dimetindene ➡ **dimethindene**.
dimetindene maleate ➡ **dimethindene**.
Dimetriose™ ➡ **gestrinone**.
diminazene aceturate [BAN, INN] (Berenil™) is an aromatic diamidine, with ANTIPROTOZOAL, ANTITRYPANOSOMAL and ANTIBACTERIAL activities, used in veterinary practice.
Dimotane™ ➡ **brompheniramine**.
Dimotapp™ ➡ **brompheniramine**.
dimoxaprost [INN] (Hoe 260) is a prostaglandin and PROSTANOID RECEPTOR AGONIST, with potential GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC activity.
DIM-SA ➡ **succimer**.
Dindevan™ ➡ **phenindione**.
dinitolmide [BAN, INN] is a dinitrobenzamide derivative with AMOEBICIDAL activity. It can be used as an ANTICOCCIDIAL poultry feed additive.
dinitrogen monoxide ➡ **nitrous oxide**.
dinoprost [BAN, INN, JAN] (prostaglandin $F_{2\alpha}$; $PGF_{2\alpha}$; Prostin F2 alpha™) is a common endogenous prostaglandin. It is a (FP subtype) PROSTAGLANDIN RECEPTOR AGONIST, and is a powerful smooth muscle stimulant and OXYTOCIC AGENT, used clinically as an ABORTIFACIENT.
dinoprostone [BAN, INN, JAN, USAN] (prostaglandin E_2; PGE_2; Prepidin™; Propess-RS; Prostin E2™ and many other names) is one of the most common and biologically active of the endogenous mammalian prostaglandins. It is a (EP subtype) PROSTAGLANDIN RECEPTOR AGONIST, and is a VASODILATOR, OXYTOCIC, ABORTIFACIENT and LUTEOLYTIC AGENT.
Diocalm™ ➡ **diphenoxylate**.
Diocalm Ultra™ ➡ **loperamide**.
dioctyl sodium sulphosuccinate ➡ **docusate sodium**.
Dioderm™ ➡ **hydrocortisone**.
Dioval™ ➡ **dimethicone**.
dioxadrol [INN] (CL 639C) is a piperidyldioxolane, an OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC, with ANTIDEPRESSANT and CNS STIMULANT actions. It has also been used in the form of its various separate enantiomers which have rather different pharmacology: levoxadrol [INN], levoxadrol hydrochloride [USAN]; dexoxadrol [INN], dexoxadrol hydrochloride [USAN]; dioxadrol hydrochloride [USAN].
dioxadrol hydrochloride ➡ **dioxadrol**.
dioxane phosphate ➡ **dioxathion**.
dioxathion [BAN, BSI] (dioxation [INN]; dioxane phosphate) is an (organophosphate group) anticholinesterase nonsystemic INSECTICIDE and ACARICIDE.
dioxation ➡ **dioxathion**.
dioxybenzone [INN, USAN] (NSC 56769) is a substituted benzoquinone, a SUNSCREEN AGENT effective against UV light.
Diparalene™ ➡ **chlorcyclizine**.
dipenteneglycol ➡ **terpin**.
Dipentum™ ➡ **olsalazine**.
diperodon [BAN, INN, USAN] is an ester series LOCAL ANAESTHETIC, which has been used by topical application for local pain relief.
diphemanil methylsulfate [BAN] (diphemanil metilsulfate [INN]) is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as a visceral ANTISPASMODIC.
diphemanil metilsulfate ➡ **diphemanil methylsulfate**.
diphenan [INN] was formerly used as an ANTHELMINTIC.
diphenhydramine [BAN, INN] (diphenhydramine hydrochloride [USAN]; diphenhydramine citrate [USAN]; benzhydramine; Benylin™; Benadryl™; Nytol™ and many other names) is one of the ethanolamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS with MUSCARINIC CHOLINOCEPTOR ANTAGONIST and SEDATIVE activity. It can be used orally for the symptomatic relief of allergic symptoms, such as rhinitis and urticaria, and is incorporated as an ANTITUSSIVE into a number of proprietary cough and cold preparations. It has marked sedative properties and can be used orally as a HYPNOTIC for the relief of occasional insomnia. The chlorotheophylline salt, diphenhydramine teoclate = dimenhydrinate, [BAN, INN] (Dramamine™), and is used as an ANTIEMETIC for prophylaxis against motion sickness. The *N*-oxide of diphenhydramine = amoxydramine [INN], and a derivative of this is amoxydramine camsilate, [INN]; both have been used as antihistamines.
diphenhydramine citrate ➡ **diphenhydramine**.
diphenhydramine hydrochloride ➡ **diphenhydramine**.
diphenhydramine teoclate ➡ **diphenhydramine**.
diphenidol [BAN, USAN] (difenidol [INN]; diphenidol hydrochloride [USAN]; difenidol hydrochloride [JAN]; SKF 478) is a piperidine derivative. It has been used as an ANTIEMETIC.
diphenidol hydrochloride ➡ **diphenidol**.
diphenoxylate [BAN, INN] (diphenoxylate hydrochloride [USAN]; NIH 756; Diocalm™) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST. It is used as an ANTIDIARRHOEAL and often in combination with other drugs, e.g. **atropine sulphate** = **co-phenotrope** = Diarphen™, Lomotil™.
diphenoxylate hydrochloride ➡ **diphenoxylate**.
diphenylamine chloroarsine ➡ **Adamsite**.
diphenylbutazone ➡ **phenylbutazone**.
diphenylpyraline [BAN, INN] (diphenylpyraline hydrochloride [USAN]; diphenylpyraline teoclate [JAN]; Histryl™ and many other names) is a piperazine derivative with HISTAMINE H_1-RECEPTOR ANTAGONIST, MUSCARINIC CHOLINOCEPTOR ANTAGONIST and SEDATIVE actions. It has been used for the symptomatic relief of hypersensitivity reactions, including urticaria, angio-oedema and rhinitis. It is incorporated into compound antitussive preparations or 'cold-cures' (e.g. with **phenylpropanolamine** = Anidox™ and Eskornade™). The chlorotheophyllinate derivative is = piprinhydrinate [BAN, INN]; diphenylpyraline teoclate [JAN], an antihistamine and ANTIEMETIC.
diphenylpyraline hydrochloride ➡ **diphenylpyraline**.
diphenylpyraline teoclate ➡ **diphenylpyraline**.
dipipanone [BAN, INN] (BW 337C48; Hoechst 10805; NIH 7343) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST, with OPIOID ANALGESIC activity.
dipivefrine [BAN, INN] (dipivefrin hydrochloride [USAN]; Propine™ and many other names) is a SYMPATHOMIMETIC that chemically is a prodrug which is converted within the eye into **adrenaline**. It can be used therapeutically in topical

ANTIGLAUCOMA TREATMENT and orally as an ANTIASTHMATIC.

dipivefrin hydrochloride ➡ **dipivefrine**.

dipotassium clorazepate ➡ **clorazepic acid**.

diprafenone [INN] is a β-ADRENOCEPTOR ANTAGONIST and ANTIARRHYTHMIC.

diprenorphine [BAN, INN] (diprenorphine hydrochloride [BAN]) is a morphone, an OPIOID RECEPTOR ANTAGONIST and a high affinity subtype non-selective agent used in veterinary practice to reverse the effects of **etorphine**.

diprenorphine hydrochloride ➡ **diprenorphine**.

diproleandomycin [INN] is a semisynthetic (macrolide) ANTIBIOTIC with ANTIBACTERIAL activity.

diprophylline [BAN, INN] (dyphylline [USAN]; Dyflex™; Lufyllin™; Neothylline™) is a **theophylline** derivative with properties similar to other xanthines. It has ANTIHYPERTENSIVE, DIURETIC, SMOOTH MUSCLE RELAXANT, BRONCHODILATOR and ANTIASTHMATIC properties. It can also be used in conjunction with **guaifenesin** in the treatment of obstructive airways disease.

Diprosone™ ➡ **betamethasone**.

diprotin A is a tripeptide that is an ENZYME INHIBITOR with selectivity as an AMINOPEPTIDASE INHIBITOR active against dipeptidylpeptidase IV (EC 3.4.11). It can be used as a pharmacological tool in experimental analytical studies.

dipyridamole [BAN, INN, USAN] (Persantin™) is a pyrimidine derivative, a coronary VASODILATOR, a (class 1a) ANTIARRHYTHMIC, an adenosine UPTAKE INHIBITOR causing indirect adenosine receptor activation, and enhances effects of anticoagulants and is a PLATELET AGGREGATION INHIBITOR. It is used particularly in preventing complications in heart valve replacement.

dipyrithione [BSI, INN, USAN] (omadine disulphide) is a dithiopyridine ANTIBACTERIAL and ANTIFUNGAL.

dipyrone [BAN, USAN] (metamizole sodium [INN]; sulpyrine [JAN]; noramidopyrine methanesulfonate; NSC 73205) is the sodium sulphonate of **amidopyrine**, and is one of the pyrazolone series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It was formerly used extensively for musculoskeletal pain, but it is now rarely used because of the risk of severe haematological effects (agranulocytosis).

direct red ➡ **Congo red**.

Dirythmin™ ➡ **disopyramide**.

Disipal™ ➡ **orphenadrine**.

disodium edetate ➡ **edetic acid**.

disodium sulbenicillin ➡ **sulbenicillin**.

disodium sulphate ➡ **sodium sulphate**.

d-isoephedrine sulfate ➡ **pseudoephedrine**.

disoprofol ➡ **propofol**.

disopyramide [BAN, INN, JAN, USAN] (disopyramide phosphate [JAN, USAN]; Dirythmin™; Isomide™; Norpace™; Rythmodan™) is a pyridineacetamide, a (type I) ANTIARRHYTHMIC, used orally or by injection to regularize the heartbeat, especially following a myocardial infarction.

disopyramide phosphate ➡ **disopyramide**.

Dispirin™ ➡ **aspirin**.

Distaclor™ ➡ **cefaclor**.

Distamine™ ➡ **penicillamine**.

distamycin A ➡ **stallimycin**.

distigmine bromide [BAN, INN, JAN] (Ubretid™) is a bisquaternary ammonium carbamate, a reversible ANTICHOLINESTERASE. It is a PARASYMPATHOMIMETIC that can be used to stimulate the bladder to treat urinary retention, and the intestine to treat paralytic ileus. It can also be used to enhance neuromuscular transmission in the treatment of myasthenia gravis.

disulfiram [BAN, INN, USAN] (tetraethylthiuram disulfide; Antabuse™) is an ANTIFUNGAL, INSECTICIDAL and ANTIBACTERIAL AGENT. It acts as an ENZYME INHIBITOR acting as a DOPAMINE β-HYDROXYLASE INHIBITOR and an ALDEHYDE DEHYDROGENASE INHIBITOR. Its main therapeutic use is as an adjunct in treating alcoholism (alcohol deterrent).

ditazole [INN] (APT 574; S 222) is an oxazole, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It also has potent PLATELET AGGREGATION INHIBITOR properties, and has been used in the treatment of thromboembolitic disorders.

ditekiren [INN, USAN] is a peptide, a RENIN INHIBITOR, an (aspartyl) PROTEASE INHIBITOR, with ANTIHYPERTENSIVE properties.

dithiazanine iodide [INN] is a broad-spectrum ANTHELMINTIC.

dithiocarb ➡ **ditiocarb sodium**.

dithranol [BAN, INN] (trihydroxyanthracene; Dithranol Ointment, B.P.; Micanol™; Psorin™) is isolated from the coral *Tubastraea micrantha*. It is used topically as a DERMATOLOGICAL AGENT in the treatment of dermatitis, psoriasis and other skin complaints. Its use is limited by skin irritancy and staining. It shows antiproliferative effects on keratinocytes activity, inhibiting cell division (antimitotic) and having some ANTIINFLAMMATORY activity. It may be used in some preparations as dithranol triacetate, and is combined with a KERATOLYTIC AGENT (or agents) that has a moisturizing effect (such as urea in many skin preparations).

Dithranol Ointment, B.P. ➡ **dithranol**.

dithranol triacetate ➡ **dithranol**.

ditiocarb sodium [INN] (sodium diethyldithiocarbamate; dithiocarb; DTC) is a CHELATING AGENT used as an ANTIDOTE for thallium poisoning. It is also an (IMMUNOSTIMULANT) IMMUNOMODULATOR.

Diucardin™ ➡ **hydroflumethiazide**.

DIURETICS are used to reduce fluid in the body by increasing the excretion of electrolytes by the kidney – so increasing urine production. They have an extensive use. Reducing oedema is, in itself, of benefit in some disorders, and diuretics may be used in acute pulmonary oedema, congestive heart failure, some liver and kidney disease, glaucoma and in certain electrolyte disturbances, such as hypercalcaemia and hyperkalcaemia. The commonest use of diuretics is in antihypertensive therapy, where their action of reducing oedema is of value in reducing the load on the heart, which then – over some days or weeks – gives way to a beneficial reduction in blood pressure (that seems associated with vasodilator action). See ANTIHYPERTENSIVE AGENTS.

In relation to their specific actions and uses, diuretics can be divided into a number of distinct classes.

Osmotic diuretics (e.g. **mannitol**, **urea**) are inert compounds that are secreted into the proximal tubules of the kidney, and are not reabsorbed, so carry salts and water with them into the urine.

Loop diuretics (e.g. **ethacrynic acid**, **bumetanide**, **frusemide**) have a vigorous action on the ascending tubules of the loop of Henlé (inhibiting resorption of sodium and water, and also some potassium), and are used for short periods, especially in heart failure. See ATPASE INHIBITORS.

Thiazide and related diuretics (e.g. **bendrofluazide**, **benzthiazide**, **chlorothiazide**, **chlorthalidone**, **clopamide**, **cyclopenthiazide**, **hydrochlorothiazide**, **hydroflumethiazide**, **indapamide**, **mefruside**, **metolazone**, **polythiazide** and **xipamide**) are the most used and have a

moderate action in inhibiting sodium reabsorption at the distal tubule of the kidney, allowing their prolonged use as antihypertensives, but they may cause potassium loss from the blood to the urine which needs correction. See ATPASE INHIBITORS.

Potassium-sparing diuretics (e.g. **amiloride**, **spironolactone** and **triamterene**) have a weak action on the distal tubule of the kidney, which, as the name suggests, cause retention of potassium; making them suitable for combination with some of the other diuretic classes, and for some specific conditions. See ATPASE INHIBITORS.

ALDOSTERONE ANTAGONISTS (e.g. **potassium canrenoate** and **spironolactone**) work by blocking the action of the hormone aldosterone (a MINERALOCORTICOID), and this makes them suitable for treating oedema associated with aldosteronism, liver failure and certain heart conditions.

CARBONIC ANHYDRASE INHIBITORS (e.g. **acetazolamide** and **dichlorphenamide**) are weak diuretics, but are now rarely used to treat systemic oedema, though useful in reducing fluid in the anterior chamber of the eye where it is causing raised intraocular pressure (glaucoma).

In the treatment of hypertension, diuretics are commonly used in combination with other classes of drugs, usually β-blockers (see β-ADRENOCEPTOR ANTAGONISTS).

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Diurexan™ ➡ **xipamide**.

Diuril™ ➡ **chlorothiazide**.

divalproex sodium ➡ **valproic acid**.

divaplon [INN] (RU 32698) is a methylimidazopyrimidine derivative, a BENZODIAZEPINE BINDING-SITE INVERSE AGONIST. It shows ANXIOLYTIC activity without sedation in animal model systems. It is used as a pharmacological tool.

divinyl ether ➡ **vinyl ether**.

divinyl oxide ➡ **vinyl ether**.

dixanthogen [INN] is used in INSECTICIDE formulation and also as a HERBICIDE.

Dixarit™ ➡ **clonidine**.

dizocilpine [INN] (MK 801; dizocilpine maleate [USAN]) is a dibenzocycloheptenimine, a noncompetitive GLUTAMATE RECEPTOR ANTAGONIST, which acts as a NMDA channel blocking agent. In experimental studies it shows NEUROPROTECTIVE, ANTICONVULSANT and PSYCHOTROPIC properties.

dizocilpine maleate ➡ **dizocilpine**.

DJ 7041 ➡ **romurtide**.

DM ➡ **Adamsite**.

DMAA ➡ **memantine**.

DMCM is a β-carbolines (i.e. containing an indole nucleus fused to a pyridine ring), a BENZODIAZEPINE BINDING-SITE INVERSE AGONIST at **flumazenil**-sensitive benzodiazepine receptors. Such agents have pro-convulsant, anxiogenic and possibly pro-cognition actions. It is extensively used as a pharmacological tool.

DMPP (1,1-dimethyl-4-diphenylpiperazinium iodide) is a NICOTINIC CHOLINOCEPTOR AGONIST that acts as a ganglionic stimulant. It is used as a pharmacological tool.

DMS ➡ **succimer**.

DMSA ➡ **succimer**.

DMT (dimethyltryptamine; nigerine) is an indole alkaloid from *Mimosa hostilis*, *Acacia* spp., *Arundo donax*, *Desmodium* spp., *Phalaris* spp., *Banisteriopsis argentea*, *Psychotria* spp., *Virola peruviana*, *Zanthoxylum* spp. and others (Leguminosae, Gramineae, Malphigiaceae, Rubiaceae, Myristicaceae, Rutaceae). It is a ($5HT_{1D}$ and other subtypes) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST. It has PSYCHOTROPIC (hallucinogenic) properties and is a drug of abuse.

D-norgestrel ➡ **levonorgestrel**.

dobutamine [BAN, INN, USAN] (dobutamine hydrochloride [JAN, USAN]; Dobutrex™; Posiject™) is a β-ADRENOCEPTOR AGONIST selective for the β_1-subtype. It is a racemate, the active (*S*)-form is levdobutamine [INN]. It shows activity as a positive INOTROPIC AGENT which can be used therapeutically in congestive HEART FAILURE TREATMENT.

dobutamine hydrochloride ➡ **dobutamine**.

Dobutrex™ ➡ **dobutamine**.

docarpamine [INN] is a prodrug of DOPAMINE, and has been investigated as an orally active CNS STIMULANT.

docebenone [INN, USAN] (AA 861) is a dodecadiynylcyclohexadienedione derivative, an orally active (5) LIPOXYGENASE INHIBITOR. It has been investigated as an ANTIINFLAMMATORY for treatment of allergic disorders, and as an ANTIASTHMATIC. It has shown protective effects in animal models of pancreatitis.

docetaxel [BAN, INN] (Taxotere™; NSC 628503) is a taxane ANTICANCER AGENT. Clinically, it can be used systemically, especially in the treatment of breast carcinomas.

doconexent [INN] (cervonic acid) is a metabolic product of **α-linolenic acid** present in fish oils and in many phospholipids. Tuna eyeballs are a major source. It is extensively marketed as a dietary supplement in Japan. It is essential for the functional development of the nervous system, including the retina. It modulates arachidonic metabolism and has ANTIINFLAMMATORY effects. It may also be a PLATELET AGGREGATION INHIBITOR, augment efficiency of anticancer agents, be a cardiac ANTIARRHYTHMIC AGENT, an ANTIHYPERLIPIDAEMIC, an ANTIHYPERTENSIVE and putative NOOTROPIC AGENT. It is a component of **omega-3 marine triglycerides** (Maxepa™).

docusate sodium [BAN, INN] (dioctyl sodium sulphosuccinate) has surfactant properties and is a (faecal softener, stimulant) LAXATIVE used therapeutically alone (also in the form of calcium and potassium salts) or combined with other laxatives; e.g. **danthron** in co-danthrusate.

dofetilide [BAN, INN, USAN] (UK 68798) is a methanesulphonamide, a (K_{VR}) POTASSIUM-CHANNEL BLOCKER and (class III) ANTIARRHYTHMIC.

dolasetron [BAN, INN] (dolasetron mesylate [INN, USAN]; MDL 73147EF) is a substituted quinolizinylindole, a selective ($5\text{-}HT_3$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It shows ANTIEMETIC activity against chemotherapy-induced emesis, and also has ANTIMIGRAINE activity.

dolasetron mesylate ➡ **dolasetron**.

Dolmatil™ ➡ **sulpiride**.

Dolobid™ ➡ **diflunisal**.

Dolophine™ ➡ **methadone**.

Doloxene™ ➡ **dextropropoxyphene**.

domiodol [INN, USAN] (MG 13608) is a dioxolane and a MUCOLYTIC.

domiphen bromide [BAN, INN, USAN] (Bradosol™) is a quaternary ammonium ANTIBACTERIAL, used as an ANTISEPTIC for minor infections of the mouth and throat.

domitroban [INN] is a phenylsulfonylamino-bicycloheptenoic acid derivative, a THROMBOXANE RECEPTOR ANTAGONIST. It is a potential ANTIASTHMATIC, and an experimental cerebroprotective. It inhibits proteinuria in

animal models of renal injury.

domoprednate [INN] (Ro 12-7024) is a CORTICOSTEROID, a GLUCOCORTICOID, with ANTIINFLAMMATORY and ANTIALLERGIC properties. It can be used topically in the treatment of skin disorders, such as eczema and psoriasis.

domperidone [BAN, INN, JAN, USAN] (R 33812; Motilium™ and many other names) is a benzimidazole, a (D_2) DOPAMINE RECEPTOR ANTAGONIST. It is used as an oral ANTIEMETIC and antinauseant, particularly for the relief of nausea and vomiting in patients undergoing treatment with cytotoxic drugs. Also, it possesses GASTRIC MOTILITY STIMULANT (prokinetic) actions, and can prevent vomiting in patients treated for parkinsonism with the drugs **levodopa** or **bromocriptine**.

donetidine [BAN, INN, USAN] (SKF 93574) pyridylfurfuryl-thioaminopyrimidinone, is a HISTAMINE H_2-RECEPTOR ANTAGONIST. It is a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.

DOPA ➡ **levodopa**.

DOPA DECARBOXYLASE INHIBITORS interfere with an enzyme (aromatic L-amino acid decarboxylase) involved in the degradation of **dopamine**, which is an important CNS neurotransmitter. The formation of dopamine follows the same route as noradrenaline. Conversion of L-tyrosine to DOPA (**levodopa**; dihydroxyphenylalanine) is the rate-limiting step and is catalysed by tyrosine hydroxylase. The next step is the conversion of DOPA to dopamine, by the cytosolic enzyme DOPA decarboxylase. This enzyme can be inhibited by drugs, including **carbidopa**, a hydrazine derivative of DOPA, and can be used as an adjunct in the treatment of Parkinson's disease (see ANTIPARKINSONIAN AGENTS). DOPA decarboxylase (aromatic L-amino acid decarboxylase) also decarboxylates other L-amino acids, including L-histidine and L-tryptophan (involved in the synthesis of **histamine** and **5-hydroxytryptamine**, respectively). In the treatment of Parkinson's disease, drugs may be used that increase the effects of the dopaminergic system. Very widely, this is by giving therapeutically the natural precursor levodopa, thereby increasing levels of dopamine. The effectiveness of levodopa may be increased by co-administering a dopa decarboxylase inhibitor that does not penetrate the blood–brain barrier (e.g. **benzerazide** or **carbidopa**), since this increases the effective reservoir of levodopa in the peripheral circulation, to subsequently be taken up into the brain.

Trendelenburg, U. *et al.* (eds) (1988) *Catecholamines. Handbook of Experimental Pharmacology, Vol. 90, parts 1 and 2*, Springer-Verlag, Berlin.

Zhu, M.-Y. *et al.* (1995) Aromatic L-amino acid decarboxylase: Biological characterisation and functional role. *Gen. Pharmacol.*, **26**, 681-696.

dopamine [BAN, INN] (dopamine hydrochloride [JAN, USAN]; 3,4-dihydroxyphenethylamine; hydroxytyramine; Intropin™) is a catecholamine that occurs in the mammalian CNS, in several higher plants and alga. It is a major central neurotransmitter, a DOPAMINE RECEPTOR AGONIST and a SYMPATHOMIMETIC, with predominantly (β_1-subtype) β-ADRENOCEPTOR AGONIST actions. It can be used as a CARDIAC STIMULANT and ANTIHYPOTENSIVE in cardiogenic hypotension. Its precursor amino acid, **levodopa**, is used as an ANTIPARKINSONIAN AGENT.

dopamine hydrochloride ➡ **dopamine**.

DOPAMINE β-HYDROXYLASE INHIBITORS interfere with a stage in the biosynthesis of the catecholamine neurotransmitters, or hormones, **dopamine**, **noradrenaline** and **adrenaline**. This synthesis follows a route where conversion of L-tyrosine to DOPA (**levodopa**; dihydroxyphenylalanine) is the rate-limiting step, and is catalysed by tyrosine hydroxylase, followed by conversion of DOPA to dopamine, by the cytosolic enzyme, DOPA decarboxylase. In the central and peripheral nervous systems, dopamine is converted to noradrenaline by dopamine-β-hydroxylase (DBH), which, though a relatively non-specific enzyme, is restricted to catecholamine-synthesizing cells. It can be inhibited by many drugs, which brings the risk of complex drug interactions. In the peripheral sympathetic nervous system, noradrenaline, in turn, is converted to adrenaline, by phenylethylamine *N*-methyl transferase, so inhibition of DBH can therefore, in principle, slow production of both adrenaline and noradrenaline; but normally tyrosine hydroxylase is the rate-limiting step in the synthetic pathway.

Agents that can inhibit dopamine-β-hydroxylase include **disulfiram**, **fusaric acid**, phenylpropargylamine, FLA 63, FLA 57, LY 10853 and SKF 102698. These agents are of value in experimental investigations, but none is used clinically for this purpose (though disulfiram is used to modify ethanol metabolism by a different mechanism: see ALDEHYDE DEHYDROGENASE INHIBITORS).

Trendelenburg, U. *et al.* (eds) (1988) *Catecholamines. Handbook of Experimental Pharmacology, Vol. 90, parts 1 and 2*, Springer-Verlag, Berlin.

DOPAMINE RECEPTOR AGONISTS act to stimulate dopamine receptors, and these have a major neurotransmitter role in the CNS. Dopamine is also a precursor in the formation of the catecholamine monoamine neurotransmitter **noradrenaline** and the hormone **adrenaline**.

The distribution of dopamine in the brain is very non-uniform. There is some in the limbic system, and a large proportion is found in the corpus striatum – a part of the extrapyramidal motor system which is concerned with the coordination of movement. Dopamine-containing nerves are found in three main pathways in the brain. The nigrostriatal pathway contains about 75% of the dopamine in the brain, and the cell bodies lie in the substantia nigra and the nerves terminate in the corpus striatum. The second important pathway is the mesolimbic pathway, the cell bodies of which lie in the mid-brain and project to parts of the limbic system, particularly the nucleus accumbens. The third, the tubero-infundibular system, consists of short neurons that run from the arcuate nucleus of the hypothalamus to the median eminence and the pituitary gland, the secretions of which they regulate.

With respect to disturbances of dopamine neurotransmitter function, the first-mentioned neuronal system is clearly critically disabled in the best-studied of the neurodegenerative diseases, namely Parkinson's disease. Here the balance in the motor system between cholinergic and dopaminergic systems is disturbed by a progressive degeneration of dopaminergic nigrostriatal pathways and neurons within the substantia nigra. The main symptoms are rigidity and tremor coupled with extreme slowness in initiating movement (hypokinesia). Similar symptoms are produced as a major side-effect of some ANTIPSYCHOTIC AGENTS, probably by block of dopamine D_2 receptors, and these are termed parkinsonian symptoms. The treatment of Parkinson's disease is discussed more fully under ANTIPARKINSONIAN AGENTS, but consists basically of using agents that increase the effects of the dopaminergic system. This can be achieved by administering the natural precursor **levodopa**, thereby increasing levels of dopamine; and also by stimulating dopamine D_2 receptors, e.g. with **bromocriptine**, **lisuride**, **pergolide** and sometimes **apomorphine**. Some other symptoms are best treated with anticholinergic drugs.

The nigrostriatal pathway and the limbic system also seem to be involved in behavioural effects, and there is evidence that schizophrenia in humans is associated with dopaminergic hyperactivity, and dopamine receptor antagonists are used as antipsychotic agents: see **DOPAMINE RECEPTOR ANTAGONISTS**.

Neuroendocrine function of dopamine involves the third pathway mentioned above: the tubero-infundibular system. The hypothalamus secretes various hormones, mainly peptides, that modulate pituitary function, and amongst them is dopamine – which inhibits **prolactin** release. It has been known for some time that various ergot derivatives inhibit prolactin release, and it is now realized that they do this by acting as agonists at dopamine D_2 receptors, e.g. bromocriptine. This fact also accounts for the side-effects of some dopamine agonists. Bromocriptine can be used to suppress prolactin secretion by tumours of the pituitary. Also growth hormone secretion is increased by dopamine in normal subjects, but paradoxically inhibits it in acromegaly (a syndrome characterized by excessive growth in some parts of the body), and this syndrome can be treated with bromocriptine.

Vomiting is triggered in the chemoreceptor trigger zone of the medulla, and nearly all dopamine receptor agonists (e.g. bromocriptine), and agents that increase dopamine in the brain (e.g. levodopa), cause vomiting. Conversely, many dopamine receptor antagonists (e.g. **metoclopramide**, and phenothiazines, e.g. **chlorpromazine** and **prochlorperazine**) have **ANTIEMETIC** activity.

Given this extensive involvement of dopamine in physiological and pathophysiological processes in the body, it is necessary to achieve some selectivity of drug action by targeting different subtypes of dopamine receptors. Until recently, two main types of receptor were identified, D_1 and D_2. With the application of the techniques of molecular biology, a number of subtypes are now recognized (though with alternative schemes of nomenclature). Dopamine D_1-like receptors couple positively to adenylyl cyclase, they are mostly involved in postsynaptic inhibition, and consist of at least two subtypes D_1 (or D_{1A}) and D5 (or D_{1B}). Dopamine D_2-like receptors are coupled negatively to adenylyl cyclase, inhibiting neurons both presynaptically and postsynaptically by opening K^+-channels, and consist of at least three subtypes D_2 (or D_{2A}), D_3 (D_{2B}) and D_4 (D_{2C}).

Agonist ligands, which are subtype-selective, include: at D_{1A}, SKF 38393 and dihydrexedine; at D_{2A}, bromocriptine, **fenoldopam**, (+)PHNO and N 0437; and at D_{2B}, PD 128907, 7-OH-DPAT. There are no agonist ligands with a very great selectivity at D_4 and D_5 receptors.

Seeman, P. *et al.* (1994) Dopamine receptor pharmacology. *Trends Pharmacol. Sci.*, **15**, 264-270.

Strange, P.G. *et al.* (1995) D_4 receptors and schizophrenia. *J. Neurochem.*, **65**, 2381-2383.

Strange, P.G. (1996) The binding of agonists and antagonists to dopamine receptors. *Biochem. Soc. Trans.*, **24**, 188-192.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

DOPAMINE RECEPTOR ANTAGONISTS act at sites discussed in more detail under **DOPAMINE RECEPTOR AGONISTS**. Drugs of this type are of great value both as experimental tools and in human therapeutics. Dopamine seems to be involved in behavioural effects, and there is evidence that schizophrenia in humans is associated with dopaminergic hyperactivity and dopamine antagonists are used as **ANTIPSYCHOTIC AGENTS** or neuroleptic agents. Dopamine antagonists that are used as antipsychotics can be divided by chemical classes: phenothiazines include **chlorpromazine** and **thioridazine**; butyrophenones include **haloperidol**; thioxanthines include **flupenthixol**; benzamides include **sulpiride**; diphenylbutylpiperazines include **pimozide**; and dibenzazepines include **clozapine**. None is entirely selective, but in benefiting schizophrenia these drugs act mainly at dopamine D_2 receptors (subtypes D_2, D_3, D_4). Clozapine has important actions at D_4 receptors – which have been especially implicated in schizophrenia – and this may account for the favourable activity profile of this drug. The dopamine antagonists have important side-effects, some known as extrapyramidal effects. These include the parkinsonian syndrome, characterized by motor disturbances (see **ANTIPARKINSONIAN AGENTS**), and tardive dyskinesia (a serious movement disorder that may appear with chronic treatment). Those antipsychotics with markedly depressant side-effects are also, somewhat misleadingly, known as major tranquillizers. The antipsychotics have many side-effects that are not related to the blockade of dopamine receptors, especially anticholinergic effects.

Vomiting is triggered in the chemoreceptor trigger zone of the medulla, and nearly all dopamine receptor agonists (e.g. **bromocriptine**), and agents that increase dopamine in the brain (e.g. **levodopa**), cause vomiting. Conversely, many dopamine receptor antagonists (e.g. **metoclopramide** and several phenothiazines, e.g. **chlorpromazine** and **prochlorperazine**) have **ANTIEMETIC** activity.

With respect to receptor selectivity and the experimental use of antagonist ligands, there is still a shortage of truly selective ligands. However, antagonist ligands with some selectivity at subtypes include: D_1 (or D_{1A}), SCH 23390, SCH 39166, SKF 83566 ; at D_2 (or D_{2A}), (s)-**sulpiride**, **raclopride**, **domperidone** and haloperidol; at D_3 (or D_{2B}), nafadotride; at D_4 (D_{2C}), L 745870, L 741742 and U 191387; and at D_5 (or D_{1B}) no selective antagonists are available.

Civelli, O. *et al.* (1993) Molecular diversity of the dopamine receptors. *Annu. Rev. Pharmacol. Toxicol.*, **32**, 281-307.

Iversen, L.L. (1993) Dopamine receptors: The D_4 and schizophrenia. *Nature*, **365**, 393.

Lieberman, J.A. *et al.* (1993) Neurochemistry and neuroendocrinology of schizophrenia: a selective review. *Schizophr. Bull.*, **19**, 371-429.

Dopar™ ➡ **levodopa**.

dopexamine hydrochloride [BAN, INN, USAN] is a **β-ADRENOCEPTOR AGONIST** selective for the β_2-subtype, also with activity as a (peripheral D_1) **DOPAMINE RECEPTOR AGONIST**. Therapeutically, it can be used in **HEART FAILURE TREATMENT**.

Dopram™ ➡ **doxapram**.

DOPS ➡ **droxidopa**.

Doral™ ➡ **quazepam**.

Doralese™ ➡ **indoramin**.

Doriden™ ➡ **glutethimide**.

Dormonact™ ➡ **loprazolam**.

dorzolamide [INN, USAN] (Trusopt™) is a sulphonamide dioxide, a **CARBONIC ANHYDRASE INHIBITOR**, which is used in **ANTIGLAUCOMA TREATMENT**.

Dostinex™ ➡ **cabergoline**.

dosulepin ➡ **dothiepin**.

dosulepin hydrochloride ➡ **dothiepin**.

Dothapax™ ➡ **dothiepin**.

dothiepin [BAN] (dosulepin [INN]; dothiepin hydrochloride [USAN]; dosulepin hydrochloride [JAN]; Dothapax™; Prepadine™; Prothiaden™) is one of the tricyclic class of monoamine **UPTAKE INHIBITORS** and is used as an oral **ANTIDEPRESSANT**, especially in cases where some degree of sedation is required.

dothiepin hydrochloride ➡ **dothiepin**.

Dovonex™ ➡ **calcipotriol**.

doxaminol [INN] is a **β-ADRENOCEPTOR AGONIST** and a

VASODILATOR.

doxapram [BAN, INN] (doxapram hydrochloride [JAN, USAN]; AHR 619; Dopram™) is a pyrrolidinone, a CNS STIMULANT and RESPIRATORY STIMULANT. It is used by injection to relieve severe respiratory difficulties in patients who suffer from chronic obstructive airways disease, and in respiratory depression following surgery particularly where ventilatory support is not possible.

doxapram hydrochloride ➡ **doxapram**.

doxaprost [INN, USAN] (AY 24559) is a prostaglandin and PROSTANOID RECEPTOR AGONIST with BRONCHODILATOR action.

doxazosin [BAN, INN] (doxazosin mesylate [USAN]; Cardura™) is a piperazinyl quinazolinyl nucleus, an (α_1-subtype) α-ADRENOCEPTOR ANTAGONIST, with structure and actions similar to **prazosin**. It is an ANTIHYPERTENSIVE, and is used particularly in the treatment of benign prostatic hyperplasia. The (-)-form is reported also to have antihypertensive activity; the (+)-form is useful for treatment of benign prostatic hyperplasia. It also alters serum lipid profile via increase in LDL-receptor activity and other effects.

doxazosin mesylate ➡ **doxazosin**.

doxefazepam [INN] (SAS 643) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity, and has been used for insomnia.

doxepin [BAN, INN] (doxepin hydrochloride [USAN]; NSC 108160; Adapin™; Sinequan™; Curatin™ and many other names) is one of the tricyclic class of monoamine uptake inhibitors and has been used as an oral ANTIDEPRESSANT, especially in cases where some degree of sedation is required. It is also reported to have HISTAMINE H_1-RECEPTOR ANTAGONIST and HISTAMINE H_2-RECEPTOR ANTAGONIST activity, and some antipruritic activity.

doxepin hydrochloride ➡ **doxepin**.

doxifluridine [INN, JAN] (5-DFUR; Ro 21-9738) is a prodrug of **fluorouridine**, and has been given orally or by injection as an ANTICANCER AGENT for breast and other solid tumours.

doxofylline [INN, USAN] is a theophylline derivative, an ANTISPASMODIC, used for treatment of bronchospasm.

doxorubicin [BAN, INN, USAN] (doxorubicin hydrochloride [JAN, USAN]; FI 106; K 1039; KW 125; NSC 123127; Adriamycin™; Rubex™) is an (anthracycline group) ANTIBIOTIC of the **adriamycin** group, a metabolite of *Streptomyces peucetius*. It is an important cytotoxic ANTICANCER AGENT, including for acute leukaemias, lymphomas and some solid tumours. It is also reported to have ANTIVIRAL and ANTI-HIV activity.

doxorubicin hydrochloride ➡ **doxorubicin**.

doxycycline [BAN, INN, USAN] (Vibramycin™) It can be used clinically as a broad-spectrum semisynthetic oral ANTIBACTERIAL to treat a variety of infections.

doxylamine [BAN, INN] (doxylamine succinate [USAN]; histadonylamine succinate) is one of the ethanolamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS with MUSCARINIC CHOLINOCEPTOR ANTAGONIST and SEDATIVE actions. It has been used for the symptomatic relief of hypersensitivity reactions, including urticaria and rhinitis, and also as a short-term HYPNOTIC. It is incorporated into compound ANTITUSSIVE preparations or 'cold-cures'.

doxylamine succinate ➡ **doxylamine**.

Dozic™ ➡ **haloperidol**.

DP 1904 ➡ **nafagrel**.

DPCPX (PD 116948) is a xanthine derivative, a (P1 purinoceptor) ADENOSINE RECEPTOR ANTAGONIST selective for the A_1-subtype, used as a tool in adenosine receptor studies.

DPMA (PD 125944) is an adenosine derivative, active as a (P1 purinoceptor) ADENOSINE RECEPTOR AGONIST selective for the A_2-subtype. It is used as a tool in adenosine receptor studies. It is reported to enhance serum erythropoietin levels in hypoxic (polycythaemic) mice.

draflazine [BAN, INN, USAN] (R 75321) is a piperazineacetanilide derivative, a purine UPTAKE INHIBITOR with coronary VASODILATOR and ANTIARRHYTHMIC properties.

Dramamine™ ➡ **diphenhydramine**.

Drapolene™ ➡ **benzalkonium chloride**.

draquinolol [INN] is a β-ADRENOCEPTOR ANTAGONIST, showing β_1-selectivity.

droloxifene [INN] (FK 435; ICI 79280; K 21060 E) is a non-steroid structurally related to **tamoxifen**, and with similar uses. It is an ANTIOESTROGEN under investigation as an ANTICANCER AGENT for advanced breast cancer.

Drebac™ ➡ **malathion**.

Driclo™ ➡ **aluminium chloride**.

Drinamyl™ ➡ **amylobarbitone**; **dexamphetamine**.

Drisdol™ ➡ **ergocalciferol**.

Dristan™ ➡ **oxymetazoline**.

Drogenil™ ➡ **flutamide**.

Droleptan™ ➡ **droperidol**.

dromostanolone propionate ➡ **drostanolone**.

dronabinol [INN, USAN] (NSC 134454; Deltanyne™; Marinol™) is a constituent of marijuana. It is the (6aR,10aR)-(-)-trans-form of **Δ^9-tetrahydrocannabinol**. It is a CANNABINOID RECEPTOR AGONIST and has euphoric, mild PSYCHOTROPIC (hallucinogenic) and ANTIEMETIC properties. As an antinauseant and antiemetic, it is used as an adjunct in cancer chemotherapy.

droperidol [BAN, INN, JAN, USAN] (Droleptan™; Inapsine™ and many other names) is one of the butyrophenone group, with general properties similar to **haloperidol**, and is used as an ANTIPSYCHOTIC. It is used primarily in emergencies to subdue or soothe psychotic (particularly manic) patients during behavioural disturbances. It is also used in patients about to undergo certain diagnostic procedures that may be difficult or painful, because it promotes a sensation of detachment, and to treat nausea and vomiting caused by chemotherapy.

drospirenone [INN] (ZK 30595) is a metabolite of **spirorenone**, a steroid, and is an ALDOSTERONE-ANTAGONIST (potassium-sparing) DIURETIC, which can be used in ANTIHYPERTENSIVE therapy. It is also a PROGESTOGEN (a potential contraceptive) and antimineralocorticoid.

drostanolone [BAN, INN] (drostanolone propionate [BAN]; dromostanolone propionate [USAN]; NSC 12198 and many other names) is a steroid, with ANABOLIC and ANDROGEN actions.

drostanolone propionate ➡ **drostanolone**.

drotebanol [BAN, INN] (oxymetebanol [JAN]; RAM 327) is an OPIOID RECEPTOR AGONIST with ANTITUSSIVE activity.

droxidopa [INN, JAN] (dihydroxytyrosine (2S,3R)-form); DOPS) is a **noradrenaline** precursor, proposed as an ANTIPARKINSONIAN AGENT.

droxypropine [BAN, INN] is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST, OPIOID ANALGESIC and ANTITUSSIVE.

DSIP ➡ **delta sleep-inducing peptide**.

DTC ➡ **ditiocarb sodium**.

DTIC™ ➡ **dacarbazine**.

DTIC-Dome™ ➡ **dacarbazine**.

DTS ➡ **succimer**.

DU 23000 ➡ **fluvoxamine**.
DU 23811 ➡ **clovoxamine**.
Dubam™ ➡ **ethyl salicylate**.
Duofilm™ ➡ **salicylic acid**.
DuP 753 ➡ **losartan**.
DuP 785 ➡ **brequinar**.
DuP 996 ➡ **linopirdine**.
Duracreme™ ➡ **nonoxinol 9**.
Duragel™ ➡ **nonoxinol 9**.
Duranest™ ➡ **etidocaine**.
Duricef™ ➡ **cefadroxil**.
Durogesic™ ➡ **fentanyl**.
Duromine™ ➡ **phentermine**.
duteplase [INN] (Solclot™) is a FIBRINOLYTIC AGENT of the (tissue-type) plasminogen activator group, forming plasmin which degrades fibrin so breaking up thrombi, thus acting as a THROMBOLYTIC. Chemically, it is a recombinant double-chain protein. Therapeutically, its thrombolytic actions are used in the acute treatment of myocardial embolism.
Duvoid™ ➡ **bethanechol chloride**.
DVC ➡ **cyclovalone**.
DW 62 ➡ **dimefline**.
DW 75 ➡ **pentacosactride**.
dyclocaine [BAN] (dyclonine [INN]; dyclonine hydrochloride [USAN]; Dyclone™) is a piperidino-propiophenone, with ANTIARRHYTHMIC and LOCAL ANAESTHETIC properties. It is used by topical application, including to mucous membranes, for local pain relief.
dyclonine hydrochloride ➡ **dyclocaine**.
dyclonine ➡ **dyclocaine**.
Dyclone™ ➡ **dyclocaine**.
dydrogesterone [BAN, INN, USAN] (NSC 92336) is a synthetic steroid, a PROGESTOGEN, which has been used for the treatment of dysmenorrhoea.
Dyflex™ ➡ **diprophylline**.
dyflos [BAN] (diisopropyl fluorophosphate; diisopropyl fluorophosphonate; diisopropyl phosphorofluoridate; difluorophate; DFP) is a phosphorylating essentially irreversible (organophosphate group) ANTICHOLINESTERASE. It is a PARASYMPATHOMIMETIC which is used topically as a MIOTIC AGENT in ANTIGLAUCOMA TREATMENT.
DynaCirc™ ➡ **isradipine**.
Dynapen™ ➡ **dicloxacillin**.
Dynese™ ➡ **magaldrate**.
dynorphin B (prodynorphin 228-240) is a 13 residue peptide containing leucine enkephalin, isolated from the pituitary gland of human, pig, rat and ox. It is a potent OPIOID RECEPTOR AGONIST.
dyphylline ➡ **diprophylline**.
Dyrenium™ ➡ **triamterene**.
Dytac™ ➡ **triamterene**.
Dytide™ ➡ **triamterene**.

E

'E' ➡ **MDMA**.
E45™ ➡ **dimethicone**.
E-64 ➡ **rexostatine**.
E101 ➡ **riboflavine**.
E160(a) ➡ **β-carotene**.
E171 ➡ **titanium dioxide**.
E 270 ➡ **lactic acid**.
E300 ➡ **ascorbic acid**.
E301 ➡ **ascorbic acid**.
E307 ➡ **α-tocopherol**.
E309 ➡ **δ-tocopherol**.
E 421 ➡ **mannitol**.
E0659 ➡ **azelastine**.
E 671 ➡ **teprenone**.
E 687 ➡ **bifemelane**.
E 954 ➡ **saccharin**.
E 2663 ➡ **bentiromide**.
E6123 is a triazolothienodiazepine derivative, a [1,4]benzodiazepine, which has been developed as an experimental PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST.
EA 1299 ➡ **tenamfetamine**.
EA 1475 ➡ **MDMA**.
Easprin™ ➡ **aspirin**.
EB 382 ➡ **alminoprofen**.
ebrotidine [INN] is a thiazolylthioaminobenzene-sulphonamide, a HISTAMINE H_2-RECEPTOR ANTAGONIST. It is a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.
E.C. 3.2.1.35 ➡ **hyalosidase**.
E.C. 3.2.1.96 ➡ **hyaluronidase**.
EC 3.4.21.1 ➡ **chymotrypsin**.
ecadotril [INN, USAN] is the (*S*)-form of acetorphan and is a (mercapto) ACE INHIBITOR. It is a VASODILATOR that therapeutically has been used as an ANTIHYPERTENSIVE. Other forms are racecadotril [INN], the racemic form of acetorphan, and dexecadotril [INN], the (*R*)-form of acetorphan.
echothiopate ➡ **ecothiopate iodide**.
ECMA ➡ **ethylcholine aziridinium**.
econazole nitrate [JAN, USAN] (Ecostatin™; Pevaryl™; Spectazole™) is an (imidazole group) broad-spectrum ANTIFUNGAL. Clinically, it can be used topically.
Ecostatin™ ➡ **econazole nitrate**.
ecothiopate ➡ **ecothiopate iodide**.
ecothiopate iodide [BAN, INN] (echothiopate; diethoxyphosphinylthiocholine; MI 217; Camsilon™; Phospholine Iodide™) is an irreversible (organophosphate group) ANTICHOLINESTERASE. It is a PARASYMPATHOMIMETIC used topically as a miotic in ANTIGLAUCOMA TREATMENT.
'Ecstasy' ➡ **MDMA**.
10-EDAAM ➡ **edatrexate**.
edatrexate [INN, USAN] (10-EDAAM; CGP 30694) is an analogue of **methotrexate**, and acts as a DIHYDROFOLATE REDUCTASE INHIBITOR acting as an antimetabolite ANTICANCER AGENT. It has been tried against various malignant neoplasms.
Edecrin™ ➡ **ethacrynic acid**.

DU 23000 ➡ **fluvoxamine**.
DU 23811 ➡ **clovoxamine**.
Dubam™ ➡ **ethyl salicylate**.
Duofilm™ ➡ **salicylic acid**.
DuP 753 ➡ **losartan**.
DuP 785 ➡ **brequinar**.
DuP 996 ➡ **linopirdine**.
Duracreme™ ➡ **nonoxinol 9**.
Duragel™ ➡ **nonoxinol 9**.
Duranest™ ➡ **etidocaine**.
Duricef™ ➡ **cefadroxil**.
Durogesic™ ➡ **fentanyl**.
Duromine™ ➡ **phentermine**.
duteplase [INN] (Solclot™) is a FIBRINOLYTIC AGENT of the (tissue-type) plasminogen activator group, forming plasmin which degrades fibrin so breaking up thrombi, thus acting as a THROMBOLYTIC. Chemically, it is a recombinant double-chain protein. Therapeutically, its thrombolytic actions are used in the acute treatment of myocardial embolism.
Duvoid™ ➡ **bethanechol chloride**.
DVC ➡ **cyclovalone**.
DW 62 ➡ **dimefline**.
DW 75 ➡ **pentacosactride**.
dyclocaine [BAN] (dyclonine [INN]; dyclonine hydrochloride [USAN]; Dyclone™) is a piperidino-propiophenone, with ANTIARRHYTHMIC and LOCAL ANAESTHETIC properties. It is used by topical application, including to mucous membranes, for local pain relief.
dyclonine hydrochloride ➡ **dyclocaine**.
dyclonine ➡ **dyclocaine**.
Dyclone™ ➡ **dyclocaine**.
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Edecrin™ ➡ **ethacrynic acid**.

edetate calcium disodium ➡ **edetic acid**.
edetate dipotassium ➡ **edetic acid**.
edetate sodium ➡ **edetic acid**.
edetate trisodium ➡ **edetic acid**.
edetic acid [BAN, INN] (ethylenediaminetetraacetic acid; EDTA) is a CHELATING AGENT used as an ANTICOAGULANT for blood samples, and included as an additive to many pharmaceutical preparations. It has only a low solubility in water, so in therapeutics it is used mainly in the form of one of its salts, including disodium edetate [BAN]; edetate calcium disodium [USAN]; edetate dipotassium [USAN]; edetate sodium [USAN]; edetate trisodium [USAN]; sodium calcium edetate [BAN, INN]. Therapeutically, these chelating agents can be used as ANTIDOTES in metal-poisoning where the poison is by those elements for which they have a high affinity (e.g. lead). They can also be used as anticoagulants (veterinary practice), and as calcium metabolism modifiers for treatment of hypercalcaemia and as ENZYME INHIBITORS where metal ions are cofactors (e.g. metalloproteinases).
edoxudine [INN, USAN] is a nucleoside ANTIVIRAL AGENT, which is used in the treatment of herpes infections.
EDRF ➡ **nitric oxide**.
edrophonium bromide ➡ **edrophonium chloride**.
edrophonium chloride [BAN, INN] (edrophonium bromide, BAN; Ro 2-3198; Tensilon™; Enlon™; Reversol™) is a quaternary ammonium rapidly reversing ANTICHOLINESTERASE. It can be used by injection at the termination of operations to reverse the actions of NEUROMUSCULAR BLOCKING AGENTS (when it is often administered with **atropine**), and as a diagnostic agent for myasthenia gravis.
EE3ME ➡ **mestranol**.
Efcortelan™ ➡ **hydrocortisone**.
Efcortesol™ ➡ **hydrocortisone**.
Efemast™ ➡ **gamolenic acid**.
Effexor™ ➡ **venlafaxine**.
eflornithine [BAN, INN] (eflornithine hydrochloride [USAN]) has ANTIPROTOZOAL activity (acting as an ornithine decarboxylase inhibitor) and can be used as an ANTITRYPANOSOMAL AGENT in the treatment of *Pneumocystis* pneumonia (e.g. in AIDS). It is also reported to have some activity as an ANTICANCER AGENT.
eflornithine hydrochloride ➡ **eflornithine**.
efloxate [INN, JAN] (ethyl flavonoxyacetate) is a carbonylmethoxyflavone, a coronary VASODILATOR and ANTIANGINAL AGENT.
eformoterol [BAN] (formoterol [INN]; formoterol fumarate [JAN]; Foradil™) is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype that therapeutically can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.
Efudex™ ➡ **fluorouracil**.
Efudix™ ➡ **fluorouracil**.
EGF ➡ **epidermal growth factor**.
EGTA ➡ **egtazic acid**.
egtazic acid [INN, USAN] (EGTA) is an ethylene glycol-tetraacetic acid derivative, a CHELATING AGENT used as a biochemical tool, e.g. to chelate divalent ions.
EL 784 ➡ **naxaprostene**.
Elantan™ ➡ **isosorbide mononitrate**.
Elavil™ ➡ **amitryptyline**.
elcatonin is eel **calcitonin**.
Eldepryl™ ➡ **selegiline**.
Eldisine™ ➡ **vindesine**.
ELE ➡ **eledoisin**.
eledoisin [INN] (ELE) is a naturally occurring 11 amino acid residue *C*-terminally amidated peptide, a tachykinin from the posterior salivary glands of *Eledone* spp. It acts as a TACHYKININ RECEPTOR AGONIST (showing greater activity at NK_3/NK_2 than NK_1 receptors). It stimulates extravascular smooth muscle, is a powerful VASODILATOR and transient HYPOTENSIVE AGENT, increases capillary permeability and causes salivation. It has been given locally to stimulate lacrimal secretion in certain disease states. It is used as a pharmacological tool.
eletriptan [BAN] (UK 116044) is a substituted indole, a selective ($5\text{-}HT_{1B/D}$-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST. It is used as a pharmacological tool.
Elimite™ ➡ **permethrin**.
Elixophyllin™ ➡ **theophylline**.
Elleste-Solo™ ➡ **oestradiol**.
elliptinium acetate [BAN, INN] (9 HME; NSC 264137) is a cytotoxic ANTICANCER AGENT thought to act by binding to DNA. It has been tried in the treatnment of breast cancers.
elmustine [INN] (HECNU; CNU-ethanol; NSC 29485) is a halogenated nitrosourea related to **carmustine** and is an alkylating ANTICANCER AGENT that directly damages DNA, so interfering with cell replication. It has been used to treat some stomach, pancreas and brain tumours.
Elocom™ ➡ **mometasone**.
Elspar™ ➡ **crisantaspase**.
eltoprazine [INN] is a piperazine derivative, a non-selective ($5\text{-}HT_1$-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST. It has ANTIHYPERTENSIVE and antiaggressive actions.
Eltroxin™ ➡ **thyroxine**.
emakalim [INN] is a pyridinylbenzopyrancarbonitrile derivative, a POTASSIUM-CHANNEL ACTIVATOR, with ANTIHYPERTENSIVE properties.
Emblon™ ➡ **tamoxifen**.
embramine [BAN, INN] (mebrophenhydramine) is one of the ethanolamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS with MUSCARINIC CHOLINOCEPTOR ANTAGONIST and SEDATIVE actions. It has been used as an ANTIEMETIC.
embutramide [BAN, INN, USAN] is a **methadone** analogue, an OPIOID RECEPTOR AGONIST, which has OPIOID ANALGESIC activity. It has been used as a euthanasia drug for animals.
Emcor™ ➡ **bisoprolol**.
Emcyt™ ➡ **estramustine**.
EMD 26644 ➡ **tioxaprofen**.
EMD 33290 ➡ **tiprostanide**.
EMD 33400 ➡ **oxazolam**.
EMD 34946 ➡ **luprostiol**.
EMD 60218 ➡ **FK 739**.
emepronium bromide [BAN, INN] is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST, an ANTISPASMODIC with **atropine**-like activity. It can be used in the treatment of urinary disorders such as urinary frequency.
Emeside™ ➡ **ethosuximide**.
Emete-Con™ ➡ **benzquinamide**.
EMETICS are substances that cause vomiting (emesis). They are used mostly to treat poisoning by non-corrosive substances and some other highly toxic substances, when the patient is conscious, especially for drug overdose. Some affect the vomiting centre in the brain and/or irritate the gastrointestinal tract. Among the best known and most used are **ipecacuanha**, **apomorphine**, which stimulates dopamine D_2 receptors in the chemoreceptor trigger zone to produce vomiting, and **copper sulphate**, which works locally in the stomach, due, it is thought, to some nerve-mediated irritation (see DOPAMINE RECEPTOR AGONISTS).

Inadvertently, many drugs in normal use may produce nausea as a side-effect. A number of drugs go on to produce

frank vomiting commonly enough to be a clinical hazard. Virtually all the OPIOID ANALGESICS frequently produce nausea and vomiting, with **morphine** amongst the worst. Similarly, with many dopamine receptor agonists, e.g. **bromocriptine**, nausea and vomiting is a major side-effect and may limit their use in treating Parkinson's disease (see DOPAMINE RECEPTOR AGONISTS). Probably the worst therapeutic drugs in this respect are many of the chemotherapeutic ANTICANCER AGENTS, notably **cisplatin**, and it may prove impossible to use these without concomitant therapy with ANTIEMETICS.

emetine [BAN] (emetine hydrochloride [USAN] is a constituent of **ipecacuanha**, an alkaloid obtained from the ipecacuanha plant, and is an inhibitor of RNA, DNA and protein synthesis. It shows activity as an orally active EMETIC, and is also a general parasiticide, AMOEBICIDAL, ANTIBACTERIAL, ANTIVIRAL AGENT with ANTICANCER activity.

emetine hydrochloride ➡ **emetine**.

Eminase™ ➡ **anistreplase**.

emoctakin ➡ **interleukin-8**.

emorfazone [INN, JAN] (M 73101) is one of the pyrazolone series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

EN 1530 ➡ **naloxone**.

EN 1639A ➡ **naltrexone**.

En 2234A ➡ **nalbuphine**.

Enabuse™ ➡ **ibogaine**.

enadoline [INN] (enadoline hydrochloride [USAN]; CI 977; PD 129290) is an oxaspirobenzofuran derivative, an (κ) OPIOID RECEPTOR AGONIST, OPIOID ANALGESIC and ANTICONVULSANT. It is neuroprotective in animal models.

enadoline hydrochloride ➡ **enadoline**.

enalapril [BAN, INN] (enalapril maleate [JAN, USAN]; Innovace™; Innozide™;Vasotec™ and many other names) is the ethyl ester prodrug of **enalaprilat**. It is an ACE INHIBITOR used as an ANTIHYPERTENSIVE and in HEART FAILURE TREATMENT.

enalaprilat [BAN, INN, USAN] (enalaprilic acid; MK-422) is a pseudopeptide, an ACE INHIBITOR used as an ANTIHYPERTENSIVE. It is normally used in the form of its prodrug, **enalapril**.

enalaprilic acid ➡ **enalaprilat**.

enalapril maleate ➡ **enalapril**.

enalkiren [INN, USAN] is a peptide derivative, an ENZYME INHIBITOR active as a RENIN INHIBITOR, an (aspartyl) PROTEASE INHIBITOR, thus preventing conversion of angiotensinogen to **angiotensin I**. It can be used parenterally in ANTIHYPERTENSIVE treatment.

enciprazine [BAN, INN] (enciprazine hydrochloride [USAN]; WY 48624) is a piperazineethanol derivative under investigation as an ANXIOLYTIC.

enciprazine hydrochloride ➡ **enciprazine**.

enclomifene ➡ **clomiphene**.

enclomiphene ➡ **clomiphene**.

Encron™ ➡ **rizolipase**.

endogenous pyrogen ➡ **interleukin-1**.

ENDOPEPTIDASE INHIBITORS act at one or other of the endopeptidase enzymes that cleave the *C*-terminal residue from oligopeptides or proteins (thus are strictly proteinases). They can be divided into classes on the basis of their functional characteristics. These classes are dealt with separately in terms of their alternate names, notable substrates and inhibitors. They often act along with ectopeptidases – the carboxypeptidases and aminopeptidases. Endopeptidase inhibitors contain members of the metalloproteinase and serine protease families. Some are important neuropeptidases – concerned with degradation of peptides having neurotransmitter or mediator roles. **Pepsin** is an example of an endoproteinase important in enzymatic digestion within the gastrointestinal tract. A partial listing of endopeptidases and their inhibitors is given below. See also PROTEASE INHIBITORS.

Endopeptidase-24.11 (EC 3.4.24.11; NELP; neutral endopeptidase; neprilysin, enkephalinase) is a zinc-metalloproteinase, found both in soluble and plasma membrane forms. It is an important enzyme in neuropeptide degradation. Notable neuropeptide substrates include: tachykinins (**substance P**, **neurokinin A**, **neurokinin B**), endothelins (**ET-1**, **ET-2**, **ET-3**), **atrial natriuretic peptide**, **neurotensin**, **somatostatin** and **cholecystokinins**. Inhibitors include: **thiorphan**, **phosphoramidon** and SCH 32615. See NEUTRAL ENDOPEPTIDASE INHIBITORS.

Endopeptidase-24.15 (EC 3.4.24.15; thimet oligopeptidase) is a zinc-metalloproteinase found in soluble and membrane forms. Notable substrates include: **angiotensin I**, **angiotensin II**, **bradykinin**, **LH-RH**, neurotensin and somatostatin. Inhibitors include: CPP-Ala-Ala-Tyr-pAB; CPE-Ala-Ala-Phe-pAB.

Endopeptidase-24.16 (EC 3.4.24.16; neurolysin; endopeptidase-24.16; neurotensin degrading endopeptidase; oligopeptidase M) is zinc-metalloproteinase, found in soluble, membrane and mitochondrial forms. Notable substrates include: angiotensin I, angiotensin II, bradykinin, neurotensin, substance P and somatostatin. Inhibitors include: phosphorus-containing peptides, such as the dipeptide Pro-Ile.

Proline endopeptidase (EC 3.4.24.26; post-proline endopeptidase; TRH deamidating enzyme) is a soluble serine protease. Notable substrates include: angiotensin I, angiotensin II, bradykinin, LH-RH, neurotensin and substance P. Inhibitors include: Cbz-Pro-Prolinal.

Endothelin converting enzyme (ECE) has yet to be fully characterized. It is a membrane-located enzyme found in the vascular endothelium. It is essential in the production of **endothelin** in the body since it converts the inactive precursor 'big ET-1' to endothelin-1. It is an unusual enzyme because it cleaves at a Tyr-Val link. Like endopeptidase-24.11, it is inhibited by **phosphoramidon** (so is a metalloproteinase), and these two enzymes are often co-located. Furthermore, monoclonal antibody co-precipitation studies indicate they share a common epitope, and a homology to the extent of about 39%. ECE is also similar to the bacterial metalloprotease thermolysin, but is more specific. If a specific inhibitor is discovered that can act *in vivo*, then clearly such a drug could modulate endothelin production throughout the body, which would have important consequences (e.g. in antihypertensive therapy).

Roques, B.P. *et al.* (1993) Neutral endopeptidase 24:11: structure, inhibition and experimental and clinical pharmacology. *Pharmacol. Rev.*, **45**, 87-146.

Turner, A.J. (1993) Endothelin-converting enzymes and other families of metallo-endopeptidases. *Biochem. Soc. Trans.*, **21**, 697-701.

Turner, A.J. *et al.* (1994) Neuropeptidases: candidate enzymes and techniques for study. *Biochem. Soc. Trans.*, **22**, 122-127.

Sansom, C.E. *et al.* (1995) Molecular modeling of the active site of endothelin-converting enzyme. *J. Cardiovasc. Pharmacol. Suppl. 3*, **26**, 75-77.

β-endorphin is an endogenous 31 amino acid residue peptide present in human, porcine, ovine and bovine pituitaries, with amino acid sequences identical to the 61–91 portion of their respective β-lipotropins. It is a potent (δ and μ) OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC. See also **endorphins**.

endorphins are endogenous peptides isolated from pituitary glands, and correspond to part of the sequence of the hormone **β-lipotropin**. Endorphins show OPIOID

RECEPTOR AGONIST, OPIOID ANALGESIC and behavioural effects in mammals. β-Endorphin is generally more potent than α- and γ-endorphins. Endorphins have also been isolated from non-mammalian spp., e.g. salmon. The fragment that is **β-endorphin** (human) (β_h-endorphin) corresponds to 61-91-β-lipotropin (human). The sequence differs with species; β-endorphin (sheep) is as the human form except for His^{27} and Gln^{31} substitutions. **α-Endorphin** (human) corresponds to sequence 61-76 of β-lipotropin. Also **γ-endorphin** corresponds to amino acid sequence 61-77 of β-lipotropin.

endothelin-1 (ET-1) is a 21 amino acid residue peptide with two intramolecular disulphide linkages, an isoform within the endothelin family of peptide mediators produced from precursor molecules, **preproendothelin I** (human, 212 residues), and fragments of these, **big-endothelin I** (38 residues in human). ET-1 is notably expressed by the endothelium of blood vessels, subserving an autocrine or paracrine role in physiology and pathology. It is a very potent VASOCONSTRICTOR (endogenous release being triggered by vascular anoxia), and also a stimulant of much extravascular smooth muscle. As an ENDOTHELIN RECEPTOR AGONIST it is active at both the ET_A and ET_B receptor subtypes.

endothelin-2 (ET-2) is a 21 amino acid residue peptide with two intramolecular disulphide linkages, an isoform within the endothelins family of peptide mediators (see **endothelin-1**), but encoded by a distinct gene, and with a specific distribution including kidney and intestine. As an ENDOTHELIN RECEPTOR AGONIST it acts at both the ET_A and ET_B receptor subtypes, and has a similar potency to ET-1. Its general pharmacology is similar to that of ET1.

endothelin-3 (ET-3) is a 21 amino acid residue peptide with two intramolecular disulphide linkages, an isoform within the endothelins family of peptide mediators (see **endothelin-1**), but with production encoded by a distinct gene, and with a distinct distribution encompassing brain, lung, intestine and adrenal gland. As an ENDOTHELIN RECEPTOR AGONIST it acts at both the ET_A and ET_B receptor subtypes, though is less potent than ET-1 and ET-2. Its general pharmacology is similar to that of ET-1.

ENDOTHELIN RECEPTOR AGONISTS recognize the endothelin family of peptide mediators produced notably by the endothelium of blood vessels, subserving an autocrine or paracrine role in physiology and pathology. The original sequence was found, using molecular biology techniques, to be a 21 amino acid sequence that could be expressed by endothelial cells. It is now recognized that there are three distinct genes, producing three endothelin sequences; **endothelin-1**, **endothelin-2** and **endothelin-3** (ET-1, ET-2 and ET-3).

There are two receptors involved in the actions of the peptides, termed ET_A and ET_B. The distribution both of peptides and receptors is very heterogeneous. The two receptors have quite a wide distribution, but a low expression of ET_A receptors in the vascular epithelium as compared to the smooth muscle layers, which underlines the paracrine role of this mediator.

The circumstances of the release, and the actions, of the endothelins are extensive. It was originally discovered that endothelin has profound vasoconstrictor actions, and was released particularly in anoxia, so a role in all varieties of vasospastic disease or hypertension has long been suspected. Other stimuli for production by the endothelium (which occurs at the transcriptional level, since the endothelium has no storage vesicles) are believed to include shear forces, some cytokines, endotoxin, thrombin, growth factors and a number of other vasoactive agents. The actions of released endothelins includes contraction of most smooth muscle, though a vasodilator element (probably involving nitric oxide) has more recently been uncovered. The vasoconstrictor actions of the endothelins are thought to be involved in renal, cardiac and cerebral vasospasm, in hypertension and in the genesis of eclampsia. The successful production of gene 'knockout' (deletion) experimental animals has uncovered some surprising developmental abnormalities which suggest other roles for endothelin.

The endothelins receptors are of the seven-transmembrane G-protein-coupled type, and couple mainly through the $InsP_3$/DAG systems, though other mechanisms (including activation of tyrosine kinases and mitogenesis) may be involved. There are at least two receptor types encoded by different genes on different chromosomes. Also, there are species-dependent isoforms. The characteristics of the two receptors are as follows.

At ET_A receptors the order of potency of the natural ligands is: ET-1 = ET-2 > ET-3, and no synthetic selective agonists are known.

At ET_B receptors the order of potency of the natural ligands is: ET-1 = ET-2 = ET-3. Synthetic selective agonists include IRL 1620, $[Ala^{1,3,11,15}]$-ET-1, also the snake toxin **sarafotoxin** is active.

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ENDOTHELIN RECEPTOR ANTAGONISTS act at receptors and are of at least two types discussed above (see ENDOTHELIN RECEPTOR AGONISTS). The characteristics of the two receptors are as follows. At ET_A receptors, active antagonists include: **BQ 123**, **FR 139317**, **97-139**, **BMS 182874**, **PD 155080**, BQ 153, BQ 485, PD 151242, PD 156707 (selective for the subtype); also BE 18257B, 27-O-caffeolyl myricerone and [Dpr1,Asp15]-ET. At ET_B receptors, active antagonists include: **BQ 788**, IRL 2500, Ro 468443 and BQ 017. A number of agents are active at both ET_A and ET_B receptors, including **bosentan**, PD 142893, Ro 46-2005, CGS 27830, L 749329, PD 145065, SB 209670 and TAK 044.

Possible applications of endothelin receptor antagonists are numerous. In view of the profound vasoconstrictor actions of the endothelins (particularly in anoxia) uses may include all varieties of vasospastic disease and hypertension.

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Warner, T.D. *et al.* (1994) Endothelin receptor antagonists: actions and rationale for their development. *Biochem. Pharmacol.*, **48**, 625-635.
Cody, W.L. *et al.* (1995) The development of potent peptide agonists and antagonists for the endothelin receptors. *Biopolymers*, **37**, 89-104.
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endothelium-derived relaxing factor ➡ **nitric oxide**.

endralazine [BAN, INN] (endralazine mesylate [USAN]) has properties similar to **hydralazine**. It can be used as a VASODILATOR and ANTIHYPERTENSIVE.

endralazine mesylate ➡ **endralazine**.

endrin [BSI, ESA, ISO, JMAF] (the stereoisomer of dieldrin) is an organochlorine, an important nonsystemic persistent insecticide, now superseded.

endrisone [INN] (endrysone [USAN]) is a CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically for skin conditions and as an ophthalmic antiinflammatory agent.

endrysone ➡ **endrisone**.
Enduron™ ➡ **methyclothiazide**.
enflurane [BAN, INN, JAN, USAN] (NSC 115944; Ethrane™ and many other names) is a halogenated ether used as an inhalation GENERAL ANAESTHETIC.
enilconazole [BAN, INN] is an (imidazole group) broad-spectrum ANTIFUNGAL. Clinically, it can be used as a veterinary fungicide.
[Leu^5]enkephalin ➡ **enkephalins**.
[Met^5]enkephalin ➡ **enkephalins**; **lipotropin**.
enkephalins are pentapeptides isolated from several CNS and peripheral tissues. There are two forms: leucine enkephalin ([Leu^5]enkephalin); and methionine enkephalin ([Met^5]enkephalin). The latter is derived from β-lipotropin (residues 61-65). Both peptides are (δ and μ) OPIOID RECEPTOR AGONISTS, and have OPIOID ANALGESIC activity, but this is very transient due to the rapid inactivation by 'enkephalinase' enzymes (especially neutral endopeptidase). Hundreds of analogues have been prepared and evaluated as analgesics in the hope of finding a long-acting material with clinical advantages over alkaloid analgesics.
Enlon™ ➡ **edrophonium chloride**.
Eno™ ➡ **calcium carbonate**.
enocitabine [INN, JAN] (*N*-docosanoyl prodrug of **cytarabine** metabolized *in vivo*) is an (antimetabolite) ANTICANCER AGENT that works by interfering with pyrimidine synthesis. Clinically, it can be used systemically in anticancer treatment primarily of acute leukaemia.
enofelast [INN, USAN] is a fluorohydroxydimethylstilbene derivative, a selective LIPOXYGENASE INHIBITOR. It is a potential ANTIASTHMATIC.
enoxacin [BAN, INN, JAN, USAN] (Penetrex™) is a fluroquinone ANTIBACTERIAL which, clinically, is used for treatment of urinary tract and skin infections.
enoxaparin [BAN, INN] (Clexane™; Na salt is bemiparin sodium [INN]) is a (parenteral) ANTICOAGULANT, chemically a low-molecular weight form of **heparin**. It can be used therapeutically in the treatment of deep-vein thrombosis.
enoximone [BAN, INN, USAN] is an imidazolinone derivative, a (type III) PHOSPHODIESTERASE INHIBITOR with VASODILATOR and CARDIAC STIMULANT actions, which can be used in congestive HEART FAILURE TREATMENT. It is also a long-chain acyl-CoA synthetase inhibitor.
enoxolone [BAN, INN] (glycyrrhetic acid; biogastrone acid; glycyrrhetin; glycyrrhetinic acid; rhetinic acid; uralenic acid; α-glycyrrhetinic acid) is a complex triterpine (aglycone) prepared from glycyrrhizinic acid, a constituent of liquorice (from *Glycyrrhiza glabra* and some other plants). It is a potent inhibitor of 11β-hydroxysteroid dehydrogenase (which inactivates **cortisol**) and may potentiate corticosteroid actions. It has ANTIBACTERIAL and ANTITUSSIVE activity. It has been used as an ANTIINFLAMMATORY in the treatment of noninfective inflammatory disorders (skin, mouth etc.).
enoxolone hydrogen succinate ➡ **carbenoxolone**.
enpiroline [INN] (enpiroline phosphate [USAN]) is an ANTIMALARIAL agent.
enpiroline phosphate ➡ **enpiroline**.
enprofylline [INN, USAN] (3-propylxanthine) is a DIURETIC, ANTIASTHMATIC and BRONCHODILATOR.
enprostil [BAN, INN, USAN] (RS 84135) is a prostaglandin and synthetic analogue of **dinoprostone** (PGE_2), and has actions and uses similar to **misoprostol**. It is an (EP_3) PROSTANOID RECEPTOR AGONIST, and has been used as a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC. Also, it has ANTIHYPERLIPIDAEMIC activity via inhibition of cholesterol absorption.
enramycin [INN, JAN] is a (peptide) ANTIBIOTIC (a mixture with enduracidin B) active as an ANTIBACTERIAL against Gram-positive bacteria and mycobacteria.
ENT 50852 ➡ **altretamine**.
enteramine ➡ **5-hydroxytryptamine**.
Entocort™ ➡ **budesonide**.
enviroxime [INN, USAN] is an ANTIVIRAL. It is active against a range of rhinoviruses and is a component of **viroxime**.
enzyme EC 3.4.21.7 ➡ **fibrinolysin**.
ENZYME INHIBITORS are important in medicinal chemistry, pharmacology and therapeutics for a number of reasons. Mechanistically, they may act in a number of different ways, mainly as competitive antagonists or allosteric modifiers, and sometimes as irreversible antagonists. Many important enzyme inhibitors are within drug classes vital to everyday therapeutics. Most of the important classes are discussed in more detail elsewhere.

Some major classes include: ACE INHIBITORS (used mainly as ANTIHYPERTENSIVE AGENTS), MONOAMINE-OXIDASE INHIBITORS (used mainly as ANTIDEPRESSANTS), ANTICHOLINESTERASES (used for a number of purposes), CARBONIC ANHYDRASE INHIBITORS, (used mainly as DIURETICS), PHOSPHODIESTERASE INHIBITORS (used as BRONCHODILATORS, CNS STIMULANTS, INOTROPIC AGENTS).

Other classes include: ALDEHYDE DEHYDROGENASE INHIBITORS; ALDOSE REDUCTASE INHIBITORS; AMINOPEPTIDASE INHIBITORS; AROMATASE INHIBITORS; CARBOXYPEPTIDASE INHIBITORS; CYCLOOXYGENASE INHIBITORS; DIHYDROFOLATE REDUCTASE INHIBITORS; DOPA-DECARBOXYLASE INHIBITORS; DOPAMINE β-HYDROXYLASE INHIBITORS; ENDOPEPTIDASE INHIBITORS; HMG-COA REDUCTASE INHIBITORS; NEUTRAL ENDOPEPTIDASE INHIBITORS; NITRIC OXIDE SYNTHASE INHIBITORS; PHOSPHOLIPASE INHIBITORS; 5α-REDUCTASE INHIBITORS; REVERSE TRANSCRIPTASE INHIBITORS; THROMBOXANE SYNTHASE INHIBITORS; XANTHINE-OXIDASE INHIBITORS.

ENZYMES can be used in therapeutics, though in general there are difficulties in delivering them to their proposed sites of action. There are commonly serious side-effects, normally immune reactions. There have been repeated attempts to use proteolytic enzymes in therapeutics to supplement deficiencies within the gastrointestinal tract, and necessarily there are difficulties in administering such enzymes without erosion of the mouth and upper digestive tract. Some notes follow on enzymes currently used.

Anistreplase is a plasminogen streptokinase activator used as a FIBRINOLYTIC AGENT in the treatment of acute myocardial infarction. **Crisantaspase** (asparaginase) is an enzyme isolated from *E. coli*, which is thought to have some activity as an anticancer and antileukaemic agent. **Batroxobin** from snake venom is a serine protease and with its thrombin-like enzyme it is a haemostatic and defibrinogenating agent, and can be used in peripheral arterial circulatory disorders. **Cellulase** is a concentrate of cellulose-splitting (cellulytic) enzymes isolated from *Aspergillus niger*. It can be given by mouth, in combination with other digestive enzymes, to aid digestion. **Chymopapain** is a proteolytic enzyme isolated from *Carica papaya*, and can be used in the form of injections into vertebral discs in treating sciatica and lumbar pain (herniated lumbar discs). **Chymotrypsin** is a proteolytic enzyme that can be used by injection to dissolve a suspensory ligament of the lens of the eye to aid surgical removal of the lens because of cataract. **Hyalosidase** (a highly purified form of hyaluronidase) is a hyaluronoglucosidase that has been used as a fibrinolytic enzyme for the treatment of myocardial infarction.

Hyaluronidase contains enzymes that depolymerize hyaluronic acid, and is used by injection in the treatment of subcutaneous and intravenous extravasation injuries, to increase the permeability of soft tissues to injected drugs, and as an ophthalmological agent. **Pancreatin**, isolated from pancreas of pig and cow, is a digestive enzyme with protease and amylase activity, and is used in replacement therapy (for instance, in cystic fibrosis, and also used by mouth in the form of capsules or granules following operations involving removal of pancreatic tissue, such as panreatectomy and gastrectomy). **Papain** is a vegetable pepsin, a purified proteolytic substance derived from *Carica papaya*, and as a proteolytic enzyme it is used topically to prevent adhesions, taken by mouth as a protein digestant, and as an anthelmintic. **Rizolipase** is a concentrate of pancreatic enzymes standardized for lipase content, used by mouth as a digestive enzyme. **Saruplase** is a recombinant human single-chain urokinase-type plasminogen activator under development as a thrombolytic agent (see **FIBRINOLYTIC AGENTS**). **Streptokinase** is isolated from *Streptococcus haemolyticus* and is used as a fibrinolytic agent in the treatment of myocardial infarction and deep-vein thrombosis. **Sutilains** is derived from *Bacillus subtilis* and contains proteolytic enzymes used for debridement of wound and burns, in moist conditions by topical application. **Trypsin** is a proteolytic enzyme extracted from bovine pancreatic gland that has been used topically for the debridement of wound and burns. It is also used combined with chymotrypsin, and taken by mouth for digestive insufficiency. It has also been inhaled into the lungs to liquefy viscous sputum. **Urokinase** is a proteolytic enzyme (physiologically present in mammalian blood) which activates plasminogen to plasmin. It is used by infusion as a fibrinolytic agent to treat pulmonary embolism and myocardial infarction.

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EORTC 1502 ➡ **prednimustine**.

Ep-453 ➡ **aloxistatin**.

epanolol [BAN, INN] is a **β-ADRENOCEPTOR ANTAGONIST** and **ANTIARRHYTHMIC**.

Epanutin™ ➡ **phenytoin**.

eperisone [INN] (eperisone hydrochloride [JAN]) is a piperidinylpropanone, a (CNS-acting) **SKELETAL MUSCLE RELAXANT**, used for the symptomatic relief of pain and spasticity.

ephedrine [BAN] (ephedrine hydrochloride [JAN, USAN]; ephedrine sulfate [USAN]) is the (1R,2S)-form of 2-(methylamino)-1-phenyl-1-propanol. It is the main alkaloid from the Chinese drug 'Ma-Huang', and from many *Ephedra* spp., and other plants sources. It is mainly an (indirect-acting) **SYMPATHOMIMETIC** (similar to **ephedrine**) with both peripheral and **CNS STIMULANT** actions. It exists in several isomeric forms, and the mix varies between countries according to pharmacopoeial description and source. It is a component of many compound preparations as an oral or topical nasal **DECONGESTANT** and as a **BRONCHODILATOR**. It can be used to treat myasthenia gravis. It is no longer commonly used as an antihypotensive or **CARDIAC STIMULANT**.

ψ-ephedrine ➡ **pseudoephedrine**.

ephedrine hydrochloride ➡ **ephedrine**.

ephedrine sulfate ➡ **ephedrine**.

epibatidine is an azabicycloheptane derivative, a member of a unique new class of alkaloids. It was originally extracted in very small amounts from the skin extracts of the Ecuadoran poison frog *Epipedobates tricolor*, and subsequently was synthesized for study. It has curariform activity (**NICOTINIC RECEPTOR ANTAGONIST**) and is claimed to be a non-opioid **ANALGESIC** (potency reported to be 200–500 times greater than that of morphine).

epicillin [BAN, INN, USAN] is a semisynthetic (penicillin) **ANTIBIOTIC** active as an **ANTIBACTERIAL** against Gram-positive and -negative bacteria.

epidermal growth factor (urogastrone; β-urogastrone; human urinary protein; EGF) was isolated from human urine and identified as a potent **GASTRIC SECRETION INHIBITOR**, but its clinical use as an **ANTIULCEROGENIC** is limited by its *in vivo* instability. There are three forms, α-urogastrone, β-urogastrone and γ-urogastrone, where the α-form is a peptide of 53 amino acid residues, and the β-form has an additional terminal arginine residue. There is a precursor molecule with 1217 amino acids. The β-urogastrone form is identical with the factor now recognized as epidermal growth factor (EGF), a cell growth regulator causing proliferation of many cell types. EDF causes skin thickening, retardation of hair follicles, cell development in the GI tract and blood vessels and various endocrine and autoimmune changes. It has been used to treat burns, ulcers and corneal lesions. **Murodermin** (murine EGF) is a close analogue.

α-epidermal growth factor (mouse) ➡ **murodermin**.

epidermal thermocyte activating factor ➡ **interleukin-2**.

Epilim™ ➡ **valproic acid**.

epimestrol [BAN, INN, USAN] (NSC 55975; Org 817) is the 3-methyl ether of the naturally occurring hormone 17-epioestriol. It is an **OESTROGEN** that can be used in the treatment of infertility due to anovulation and amenorrhoea.

epinastine [INN] is an azepine, a recently introduced **HISTAMINE H_1-RECEPTOR ANTAGONIST**, reported to have little **SEDATIVE** activity.

epinephrine ➡ **adrenaline**.

epinephrine bitartrate ➡ **adrenaline**.

epinine (desoxyepinephrine; *N*-methyldopamine) is a catecholamine, an analogue of the neurotransmitters **noradrenaline** and **dopamine**. It is an alkaloid from *Cytisus scoparius*, *Vicia faba* and *Lophophora williamsii* (Leguminosae, Cactaceae). It acts as a **DOPAMINE RECEPTOR AGONIST** (D_1 and D_2), an **α-ADRENOCEPTOR AGONIST** and **β-ADRENOCEPTOR AGONIST**, and also as a **CARDIAC STIMULANT** and **VASODILATOR**.

epirizole [INN, USAN] (mepirizole [JAN]; methopyrimazole) is a pyrazolylpyrimidine, a **CYCLOOXYGENASE INHIBITOR**, with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity. It is a pharmacological tool used to produce duodenal lesions in animal models.

epirubicin [BAN, INN] (epirubicin hydrochloride [USAN]; Farmorubicin™; Pharmorubicin™) is an (adriamycin group) **ANTIBIOTIC** structurally closely related to the **ANTICANCER AGENT doxorubicin**. It can be used in chemotherapy for breast cancer.

epirubicin hydrochloride ➡ **epirubicin**.

epithiazide [BAN, USAN] (epitizide [INN]) is a (thiazide) **DIURETIC** which can be used in **ANTIHYPERTENSIVE** therapy.

epitiostanol [INN, JAN] (10275 S; NSC 194684) is a steroid with **ANTIOESTROGEN** and **ANABOLIC** activities. It has been

investigated as an **ANTICANCER AGENT**, including breast cancer.

epitizide ➡ **epithiazide**.

Epivir™ ➡ **lamivudine**.

epoetin alpha [BAN, INN, JAN, USAN] (glycoform α; Epogen™; Procrit™) – more fully termed 1-165-erythropoetin (human clone γHEPOFL13 protein moiety – is recombinant human erythropoietin produced by genetically engineered Chinese hamster cells. It is a haematinic and regulates red blood cell production. It is used as a haemopoietic and **ANTIANAEMIC** in the treatment of anaemia associated with chronic renal failure, and also in **ANTICANCER** chemotherapy to stimulate erythrocyte production after treatment.

epoetin beta [BAN, INN, JAN, USAN] (BM 6019) – more fully termed 1-165-erythropoietin (human clone γHEPOFL13 protein moiety) glycoform β – is the recombinant form of human erythropoietin produced by genetically engineered Chinese hamster cells. It is a haematinic and regulates red blood cell production. It is used as a haemopoietic and **ANTIANAEMIC** in the treatment of anaemia associated with chronic renal failure, and also in premature babies.

epoetin gamma [BAN, INN] (BI 71052; TYB 5220) – more fully termed 1-165-erythropoietin (human clone λ HEPOFL13 protein moiety) glycoform γ epohuman – is produced by recombinant DNA technology. It is a haematinic that regulates red blood cell production. Potentially, a haemopoietic and **ANTIANAEMIC AGENT**.

Epogam™ ➡ **gamolenic acid**.

Epogen™ ➡ **epoetin alpha**.

epoprostenol [INN] (epoprostenol sodium [BAN, USAN]; prostacyclin; prostaglandin I_2; PGI_2; prostaglandin X; PGX; U 53217; Flolan™) is a natural prostaglandin (prostacyclin) present in the walls of blood vessels. It is an (IP) **PROSTANOID RECEPTOR AGONIST**. When administered therapeutically by intravenous infusion, it has **PLATELET AGGREGATION INHIBITOR** and **ANTITHROMBOTIC** activity, and is a potent **VASODILATOR**. Its main use is in extracorporeal procedures, such as kidney dialysis. It has a very short lifetime in the body, though it can be given by continuous infusion *in vivo*.

epoprostenol sodium ➡ **epoprostenol**.

epostane [BAN, INN, USAN] (Win 32729) is a synthetic prostaglandin carbonitrile derivative antiprogestogen, which has been investigated for use as an **ABORTIFACIENT** and **OXYTOCIC AGENT**, and to induce labour.

Eppy™ ➡ **adrenaline**.

eprazinone [INN] (eprazinone hydrochloride [JAN]) is a propiophenone, reported to have **ANTITUSSIVE, EXPECTORANT** and **MUCOLYTIC** properties with effects on lung surfactant levels and composition.

eprazinone hydrochloride ➡ **eprazinone**.

epristeride [BAN, INN, USAN] is a steroid which acts as a **5α-REDUCTASE INHIBITOR**, and is used in the treatment of benign prostatic hypertrophy.

eprosartan [BAN, USAN] (eprosartan mesylate; SKF 108566) is an imidazolylthiophenepropanoic acid derivative, an (AT_1) **ANGIOTENSIN RECEPTOR ANTAGONIST** with **ANTIHYPERTENSIVE** activity.

eprosartan mesylate ➡ **eprosartan**.

eproxindine [INN] is an indolecarboxamide derivative, which has been evaluated for **ANTIARRHYTHMIC** activity.

Epsikapron™ ➡ **aminocaproic acid**.

epsiprantel [BAN, INN] is an **ANTHELMINTIC** and anticestodal.

Epsom salts ➡ **magnesium sulphate**.

EPT ➡ **teniposide**.

eptacog alfa [BAN, INN] (Novoseven™) – more fully described as blood coagulation factor VII; human clone λHVII2463 protein moiety – is a recombinant form of **factor VII**, and is a **HAEMOSTATIC AGENT**.

eptastigmine [INN] is a lipophilic derivative of **physostigmine**, and is a reversible **ANTICHOLINESTERASE** that has been investigated for treating Alzheimer's disease.

eptazocine [INN] (eptazocine hydrobromide [JAN]) is a benzazonin derivative, and is a mixed (μ) **OPIOID RECEPTOR ANTAGONIST** and (κ) **OPIOID RECEPTOR AGONIST** which has **OPIOID ANALGESIC** activity.

eptazocine hydrobromide ➡ **eptazocine**.

Equanil™ ➡ **meprobamate**.

equilin is a steroid, an **OESTROGEN** obtained from the urine of pregnant mares. It is a component of conjugated and esterified oestrogen preparations.

equine prolactin ➡ **prolactin**.

Equivurm Plus™ ➡ **mebendazole**.

Eraldin™ ➡ **practolol**.

ercalciol ➡ **ergocalciferol**.

erdosteine [INN] (RV 144) is a thioacetic acid derivative, and is being studied as an oral **MUCOLYTIC** and **EXPECTORANT** for respiratory disorders characterized by viscous or excessive mucus. It shows protective effect against cigarette smoke-induced oxidative lung damage.

ergamine ➡ **histamine**.

Ergamisol™ ➡ **dexamisole**.

ergocalciferol [INN, USAN] (vitamin D_2; calciferol; ercalciol; ergosterol (activated); irradiated ergosterol; oleovitamin D_2; viosterol; Drisdol™ and many other names) acts as a **VITAMIN** and **CALCIUM METABOLISM MODIFIER**. It is formed by irradiation of **ergosterol**. It can be used orally or by injection in the treatment of refractory rickets, hypoparathyroidism and familial hypophospharaemia.

ergocornine is a 6-methyl ergoline derivative, an alkaloid from ergot (*Claviceps purpurea*). It is a **VASOCONSTRICTOR**. Overall, its pharmacological effects resemble those of **ergotamine**, but it is more toxic and little used clinically. It is an investigational tool in pharmacology and reproductive physiology. It is a component of the mixture **ergotoxine**.

ergocristine is a 6-methyl ergoline derivative, an alkaloid from ergot (*Claviceps purpurea*). Overall, its pharmacological effects resemble those of **ergotamine**, but it is more toxic and little used clinically. It is a component of **ergotoxine**.

ergometrine [BAN, INN] (ergonovine maleate [USAN]; ergometrine maleate [JAN]; Ergostat™; Syntometrine™ and many other names) is a 6-methyl ergoline derivative, an alkaloid from ergot (*Claviceps purpurea*) and several other vegetable sources. It is a (partial) **α-ADRENOCEPTOR AGONIST**, weak **DOPAMINE RECEPTOR ANTAGONIST** and ($5\text{-}HT_1$) **5-HYDROXYTRYPTAMINE RECEPTOR AGONIST**. It is an **OXYTOCIC AGENT**, used in childbirth and mainly postpartum as a **HAEMOSTATIC** to limit blood loss.

ergometrine maleate ➡ **ergometrine**.

ergonovine maleate ➡ **ergometrine**.

Ergostat™ ➡ **ergometrine**; **ergotamine**.

ergosterin ➡ **ergosterol**.

ergosterol (activated) ➡ **ergocalciferol**.

ergosterol (ergosterin; provitamin D_2) occurs in yeast and fungi (the main fungal steroid). It is also found in small amounts in higher plant products, e.g. palm oil. It is a precursor of vitamin D_2.

ergotamine [BAN, INN] (ergotamine tartrate [JAN, USAN]; Lingraine™; Migril™; Ergostat™ and many other names) is a 6-methyl ergoline derivative, an alkaloid from ergot (*Claviceps purpurea*). It is a (partial) **α-ADRENOCEPTOR**

AGONIST or α-ADRENOCEPTOR ANTAGONIST, weak DOPAMINE RECEPTOR ANTAGONIST and (5-HT_1) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST. It is a VASOCONSTRICTOR used in acute antimigraine treatment. It is oxytocic and has been used as an ABORTIFACIENT. Also, it is a component of Cafergot™ (with **caffeine**).

ergotamine tartrate ➡ **ergotamine**.

ergotoxine is a mixture of ergoline alkaloids from ergot (*Claviceps purpurea*), isolated as a crystalline principle. Constituents include **ergocornine**, **ergocristine**, α-ergocryptine and β-ergocryptine. It has powerful VASOCONSTRICTOR actions.

ericolol [INN] is a β-ADRENOCEPTOR ANTAGONIST and ANTIANGINAL, ANTIARRHYTHMIC and ANTIHYPERTENSIVE AGENT.

eritrityl tetranitrate ➡ **erythrityl tetranitrate**.

ersentilide [INN] is a β-ADRENOCEPTOR ANTAGONIST and (Class III) ANTIARRHYTHMIC.

Erwinase™ ➡ **crisantaspase**.

Erycen™ ➡ **erythromycin**.

erythrityl tetranitrate [USAN] (eritrityl tetranitrate [INN]; erythrol tetranitrate; Cardilate™) is an organic nitrate, a coronary VASODILATOR and ANTISPASMODIC. (This drug is different to **pentaerythritol tetranitrate**.)

Erythrocin™ ➡ **erythromycin**.

erythrol tetranitrate ➡ **erythrityl tetranitrate**.

Erythromid™ ➡ **erythromycin**.

erythromycin [BAN, INN] (erythromycin acistrate [INN]; erythromycin estolate [BAN, USAN]; erythromycin ethylsuccinate [USAN]; erythromycin lactobionate [USAN]; erythromycin stearate [USAN]; flurithromycin [INN]; lexithromycin [INN]; Arpimycin™; Erycen™; Erythrocin™; Erythromid™; Erythroped™; Ilosone™; Rommix™; Stiemycin™; Zineryt and many others) is a (macrolide) ANTIBIOTIC, the original member of the series, also used in the form of several derivatives. Clinically, it can be used as an oral or parenteral ANTIBACTERIAL to treat a wide variety of infections. It is effective against many Gram-positive bacteria, including streptococci, mycoplasma and chlamydia. It can also be used in the treatment of acne and chronic prostatitis and to prevent diphtheria and whooping cough. Its principal use is as an alternative to penicillin in individuals who are allergic to that drug. However, bacterial resistance to erythromycin is quite common.

erythromycin acistrate ➡ **erythromycin**.

erythromycin estolate ➡ **erythromycin**.

erythromycin ethylsuccinate ➡ **erythromycin**.

erythromycin lactobionate ➡ **erythromycin**.

erythromycin stearate ➡ **erythromycin**.

Erythroped™ ➡ **erythromycin**.

erythropoietin (EPO) is a glycoprotein containing 167 amino acid residues, and is a factor produced by the kidney which stimulates erythrocyte production. Recombinant forms of human erythropoietin, produced by genetic engineering, are available. They are termed epoietin alpha, beta and gamma. Therapeutically, they have equivalent actions and are used by intravenous administration. They have haemopoietic and ANTIANAEMIC actions, and stimulate red blood cell production. They are used for this in treating aplastic anaemia, in ANTICANCER chemotherapy, in premature infants and other anaemia conditions. There are three forms of erythropoietin: **epoietin alpha**, **epoietin beta** and **epoietin gamma**.

esaprazole [INN] (CO 063) is a piperazineacetamide derivative, and is a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC (acting probably via peripheral anticholinergic activity).

eserine ➡ **physostigmine**.

Esidrex™ ➡ **hydrochlorothiazide**.

Eskalith™ ➡ **lithium carbonate**.

Eskamel™ ➡ **resorcinol**.

Eskazole™ ➡ **albendazole**.

Eskornade™ ➡ **diphenylpyraline**; **phenylpropanolamine**.

Esmeron™ ➡ **rocuronium bromide**.

esmolol [BAN, INN] (esmolol hydrochloride [USAN]; Brevibloc™ Celectol™) is a β-ADRENOCEPTOR ANTAGONIST, which is relatively water-soluble. Therapeutically, it can be used as an ANTIARRHYTHMIC to control supraventricular tachyarrhythmias, as an ANTIHYPERTENSIVE and ANTIGLAUCOMA TREATMENT.

espatropate [BAN, INN] is a quinuclidinylimidazole derivative, with (M_3-subtype) MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity, and can be used as an anticholinergic and BRONCHODILATOR.

EST ➡ **aloxistatin**.

estazolam [INN, JAN, USAN] (Abbott 47631; ProSom™ and many other names) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It has been used orally for short-term treatment of insomnia.

Estracyt™ ➡ **estramustine**.

Estraderm™ ➡ **oestradiol**.

estradiol ➡ **oestradiol**.

estradiol benzoate ➡ **oestradiol**.

estradiol cypionate ➡ **oestradiol**.

estradiol enanthate ➡ **oestradiol**.

estradiol hexahydrobenzoate ➡ **oestradiol**.

estradiol valerate ➡ **oestradiol**.

Estradurin™ ➡ **polyestradiol phosphate**.

estramustine [BAN, INN, USAN] (estramustine sodium phosphate; estramustine phosphate sodium; Leo 275; Ro 21-8837; Emcyt™; Estracyt™) is a chemical combination of an **oestrogen** and **mustine** used as an ANTICANCER AGENT, predominantly in treating prostate cancer. It is given orally and has both an alkylating antimitotic effect and a hormonal effect (reducing testosterone concentrations).

estramustine phosphate sodium ➡ **estramustine**.

estramustine sodium phosphate ➡ **estramustine**.

Estring™ ➡ **oestradiol**.

estriol ➡ **oestriol**.

estriol acetate benzoate ➡ **oestriol**.

estriol succinate ➡ **oestriol**.

estrone ➡ **oestrone**.

estropipate [BAN, USAN] (piperazine oestrone sulphate; piperazine estrone sulfate; Harmogen™; Improvera™; Ogen™. Ortho-Est™ and many other names) is a semi-synthetic conjugate of a natural steroid **oestrone** to which it is hydrolysed *in vivo*. It is an OESTROGEN, used therapeutically in combination with other natural oestrogens mainly in HRT.

Estrovis™ ➡ **quinestrol**.

ET-1 ➡ **endothelin-1**.

ET-2 ➡ **endothelin-2**.

ET-3 ➡ **endothelin-3**.

etacrynic acid ➡ **ethacrynic acid**.

ETAF ➡ **interleukin-1**.

etafedrine [BAN, INN] (etafedrine hydrochloride [USAN]) is a SYMPATHOMIMETIC with properties similar to **ephedrine**. It can be used as a BRONCHODILATOR.

etafedrine hydrochloride ➡ **etafedrine**.

etafenone [INN] (etafenone hydrochloride [JAN]) is a phenylpropiophenone, a coronary VASODILATOR, which has been used as an ANTIANGINAL AGENT.

etafenone hydrochloride ➡ **etafenone**.

etamivan ➡ **ethamivan**.

etamsylate ➡ **ethamsylate**.

etazolate [INN] (etazolate hydrochloride [USAN]; etazole; SQ 20009) is a PHOSPHODIESTERASE INHIBITOR and also a (P1 purinoceptor) ADENOSINE RECEPTOR ANTAGONIST (active at A_1 and A_2 subtypes). It is reported to have TRANQUILLIZER and ANXIOLYTIC properties.

etazolate hydrochloride ➡ **etazolate**.

etazole ➡ **etazolate**.

etebenecid ➡ **ethebenecid**.

etersalate [INN] is a compound combining a **paracetamol** derivative with a salicylate derivative, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It has been used to treat musculoskeletal pain. It is also a potent PLATELET AGGREGATION INHIBITOR, and has been used orally in the treatment of thromboembolic disorders.

ethacrynic acid [BAN, USAN] (etacrynic acid [INN, JAN]; Edecrin™) is a powerful (loop) DIURETIC. It can be used orally or systemically to treat pulmonary oedema. It acts as an ATPASE INHIBITOR (kidney tubules) and is used as a pharmacological tool.

ethambutol [BAN, INN] (ethambutol hydrochloride [USAN]) is an ANTIBACTERIAL, especially used in antitubercular treatment.

ethambutol hydrochloride ➡ **viroxime ethambutol**.

ethamivan [BAN, USAN] (etamivan [INN]) is a benzamide, with similar properties as **doxapram**, and is used as a CNS STIMULANT and RESPIRATORY STIMULANT. It was previously used orally or by injection for treatment of barbiturate and other CNS depressant overdose.

ethamsylate [BAN, USAN] (etamsylate [INN, JAN]; Dicynene™ and many other names) is a benzenesulphonic acid derivative, a HAEMOSTATIC, which, as an ANTIFIBRINOLYTIC AGENT, does not act by fibrin stabilization, but probably by correcting abnormal platelet adhesion. It has been used to treat menstrual disorders, and has ANTIINFLAMMATORY activity.

ethanol (ethyl alcohol; hydroxyethane) is an alcohol produced by fermentation of sugars, carbohydrates and starch. It is the intoxicating constituent of all alcoholic beverages. It is a VASODILATOR and CNS DEPRESSANT with SEDATIVE properties. It can be used locally (98%) as a protein precipitant in the therapeutic neurolysis of nerves and ganglia in the relief of intractable pain. It is also used as an ANTISEPTIC and drug solvent.

Ethaquin™ ➡ **ethaverine**.

ethaverine [INN] (Ethaquin™; Ethavex™; Isovex™) is a tetraethylpapaverine, which can be used as a visceral ANTISPASMODIC and a VASODILATOR to treat vasomotor spasm; it also has ANTIARRHYTHMIC properties.

Ethavex™ ➡ **ethaverine**.

ethchlorovynol [BAN, INN, JAN] (AB 1404; Placidyl™) is a liquid with a pungent, aromatic odour. It is similar to barbitutates in action (though not chemically similar), and has HYPNOTIC, SEDATIVE, (CNS-acting) SKELETAL MUSCLE RELAXANT and ANTICONVULSANT properties. It is still used in some countries for short-term treatment of insomnia. It is also used as an animal appetite and growth stimulant.

ethebenecid [BAN] (etebenecid [INN]; NSC 140115) is a substituted sulphonylbenzoic acid, a URICOSURIC AGENT and penicillin excretion inhibitor.

ether ➡ **diethyl ether**.

ethinamate [BAN, INN] is a carbamate or urethane derivative, formerly used as a short-duration HYPNOTIC and SEDATIVE. It is also used as an immobilizer of birds.

ethinylestradiol ➡ **ethinyloestradiol**.

ethinyloestradiol [BAN] (ethinylestradiol [INN, USAN]; NSC 10973 and many other names) is a steroid, a synthetic OESTROGEN. It can be used to make up hormonal deficiencies, to treat menopausal or other gynaecological problems and as an ANTICANCER AGENT for palliative treatment of prostate cancer. It is extensively used as a constituent of many oral CONTRACEPTIVES (in combination with PROGESTOGENS). Rarely, it is used to treat hereditary haemorrhagic telangiectasia (hereditary condition of distended blood capillaries and bleeding). One form is available as a compound preparation with **cyproterone acetate** for the treatment of acne and abnormal body hair growth (Dianette™).

Ethiofos™ ➡ **amifostine**.

ethisterone [BAN, INN] is a synthetic steroid and analogue of **testosterone**, a PROGESTOGEN that also has OESTROGEN and ANDROGEN properties. It was formerly used by mouth but has been associated with masculinization of female infants.

Ethmozine™ ➡ **moracizine**.

ethoglucid [BAN] (etoglucid [INN]; triethylene glycol diglycidyl ether; AY 62013; ICI 32865; NSC 80439) is an alkylating ANTICANCER AGENT which has been used for treating tumours of the bladder by instillation.

ethoheptazine [BAN, INN] (Wy 401) is a pethidine analogue and one of the phenylpiperidine series. It is an OPIOID RECEPTOR AGONIST and has been used as an OPIOID ANALGESIC for mild to moderate pain.

ethopabate [BAN] is a 4-aminosalicylic acid ester, an ANTIBACTERIAL and ANTITUBERCULAR AGENT.

ethopropazine [BAN] (profenamine [INN]) is a phenothiazine, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, a weak HISTAMINE H_1-RECEPTOR ANTAGONIST, α-ADRENOCEPTOR ANTAGONIST, LOCAL ANAESTHETIC and GANGLION BLOCKING AGENT. It also has SEDATIVE actions, and can be used as an ANTIPARKINSONIAN AGENT for symptomatic relief.

ethosuximide [BAN, INN, JAN, USAN] (NSC 64013; Emeside™; Zarontin™ and many other names) is an ANTICONVULSANT used orally as an ANTIEPILEPTIC in the treatment of absence (petit mal), myoclonic and some other types of seizure.

ethotoin [BAN, INN] (AC 695) is one of the hydantoin series, similar to **phenytoin**, and acts as an ANTICONVULSANT. It is potentially an ANTIEPILEPTIC.

6-ethoxythiazolesulphonamide ➡ **ethoxzolamide**.

ethoxzolamide (6-ethoxythiazolesulphonamide; U 4191) is chemically a SULPHONAMIDE derivative, a CARBONIC ANHYDRASE INHIBITOR with DIURETIC properties. It can be used to reduce intraocular pressure in ANTIGLAUCOMA TREATMENT.

Ethrane™ ➡ **enflurane**.

ethybenztropine [BAN, USAN] (etybenzatropine [INN]) is a tertiary amine, with actions similar to **benzhexol**. It is a MUSCARINIC CHOLINOCEPTOR ANTAGONIST with SEDATIVE actions. It has been used as an ANTIPARKINSONIAN AGENT.

ethyl alcohol ➡ **ethanol**.

ethylaminesulphonic acid ➡ **taurine**.

ethyl aminobenzoate ➡ **benzocaine**.

ethyl aminoformate ➡ **urethane**.

ethyl biscoumacetate [BAN, INN] is an (oral) ANTICOAGULANT, chemically one of the coumarin group. It can be used therapeutically to prevent the formation of clots.

ethyl carbamate ➡ **urethane**.

ethyl chloride [USAN] (chloroethane) is a volatile

liquid/gas used by topical application as a LOCAL ANAESTHETIC for minor surgical procedures.

ethylcholine aziridinium (monoethylcholine mustard aziridinium ion; AF 64A; ECMA) is a choline UPTAKE INHIBITOR (it alkylates the choline carrier), so eventually acts as a NEUROTRANSMITTER-RELEASE-MODIFYING AGENT, decreasing release of the neurotransmitter **acetylcholine** and has general anticholinergic actions and is a NEUROMUSCULAR BLOCKING AGENT. It is a NEUROTOXIN and pharmacological tool for studying choline transport; given into the CNS it produces central cholinergic hypofunction in animal models, serving as a possible model for Alzheimer's disease.

ethyl cinepazate maleate ➡ **cinepazic acid**.

ethylestrenol ➡ **ethyloestrenol**.

ethyl ether ➡ **diethyl ether**.

ethyl flavonoxyacetate ➡ **efloxate**.

4-ethyl-2-(hydroxyimino)-5-nitro-3-hexenamide ➡ **FK 409**.

ethyl loflazepate [INN, JAN] (CM 6912) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It has been used orally for short-term treatment of anxiety and insomnia.

ethylmethylthiambutene [BAN, INN] (BW 50-1; NIH 5145) is a dithienyl compound, an OPIOID RECEPTOR AGONIST, with OPIOID ANALGESIC activity.

ethylmorphine [BAN] is the 3-ethyl ether of **morphine**, and is an OPIOID RECEPTOR AGONIST, with OPIOID ANALGESIC and ANTITUSSIVE activity.

ethylnorepinephrine ➡ **ethylnorepinephrine hydrochloride**.

ethylnorepinephrine hydrochloride [USAN] (ethylnorepinephrine) is a SYMPATHOMIMETIC similar to **isoprenaline**, with largely β-ADRENOCEPTOR AGONIST activity. It can be used as a BRONCHODILATOR.

ethylnorgestrienone ➡ **gestrinone**.

ethyloestrenol [BAN] (ethylestrenol [INN, USAN]; Org 483) is a steroid with ANABOLIC activity, little ANDROGEN effects and some PROGESTOGEN activity. It has been used to promote growth in boys with small stature.

ethyl pemoline ➡ **fenozolone**.

ethylphencyclidine ➡ **eticyclidine**.

ethylphenephrine ➡ **etilefrine**.

ethylphenylbarbituric acid ➡ **phenobarbitone**.

ethyl pyrophosphate [BAN] (tetraethyl pyrophosphate; tetraethyl diphosphate; TEPP) is an (organophosphate group) ANTICHOLINESTERASE that has been used as a non-systemic INSECTICIDE.

ethyl salicylate is the ethyl ester of **salicylic acid**, and is one of the salicylate series of NSAID ANALGESICS. It is used topically as a COUNTER-IRRITANT (rubefacient or topical analgesic) for symptomatic relief of underlying pain. It is a component of many compound topical preparations, e.g. Algipan™, Cremalgin™, Dubam™, Ralgex™. It is also used as a veterinary counter-irritant.

ethyl urethane ➡ **urethane**.

ethynodiol ➡ **etynodiol**.

ethynodiol diacetate ➡ **etynodiol**.

Ethyol™ ➡ **amifostine**.

eticyclidine [INN] (cyclohexamine; ethylphencyclidine; 'Rocket Fuel'; CL 45; CI 400; PCE) is one of the benzomorphans, a **phencyclidine** and **ketamine** analogue, with some similar properties. It is an OPIOID RECEPTOR AGONIST, including at the atypical σ-site, and is a GLUTAMATE RECEPTOR ANTAGONIST (channel-blocking at NMDA receptors). It is an OPIOID ANALGESIC, (dissociate) GENERAL ANAESTHETIC, PSYCHOTROPIC and ANTICONVULSANT. It is a drug of abuse and has been withdrawn from human clinical use.

etidocaine [BAN, INN, USAN] (Duranest™) is an amide series LOCAL ANAESTHETIC, used by injection for infiltration and regional pain relief.

etidronate disodium ➡ **etidronic acid**.

etidronate ➡ **etidronic acid**.

etidronic acid [BAN, INN, USAN] (etidronate disodium [USAN]; sodium etidronate; etidronate; Didronel™ and many other names) is one of the bisphosphonate series of CALCIUM METABOLISM MODIFIERS which are used to treat disorders of bone metabolism, reducing calcium-resorption from the bone. It is used orally or by injection to treat tumour-induced hypercalcaemia, and to treat Paget's disease of the bone. It is also available in a compound preparation with calcium carbonate to treat established osteoporosis of the vertebrae (Didronal PMO™).

etifelmine [INN] (etifelmine hydrochloride [JAN]) is a diphenylmethylenebutylamine derivative, a SYMPATHOMIMETIC and CNS STIMULANT. It has been used as an antihypotensive.

etifelmine hydrochloride ➡ **etifelmine**.

etifoxin [BAN, INN] (Hoe 36801) is a benzoxazine which was used as an oral ANXIOLYTIC.

etilefrine [INN] (etilefrine pivalate [INN]; tilefrine hydrochloride [JAN]; ethylphenephrine) is an analogue of **phenylephrine**, an α-ADRENOCEPTOR AGONIST with hypertensive activity. It has been used to treat hypotension.

etilefrine pivalate ➡ **etilefrine**.

etintidine [INN] (etintidine hydrochloride [USAN]; BL 5641A) is an animidazolylguanidine derivative, a HISTAMINE H_2-RECEPTOR ANTAGONIST. It is a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.

etintidine hydrochloride ➡ **etintidine**.

etiproston [INN] (etiproston trometamol [INN]) is a prostaglandin and PROSTANOID RECEPTOR AGONIST, and is a veterinary ABORTIFACIENT.

etiproston trometamol ➡ **etiproston**.

etiroxate [INN] (CG 635) is a methyltyrosine ethyl ester derivative, which has been used as an ANTIHYPERLIPIDAEMIC.

etizolam [INN, JAN] is a triazolodiazepine, one of the [1,4]benzodiazepines, and is a BENZODIAZEPINE BINDING-SITE AGONIST. Most of its properties are similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It is also reported to be a PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST.

etocrilene [INN] (etocrylene [USAN]) is a cinnamic acid derivative. It can be used in topical SUNSCREEN preparations.

etocrylene ➡ **etocrilene**.

etodolac [BAN, INN, USAN] (etodolic acid; AY 24236; Lodine™) is a recently approved member of the indole-acetic acid series. It is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It is primarily used orally to treat the pain and inflammation of rheumatoid arthritis and osteoarthritis, and for postoperative analgesia. It appears to produce less gastric erosion than many NSAIDs.

etodolic acid ➡ **etodolac**.

etodroxizine [INN] is a chlorbenzethylamine, with SEDATIVE/HYPNOTIC properties. It has been used as a sedative.

etofamide [INN] has AMOEBICIDAL activity.

etofenamate [BAN, INN, USAN] (B 577) is one of the fenamate series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It

has been used by topical application in pain relief.

etofibrate [INN] (XE 14-543) is one of the fibrate group. It has been used as an ANTIHYPERLIPIDAEMIC.

etoformin [INN] (etoformin hydrochloride [USAN]) is one of the biguanide group of (oral) HYPOGLYCAEMICS, which (unlike the sulphonylureas) act mainly by decreasing gluconeogenesis and by increasing peripheral utilization of glucose, and is only effective in diabetics where there is residual functioning in pancreatic islet cells. It can be used as an ANTIDIABETIC in non-insulin-dependent diabetes mellitus (NIDDM; Type 2 diabetes).

etoformin hydrochloride ➡ **etoformin**.

etofylline [BAN, INN] is a **theophylline** derivative, a metabolite of **doxofylline**, with properties similar to other xanthines. It has ANTIHYPERTENSIVE, DIURETIC, SMOOTH MUSCLE RELAXANT, BRONCHODILATOR and ANTIASTHMATIC properties.

etofylline clofibrate [INN] (theofibrate [USAN]) is a compound of the theophylline derivative **etofylline** combined with the fibrate **clofibrate**, which has ANTIHYPERLIPIDAEMIC activity and also experimental ANTITHROMBOTIC activity. Clinically, it can be used in antihyperlipidaemic treatment.

etoglucid ➡ **ethoglucid**.

etomidate [BAN, INN, USAN] (Hypnomidate™) is a carbonylimidazole, an intravenous GENERAL ANAESTHETIC, which is used for the initial induction of anaesthesia.

etoperidone [INN] (etoperidone hydrochloride [USAN]) is a piperazine derivative. It has ANTIPARKINSONIAN activity and has been used as an ANTIDEPRESSANT.

etoperidone hydrochloride ➡ **etoperidone**.

etoposide [BAN, INN, USAN] (NSC 141540; VP 16; VP 16213. BMY 40481; Vepesid™; and many other names) is an analogue of **teniposide**, a semisynthetic podophyllotoxin derivative. It is a DNA-synthesis and cell-replication inhibitor, an ANTICANCER AGENT which is used orally or by injection primarily to treat small cell lung cancer, lymphomas and cancer of the testes.

etorphine [BAN, INN] (M 99; NIH 8068; UM 495) is an early member of the thebaine series, an OPIOID RECEPTOR AGONIST. It is extremely potent as an OPIOID ANALGESIC. It is used as a veterinary immobilizing agent in neuroleptananalgesia.

etoxazene [INN] (ethoxazene hydrochloride; SQ 2128) is a phenazopyridine analogue, a NSAID ANALGESIC. It is also claimed to be an ANTIBACTERIAL, and an azo-dye and acid/base indicator.

ethoxazene hydrochloride ➡ **etoxazene**.

etoxeridine [BAN, INN] (Wy 2039) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST. It has been used as an OPIOID ANALGESIC.

etozolin [INN, USAN] is a (loop) DIURETIC that can be used as an ANTIHYPERTENSIVE.

etretinate [BAN, INN, JAN, USAN] (Ro 10-9359; Tegison™) is a retinoid, a DERMATOLOGICAL AGENT that effects epithelial proliferation and is used topically to relieve severe psoriasis and other skin conditions. It is a prodrug, and is metabolized to **acitretin**, which is now normally used in its place.

ettriol trinitrate ➡ **propatyl nitrate**.

etybenzatropine ➡ **ethybenztropine**.

etynodiol [INN] (ethynodiol diacetate [USAN]; ethynodiol) is a synthetic steroid, a PROGESTOGEN, which has been used as a constituent of the combined oral CONTRACEPTIVES that contain an OESTROGEN.

EU 2826 ➡ **benurestat**.

EU 2972 ➡ **nolinium bromide**.

EU 4534 ➡ **flurofamide**.

EU 4584 ➡ **tolfamide**.

eucalyptol ➡ **cineole**.

Eucardic™ ➡ **carvedilol**.

eucatropine [BAN, INN] (eucatropine hydrochloride [USAN]) is a tertiary amine, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as a MYDRIATIC AGENT without cycloplegic actions.

eucatropine hydrochloride ➡ **eucatropine**.

eugenol [USAN] (5-allylguaiacol) has a very widespread occurrence in essential oils, and is a major component of **clove oil**. It is also found in *Cinnamomum* spp., *Cistus* spp., *Camellia* spp., *Pelargonium* spp. and *Thymus* spp. It is an ANTIFUNGAL and ANTISEPTIC. It is used as a dental LOCAL ANAESTHETIC, sometimes in dental cement preparations. Also, it can be used as a COUNTER-IRRITANT (rubefacient or topical analgesic) for some painful skin conditions. It is used extensively in the perfumery and flavour industries.

Euglucon™ ➡ **glibenclamide**.

Eulexin™ ➡ **flutamide**.

euprocin [INN] (euprocin hydrochloride [USAN]; WI 287) is an ester series LOCAL ANAESTHETIC, which has been used by topical application for local pain relief.

euprocin hydrochloride ➡ **euprocin**.

Eurax™ ➡ **cromoglycic acid**; **crotamiton**.

Evans blue ➡ **azovan blue**.

Everone™ ➡ **testosterone**.

Evista™ ➡ **raloxifene**.

Evorel™ ➡ **oestradiol**.

examorelin [INN] (hexarelin) is a synthetic hexapeptide, a truncated analogue of the HYPOTHALAMIC HORMONE, GROWTH HORMONE-RELEASING HORMONE, that stimulates release of growth hormone *in vivo*.

exaprolol [INN] (exaprolol hydrochloride [USAN]) is a β-ADRENOCEPTOR ANTAGONIST that is also a PLATELET AGGREGATION INHIBITOR.

exaprolol hydrochloride ➡ **exaprolol**.

Exelderm™ ➡ **sulconazole**.

exemestane [INN] (FCE 24304) is a steroid, with AROMATASE INHIBITOR (oestrogen synthetase inhibitor) activity. It is under investigation for use in certain anticancer treatments.

exifone [INN] is a galloylpyrogallol, and shows ANTITHROMBOTIC and PLATELET AGGREGATION INHIBITOR activity. It is claimed to have NOOTROPIC activity and was formerly used to treat senile memory disorders.

exiproben [INN] has been used as a CHOLERETIC.

Exna™ ➡ **benzthiazide**.

Exocin™ ➡ **ofloxacin**.

Exovir HZ™ ➡ **interferon α**.

EXP 655 ➡ **PD 123177**.

EXP 801 is an isoquinolinecarboxylic acid, an (AT_2) ANGIOTENSIN RECEPTOR ANTAGONIST, with antihypertensive activity.

EXP 3174 is an imidazole-5-carboxylic acid derivative, an early ANGIOTENSIN RECEPTOR ANTAGONIST, with ANTIHYPERTENSIVE activity. It is an active metabolite of **losartan**.

EXPECTORANTS are intended to change the viscosity of sputum (phlegm), making it more watery and easier to cough up, and are normally used in a medicated liquid preparation. In high dosage, most expectorants can be used as EMETICS, which leads to the traditional belief that they work as expectorants by stimulating nerves in the stomach to cause reflex secretion of fluid by the bronchioles. In truth, it is not known for certain how they act. Furthermore, there is considerable doubt about their clinical efficacy. Examples of expectorants in use include **ammonium chloride**, **guaiphenesin** and **ipecacuanha**.

F 2207 ➡ **milnacipran**.

factor V (blood-coagulation factor V; accelerator globulin; labile factor; proaccelerin) is a physiological blood-clotting agent, part of the blood coagulation cascade, and important for the binding and action of factor Xa. It is not usually used clinically as a HAEMOSTATIC AGENT.

factor VII (blood-coagulation factor VII; cothromboplastin; proconvertin; serum prothrombin conversion accelerator; SPCA; eptacog alfa [BAN, INN]; Novoseven™) is a physiological HAEMOSTATIC AGENT, part of the blood coagulation cascade. It is a protein containing 406 amino acid residues, and for clinical use it is normally isolated from normal human plasma or serum. It may also contain clotting factor II, VII and X. It is used in treating patients with a deficiency in factor IX (haemophilia B) and hereditary deficiency of factor IX (Christmas factor). It is available in a form for infusion. Recently, a recombinant form has become available (see **eptacog alfa**).

factor VIII (blood-coagulation factor VIII; octocog alfa [BAN]; antihaemophilic factor; antihemophilic globulin; Alpha VIII™; Kogenate™; Monoclate-P™; Recombinate™ and many other names) is a physiological HAEMOSTATIC AGENT, part of the blood coagulation cascade. It is a protein containing 2,332 amino acid residues, isolated for clinical use from normal plasma (recombinant form now available: see **octocog alfa**). It is used in the treatment of haemophilia A.

factor IX (blood-coagulation factor IX; Christmas factor; autohaemophilic factor B; autoprothrombin II; plasma thromboplastin component; Alphanine™; Mononine™; Replenine™ and many other names) is a physiological blood-clotting factor, a component of the blood coagulation cascade. Clinically, this HAEMOSTATIC AGENT glycoprotein containing 416 amino acid residues, is isolated from plasma and serum. It is used in the treatment of patients with haemophilia B (Christmas disease) who are genetically deficient in this factor.

factor X (blood-coagulation factor X; Stuart-Prower factor) is isolated from plasma and serum. It is a physiological blood-clotting agent. It is not usually used clincally as a HAEMOSTATIC AGENT.

factor XII (blood-coagulation factor XII; contact factor; Hageman factor) is a physiological HAEMOSTATIC AGENT, part of the blood coagulation cascade. It is a single chain glycoprotein (MW approx. 80,000). It can be isolated from plasma.

factor XIII (blood-coagulation factor XIII; fibrogammin; fibrin-stabilising factor; Laki-Lorand factor; FSF) is a physiological HAEMOSTATIC AGENT, part of the blood coagulation cascade. It is a is protein containing 1,372 amino acid residues. It can be isolated from plasma. It is a blood clotting agent, and can be used to treat patients with a rare genetic deficiency of the factor. It is also a component of 'fibrin glues' (surgical adhesives).

factor XIV (blood-coagulation factor XIV; protein C; PC) is a physiological HAEMOSTATIC AGENT, part of the blood coagulation cascade. It is a peptide containing 262 amino acid residues.

fadrozole [INN] (fadrozole hydrochloride [USAN]; CGS 16949A) is a non-steroid with AROMATASE INHIBITOR (oestrogen synthetase inhibitor) activity, and is under investigation for some anticancer applications.

fadrozole hydrochloride ➡ **fadrozole**.

falintolol [INN] is a β-ADRENOCEPTOR ANTAGONIST which can be used in ANTIGLAUCOMA TREATMENT.

famciclovir [BAN, INN, USAN] (Fanvir™) is a synthetic (nucleoside analogue) ANTIVIRAL, a prodrug of **penciclovir**. It can be used orally to treat infection by the herpes viruses.

famotidine [BAN, INN, USAN] (YM 11170; L 643341; MK 208; Pepcid™) is a thiosulfamoylpropionamidine, a HISTAMINE H_2-RECEPTOR ANTAGONIST. It is a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC. It is also suggested to be beneficial in the treatment of schizophrenia, and as an ANTIVIRAL.

famprofazone [BAN, INN] is one of the pyrazolone series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

Fansidar™ ➡ **pyrimethamine; sulfadoxine**.

fantofarone [BAN, INN] is an indolizinyl derivative, which acts as a CALCIUM-CHANNEL BLOCKER with ANTIHYPERTENSIVE actions.

Fanvir™ ➡ **famciclovir**.

Farlutal™ ➡ **medroxyprogesterone**.

farrerol is a flavanone, with ANTITUSSIVE, EXPECTORANT, CHOLERETIC and ANTIHYPERLIPIDAEMIC properties.

Fastin™ ➡ **phentermine**.

fasudil [INN] (HA 1077; AT 877) is an isoquinolinyldiazepine, a PROTEIN KINASE INHIBITOR and intracellular calcium antagonist. It has VASODILATOR and cerebroprotective properties, and has been investigated for treatment of cerebral ischaemia.

Faverin™ ➡ **fluvoxamine**.

fazadinium bromide [BAN, INN] is a bisquaternary amine complex heterocyclic compound, which acts as a NICOTINIC CHOLINOCEPTOR ANTAGONIST, a (competitive) NEUROMUSCULAR BLOCKING AGENT. It can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia.

fazarabine [INN, USAN] (Ara-Ac; NSC 281272) is an analogue of **cytarabine**, an antimetabolite cytotoxic agent that has been used in ANTICANCER treatment.

FC 3001 ➡ **tiaprofenic acid**.

FC 1157 ➡ **toremifene**.

FCE 22178 ➡ **rolafagrel**.

FCE 23067 is a guanidothiazolopyridine, a HISTAMINE H_2-RECEPTOR ANTAGONIST. It is a potential GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.

febantel [BAN, INN, USAN] is a carbamate group veterinary ANTHELMINTIC.

febarbamate [INN] (phenobamate; Go 560) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone**. It has been used to treat anxiety.

febuprol [INN] (H 33; K 10033) is a phenoxypropanol derivative, a CHOLERETIC with ANTISPASMODIC and ANTIHYPERLIPIDAEMIC effects.

feclobuzone [INN] (AE 9) is one of the pyrazolone series of CYCLOOXYGENASE INHIBITORS, with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

fedotozine [INN] is one of the methadone series, a (κ) OPIOID RECEPTOR AGONIST, which is an OPIOID ANALGESIC and ANTISPASMODIC.

Fefol™ ➡ **ferrous sulphate**.

felbamate [INN] (W 554; Felbatol™) is a carbamate structurally related to **meprobamate**. It has ANTICONVULSANT activity and can be used as an ANTIEPILEPTIC for partial seizures in patients unresponsive to other drugs (it increases the incidence of aplastic anaemia).
Felbatol™ ➡ **felbamate**.
felbinac [BAN, INN, USAN] (*p*-biphenylylacetic acid; CL 83544; LY 61017; Traxam™) is the active metabolite of **fenbufen**, a NSAID ANALGESIC, ANTIPYRETIC and ANTIINFLAMMATORY. It is used topically, when it has COUNTER-IRRITANT (rubefacient or topical analgesic) actions.
Feldene™ ➡ **piroxicam**.
felodipine [BAN, INN, USAN] (Plendil™ etc.) is a dihydropyridine CALCIUM-CHANNEL BLOCKER with VASODILATOR properties, which can be used in ANTIHYPERTENSIVE therapy and ANTIANGINAL prophylaxis.
felypressin [BAN, INN, USAN] ([Phe^2,Lys^8]vasopressin; phelypressin; PLV2; Octapressin™; Octopressin™) is a synthetic analogue of **vasopressin**. It is a VASOCONSTRICTOR and is incorporated into LOCAL ANAESTHETIC preparations to prolong their duration of action. (It is a constituent with **prilocaine** of Citanest with Octapressin™.)
Femara™ ➡ **letrozole**.
Fematrix™ ➡ **oestradiol**.
femoxetine [INN] is a phenylpiperidine, a SSRI, a selective serotonin (re-) UPTAKE INHIBITOR, and has been used as an oral ANTIDEPRESSANT.
fenampromide ➡ **phenampromide**.
fenazoxine ➡ **nefopam**.
fenbendazole [BAN, INN, USAN] is a carbamate group veterinary ANTHELMINTIC.
fenbufen [BAN, INN, JAN, USAN] (CL 82204; Lederfen™ and many other names) is one of the propionic acid series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It is used particularly in the treatment of pain associated with rheumatoid arthritis and osteoarthritis.
fenbutrazate ➡ **phenbutrazate**.
fencamfamin [BAN, INN] is a CNS STIMULANT and APPETITE SUPPRESSANT, formerly used to treat narcolepsy.
fencibutirol [INN, USAN] has been used as a CHOLERETIC.
fenclofenac [BAN, INN, USAN] (RX 67408) is a benzeneacetic acid derivative, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It was withdrawn due to adverse reactions.
fenclonine [INN, USAN] (*p*-chlorophenylalanine; PCPA; NSC 77370; CP 10188) is an ENZYME INHIBITOR, a selective irreversible tryptophan hydroxylase inhibitor, thereby depleting 5-HT in the brain. As an indirect 5-HT antagonist, it has been given to patients with carcinoid syndrome to relieve some of the symptoms.
fendiline [INN] is a methylbenzylamine, a CALCIUM-CHANNEL BLOCKER and calmodulin antagonist, with coronary VASODILATOR properties.
fenethylline [BAN] (fenetylline [INN]; fenethylline hydrochloride [USAN]; amphetaminotheophylline; H 814) is a **theophylline** derivative of **amphetamine**, to which it is partly converted. It has similar properties to **dexamphetamine** as a CNS STIMULANT and APPETTITE SUPPRESSANT. It was formerly used orally as an ANTIDEPRESSANT and to treat narcolepsy. It is subject to abuse.
fenethylline hydrochloride ➡ **fenethylline**.
fenetylline ➡ **fenethylline**.
fenfluramine hydrochloride [BAN, INN] (Ponderax™; Pondimin™) is a SYMPATHOMIMETIC chemically and pharmacologically related to **amphetamine**. Clinically, it is used as an APPETITE SUPPRESSANT that acts at the level of the CNS. This is the (±)-form; the (*S*)-form **dexfenfluramine**, which has simiar properties; and the (*R*)-form is **levofenfluramine**. (Drugs of this class have recently been withdrawn because of proposed association with causation of primary pulmonary hypertension.)
fenipentol [INN, JAN] is a benzenemethanol derivative, and has been used as a CHOLERETIC.
fenitrothion [BAN, BSI] is an (organophosphate group) ANTICHOLINESTERASE, used as a contact INSECTICIDE.
fenofibrate [BAN, INN] (LF 178; Lipantil™ and many other names) is one of the fibrate group, and is used as an ANTIHYPERLIPIDAEMIC.
fenoldopam [BAN, INN] (fenoldopam mesylate [USAN]) is a benzazepine derivative, which acts as a (D_1-subtype) DOPAMINE RECEPTOR AGONIST and as a (vascular 5-HT_2) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST. It has been investigated as an ANTIHYPERTENSIVE for the treatment of hypertensive crises, and in HEART FAILURE TREATMENT.
fenoldopam mesylate ➡ **fenoldopam**.
fenoprofen [BAN, INN, USAN] (fenoprofen calcium [JAN, USAN]; Lilly 53858; Lilly 69323; Fenopron™; Nalfon™; Progesic™ and many other names) is a member of the propionic acid series, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It can be used orally to treat and relieve pain and inflammation, particularly the pain of arthritis and rheumatism and other musculoskeletal disorders.
fenoprofen calcium ➡ **fenoprofen**.
Fenopron™ ➡ **fenoprofen**.
fenoterol [BAN, INN, USAN] (fenoterol hydrobromide [JAN]; Berotec™) is a β-ADRENOCEPTOR AGONIST which can be used as a BRONCHODILATOR.
fenoverine [INN] is chemically a phenothiazine, a CALCIUM-CHANNEL BLOCKER and ANTISPASMODIC.
fenoxazoline [INN] is an imidazoline, an α-ADRENOCEPTOR AGONIST, used as a SYMPATHOMIMETIC topical nasal DECONGESTANT.
fenozolone [INN] (phenozolane; ethyl pemoline; LD 3394) is an ethylaminophenyloxazolone derivative, a CNS STIMULANT, psychostimulant and APPETITE SUPPRESSANT. It was previously used as a NOOTROPIC AGENT to treat memory disorders.
fenproporex [INN] is an **amphetamine**-like agent with SYMPATHOMIMETIC properties. It can be used as an APPETITE SUPPRESSANT.
fenprostalene [BAN, INN, USAN] (RS 84043) is a prostaglandin and synthetic analogue of **dinoprost** ($PGF_{2\alpha}$), a PROSTANOID RECEPTOR AGONIST, which can be used as an ABORTIFACIENT, and also a LUTEOLYTIC AGENT in veterinary practice.
fenspiride [INN] (fenspiride hydrochloride [USAN]) is a diazaspiro derivative, a BRONCHODILATOR, which shows protective effects in animal model of endotoxemia.
fenspiride hydrochloride ➡ **fenspiride**.
Fentamox™ ➡ **tamoxifen**.
fentanyl [BAN, INN] (fentanyl citrate [JAN, USAN]; fentanyl isothiocyanate; Durogesic™; Sublimaze™) is one of the phenylpiperidine series and an OPIOID RECEPTOR AGONIST. It is used as a (μ) OPIOID ANALGESIC to treat moderate to severe pain, and as part of GENERAL ANAESTHESIA (intravenously).
fentanyl citrate ➡ **fentanyl**.
fentanyl isothiocyanate ➡ **fentanyl**.
Fentatienil™ ➡ **sufentanil**.

Fentazin™ ➡ **perphenazine**.

fenthion [BAN, BSI] is an (organophosphate group) ANTICHOLINESTERASE used as a contact INSECTICIDE with low mammalian toxicity. It is used against mosquito larvae in tropical fresh waters.

fentiazac [BAN, INN, JAN, USAN] (BR 700; Wy 21894 and many other names) is a thiazoleacetic acid derivative, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

fenticlor [BAN, INN, USAN] is a topical ANTIFUNGAL, ANTIBACTERIAL and ANTHELMINTIC.

fenticonazole [BAN, INN] (fenticonazole nitrate [USAN]; Lomexin™) is an (imidazole group) ANTIFUNGAL. Clinically, it can be used topically.

fenticonazole nitrate ➡ **fenticonazole**.

fentonium bromide [INN] is a quaternary amine, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as an ANTISPASMODIC and to treat bladder irritability.

fenyramidol [INN] ((±)-form = phenyramidol hydrochloride [USAN]) is a pyridinylaminobenzenemethanol derivative, with ANALGESIC and SKELETAL MUSCLE RELAXANT properties.

Feospan™ ➡ **ferrous sulphate**.

feprazone [BAN, INN, JAN] is related to the pyrazolone series of CYCLOOXYGENASE INHIBITORS, and has NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

Fergon™ ➡ **ferrous gluconate**.

ferric ammonium citrate (soluble ferric citrate; iron(III) ammonium citrate) has a variable composition. It can be used as an ANTIANAEMIC in the treatment of iron-deficiency anaemia.

ferrous citrate (iron(2+) citrate) is used as an ANTIANAEMIC in the treatment of iron-deficiency anaemia. It is also a ^{59}Fe radiolabelled compound (ferrous citrate Fe 59, [USAN]), which is used as a diagnostic agent.

ferrous citrate Fe 59 ➡ **ferrous citrate**.

ferrous fumarate [JAN, USAN] (iron(II) fumarate; Galfer™ and many other names) it can be used as an ANTIANAEMIC in the treatment of iron-deficiency anaemia. It is incorporated into a number of compound preparations combined with **folic acid** and other vitamins.

ferrous gluconate [USAN] (iron(II) gluconate; Fergon™ and many other names) is used as an ANTIANAEMIC in the treatment of iron-deficiency anaemia.

ferrous sulfate ➡ **ferrous sulphate**.

ferrous sulphate (ferrous sulfate [JAN, USAN]; iron(II) sulphate; $FeSO_4$; Fefol™; Feospan™ and many other names) it can be used as an ANTIANAEMIC in the treatment of iron-deficiency anaemia. It is incorporated into a number of compound preparations combined with **folic acid** and other vitamins. It is also used as an ASTRINGENT.

Fertiral™ ➡ **gonadotrophin-releasing hormone**.

fertirelin [BAN, INN] (fertirelin acetate [USAN]; TAP 031; U 69689) is a synthetic peptide analogue of **gonadorelin** (**gonadotrophin-releasing hormone**), a potent LH-RH RECEPTOR AGONIST with similar properties. It can be used in the treatment of gonadal steroid-dependent diseases and infertility in women. For further detail see gonadotrophin-releasing hormone.

fertirelin acetate ➡ **fertirelin**.

$FeSO_4$ ➡ **ferrous sulphate**.

fetoxilate ➡ **fetoxylate**.

fetoxylate [BAN] (fetoxilate [INN]; McN JR 13558-11; R 13558) is the phenoxyethyl ester of **diphenoxylate**, one of the phenylpiperidine series, and is an OPIOID RECEPTOR AGONIST. It is used as an ANTIDIARRHOEAL.

feverfew ➡ **parthenolide**.

fexofenadine [BAN, INN] (fexofenadine hydrochloride [USAN]; carboxyterfenadine; MDL 16455; Allegra™; Telfast™) is a recently introduced drug, and is the active metabolite of **terfenadine**, one of the newer HISTAMINE H_1-RECEPTOR ANTAGONISTS with reduced SEDATIVE action. It is used orally in the treatment of allergic rhinitis.

fexofenadine hydrochloride ➡ **fexofenadine**.

FF 18 ➡ **verteporfin**.

FG 7051 ➡ **paroxetine**.

FG 9202 ➡ **NBQX**.

FGA ➡ **flugestone acetate**.

FI 5852 ➡ **oxabolone cipionate**.

FI 6337 ➡ **metergoline**.

fiacitabine [INN, USAN] is a (nucleoside) ANTIVIRAL AGENT.

fiblaferon ➡ **interferon β**.

fibracillin [INN] is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat certain infections.

fibrinase ➡ **fibrinolysin**.

fibrinogen (blood-coagulation factor I; parenogen) is a physiological plasma glycoprotein synthesized and secreted by hepatic parenchymal cells. It is acted on by the serine protease enzyme **thrombin** to produce the insoluble protein fibrin in the final stage of blood coagulation. Clinically, it has been used as a HAEMOSTATIC AGENT to control haemorrhage associated with low plasma fibrinogen levels. Fibrinogen labelled with ^{125}I (fibrinogen I125 [USAN]) is used as a radioactive diagnostic agent for some procedures.

fibrinogen I125 ➡ **fibrinogen**.

fibrinolysin [INN] (plasmin [BAN]; fibrinase; enzyme EC 3.4.21.7) is a proteolytic ENZYME that contains plasmogen-activator and FIBRINOLYTIC properties. Chemically, it is a protein (MW *c.* 85,000) derived by the breakdown of blood plasminogen. Therapeutically, it can be used to treat thromboembolytic disorders.

FIBRINOLYTIC AGENTS help in the dissolution of thrombi or blood clots. Some agents used clinically are versions of endogenous agents, and others are agents foreign to the body, with a number of modes of action. Blood coagulation involves the conversion of fluid blood to a solid gel or a clot. The formation of a clot helps in the process of haemostasis (see HAEMOSTATICS). The formation of fibrin filament, together with the adhesion and activation of platelets, helps form the haemostatic plug, which serves to block the damaged blood vessel wall. The actual elements of the clot, insoluble strands of fibrin, are the end-product of a cascade largely involving serine protease enzymes, notably thrombin, and blood-borne proteins. A thrombus is the unwanted formation of a haemostatic plug in blood vessels, often within the veins or arteries of the heart, commonly in pathological conditions associated with arterial disease or where there is stasis. Pieces of the thrombus may break off and form an embolism, which may lodge in vessels in the lungs or brain causing damage to the tissues supplied.

Thrombolytic drugs are able actually to dissolve thrombi. In contrast, neither antiplatelet drugs nor anticoagulants are necessarily thrombolytic. However, antiplatelet drugs – normally given prophylactically – do diminish the adhesion of platelets, which reduces their potential contribution to thrombus formation (see PLATELET AGGREGATION INHIBITING AGENTS). Similarly, anticoagulants – particularly when used prophylactically – can protect individuals at risk of thrombus formation. It is often beneficial to give agents from two or

three of these classes in concert (*vide infra*).

Regarding intrinsic fibrinolytic factors in the body, when the 'intrinsic' coagulation system is activated, the fibrinolytic system is also set in motion, and the latter involves endogenous plasminogen activators. The endogenous activators are of two types – tissue-type plasminogen activators (t-PA) and urokinase-type plasminogen activators (u-PA). The main role of the t-PA is fibrinolysis, and that of u-PA is mainly in cell migration and tissue remodelling processes. In the blood, some plasminogen activator derives from the vascular endothelium and from phagocytic cells, or by the action of factor XII on pro-activators in plasma and or tissues. Plasminogen is a serum β-globulin (MW 143,000) that is deposited on fibrin strands within the thrombus. The plasmogen activators, which have a short half-life in the bloodstream, are serine protease enzymes that split an Arg-Val bond in plasminogen, to release the enzyme plasmin (also known as fibrinolysin). Plasmin is a trypsin-like serine protease that acts on Arg-Lys bonds to digest many blood components, including fibrin, fibrinogen and factors II, V, VIII and a number of other proteins. Plasmin is normally formed only locally within the clot since plasminogen is adsorbed onto fibrin, and is rapidly broken down in the bloodstream. There is a second mechanism for stimulating fibrinolysis which involves activation of protein C, a coagulation inhibitor.

Turning to extrinsic fibrinolytic agents used medically to enhance or mimic the normal fibrinolytic processes, and dissolve thrombi, there are only a few agents available. The most commonly used is **streptokinase**, a non-enzymic protein obtained from cultures of *Streptococcus haemolyticus*, which acts indirectly by forming a stable complex with plasminogen, and imparts greater activity to that enzyme through a conformational change. Though effective, there may be a dangerous sensitivity reaction to this foreign protein. **Anistreplase** (APSAC) is a complex of human Lys-plasminogen and streptokinase, and is used in acute myocardial infarction. Of plasminogen activators similar to those found normally *in vivo*, **alteplase** is a single-chain recombinant tissue-type plasmin activator, whereas **duteplase** is a double-chain recombinant tissue-type plasmin activator. **Urokinase** (tca-PA or r-scu-PA) is an endogenous serine protease with many actions, which binds to a urokinase receptor found on the membrane of monocytes and other cells. It is normally secreted from cells as a single-chain proenzyme (scu-PA) from which the double-chain active form (tcu-PA) is derived by proteolysis. Clinically, **tcu-PA urokinase** is the form used (which is derived from human embryonic kidney cells), and acts directly as a plasminogen activator. Also under development is **saruplase** (recombinant human single-chain urokinase-type plasminogen activator, **r-scuPa urokinase**), which is converted to urokinase on binding to fibrin. Urokinase has the advantage of being non-immunogenic, and is used mainly for thrombolysis in the eye, and in arteriovenous shunts.

The dangers of most of these treatments are significant, and include, in addition to sensitivity reactions, the risk of excessive bleeding, particularly gastrointestinal bleeding, and haemorrhagic stroke. It is therefore necessary to know the best treatment under given circumstances, and to this end a number of multicentre controlled trials have been undertaken – particularly addressing the question of treatment of myocardial infarction, which is a major cause of death in the developed countries. They all consider the effects of particular fibrinolytic drugs given in concert with antiplatelet and anticoagulant therapy. The trials – entitled ISIS-3, GISSI-2, ISG and GUSTO – have studied very large numbers of patients, and suggest that streptokinase therapy is the best emergency treatment (in conjunction with oral **aspirin**), to which **heparin** did not add any advantage. However, the GUSTO trial suggests that rapid intravenous **t-PA** saved more lives than streptokinase (both with intravenous heparin in conjunction with oral aspirin). With the current development of newer fibrinolytic treatments, clearly the question is still not fully resolved.

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fibrin-stabilising factor ➡ **factor XIII**.

fibroblast interferon ➡ **interferon β**.

fibrogammin ➡ **factor XIII**.

filgrastim (recombinant human granulocyte-colony stimulating factor; G-CSF; Neupogen™) is an unglycosylated recombinant version of **HuG-CSF**, an endogenous granulocyte macrophage **colony-stimulating factor**. It is a (G-CSF subtype) CYTOKINE RECEPTOR AGONIST, and acts as a haemopoietic agent and IMMUNOMODULATOR. It stimulates production of granulocytes, and is used for reduction in the duration of neutropenia and incidence of febrile neutropenia in cytotoxic chemotherapy of non-myeloid malignancy; for reduction in duration of neutropenia (and associated sequelae) in myeloablative therapy followed by bone-marrow transplantation; for mobilization of peripheral blood progenitor cells for harvesting and subsequent autologous infusion; for severe congenital neutropenia, cyclic neutropenia, or idiopathic neutropenia and history of severe or recurrent infections; and for reversal of neutropenia in advanced HIV infection to allow scheduled myelosuppressive or antiviral therapy. It is given by infusion or subcutaneous injection.

Finaject™ ➡ **trenbolone**.

Finaplix™ ➡ **trenbolone**.

finasteride [BAN, INN, USAN] (Proscar™) is a 4-azasteroid, which acts as a **5α-REDUCTASE INHIBITOR**, and is used in the treatment of benign prostatic hypertrophy.

fipronil [BAN, BSI] blocks GABA-gated chloride ion channels and is used as a neurotoxic INSECTICIDE.

FK 366 ➡ **zenarestat**.

FK 409 (FR 900409; 4-ethyl-2-(hydroxyimino)-5-nitro-3-hexenamide) is produced by *Streptomyces griseosporeus*. It is a nitric oxide releaser (in solution at pH 7.4), acting as a NITRERGIC STIMULANT. It is a PLATELET AGGREGATION INHIBITOR and coronary VASODILATOR.

FK 506 ➡ **tacrolimus**.

FK 739 (EMD 60218) is an imidazopyridine, a non-peptide (AT_1 and AT_2) ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE activity.

FK 780 ➡ **mecasermin**.

FK 1160 ➡ **tiaramide**.

FLA 731 ➡ **remoxipride**.

Flagyl™ ➡ **metronidazole**.

Flamatrol™ ➡ **piroxicam**.

flavoxate [BAN, INN] (flavoxate hydrochloride [JAN, USAN]; Urispas™) is a piperidinylbenzopyran derivative, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST with ANTISPASMODIC and SMOOTH MUSCLE RELAXANT properties. It has been investigated for the treatment of micturition disorders.

flavoxate hydrochloride ➡ **flavoxate**.

Flaxedil™ ➡ **gallamine**.

flecainide [BAN, INN] (flecainide acetate [USAN]; Tamboco™; Tambocor™) is a benzamide, a (class Ic) ANTIARRHYTHMIC.

flecainide acetate ➡ **flecainide**.

flerobuterol [INN] is a β-ADRENOCEPTOR AGONIST and CNS STIMULANT.

fleroxacin [BAN INN, USAN] is a fluroquinone ANTIBACTERIAL, used clincally for treatment of gonorrhea, bacterial enteritis, chronic bronchitis and urinary tract infections.

flestolol [INN] (flestolol sulfate [USAN]) is a β-ADRENOCEPTOR ANTAGONIST with a very short duration of action.

flestolol sulfate ➡ **flestolol**.

Flexin™ ➡ **indomethacin**.

Flixonase™ ➡ **fluticasone**.

floctafenine [BAN, INN, USAN] (R 4318; RU 15750) is one of the fenamate series, a CYCLOOXYGENASE INHIBITOR, with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

Flomax™ ➡ **tamsulosin**.

flomoxef [INN] is an (oxacephalosporin) ANTIBIOTIC with ANTIBACTERIAL activity.

flopropione [INN] is a propiophenone and constituent of *Inula viscosa*. It is a ($5\text{-}HT_{1A}$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST with ANTISPASMODIC properties.

florantyrone [BAN, INN] (SC 1674) is a fluoranthene derivative, and has been used as a CHOLERETIC.

Florinef™ ➡ **fludrocortisone**.

Florone™ ➡ **flumethasone**.

flosequinan [BAN, INN, USAN] is a quinolinone derivative acting as a direct VASODILATOR with ANTIHYPERTENSIVE and CARDIAC STIMULANT properties, and formerly used in HEART FAILURE TREATMENT.

floxacillin ➡ **flucloxacillin**.

floxacillin magnesium ➡ **flucloxacillin**.

Floxapen™ ➡ **flucloxacillin**.

Floxin™ ➡ **ofloxacin**.

floxuridine [INN, USAN] (fluoruridindeoxyribose; Fudr™) is an antimetabolite ANTICANCER AGENT (DNA synthesis inhibitor). Clinically, it can be used in the treatment of malignant neoplasms of liver and gastrointestinal tract.

Fluanxol™ ➡ **flupenthixol**.

flubendazole [BAN, INN, USAN] is an ANTHELMINTIC and ANTIPROTOZOAL AGENT.

flucinolide ➡ **fluocinonide**.

flucloxacillin [BAN, INN] (floxacillin [USAN]; floxacillin magnesium [USAN]; flucloxacillin magnesium [BAN, INN]; sodium flucloxacillin [JAN]; Floxapen™) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an oral ANTIBACTERIAL, resistant to β-lactamase, to treat certain infections.

flucloxacillin magnesium ➡ **flucloxacillin**.

fluconazole [BAN, INN, JAN, USAN] (Diflucan™ etc.) is a synthetic bis-triazole ANTIFUNGAL. Clinically, it can be used orally against infections such as vaginal candidiasis and in prophylactic treatment for AIDS patients, but it is not active against *Aspergillus*.

flucytosine [BAN, INN, JAN, USAN] (5-fluorocytosine; Alcobon™; Ancobon™) is a fluorinated pyrimidine, an ANTIFUNGAL. Clinically, it can be used orally or systemically in treating serious infections.

Fludara™ ➡ **fludarabine**.

fludarabine [INN] (fludarabine phosphate [USAN]; NSC 312887; Fludara™) is a nucleotide antimetabolite ANTICANCER AGENT, used to treat leukaemia (chronic B-cell lymphocytic leukaemia, CLL).

fludarabine phosphate ➡ **fludarabine**.

fludiazepam [INN, JAN] (Ro 5-3438) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity, and has been used orally to treat anxiety disorders.

fludrocortisone [BAN, INN, USAN] (fludrocortisone acetate [BAN, INN, USAN]; StC 1400; Florinef™ and many other names) is a CORTICOSTEROID with MINERALOCORTICOID activity. It is used orally to treat primary adrenal insufficiency, usually as an adjunct to **hydrocortisone** replacement therapy.

fludrocortisone acetate ➡ **fludrocortisone**.

fludroxycortide ➡ **flurandrenolone**.

flufenamic acid [BAN, INN, JAN, USAN] is one of the fenamate series, a CYCLOOXYGENASE INHIBITOR, with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It is also reported to be a CHLORIDE-CHANNEL BLOCKER and non-selective cation channel blocker. It is used as a pharmacological tool.

flugestone acetate [BAN, INN] (flurogestone acetate [USAN]; FGA; NSC 65411; SC 9880) is a synthetic steroid, a PROGESTOGEN, formerly used to synchronize oestrus in sheep.

Flumadine™ ➡ **rimantadine**.

flumazenil [BAN, INN, USAN] (Ro 15-1788; Anexate™; Romazicon™) is a [1,4]benzodiazepine, a BENZODIAZEPINE BINDING-SITE ANTAGONIST, which is able to reverse the effects of BENZODIAZEPINE BINDING-SITE AGONISTS. It is used intravenously to reverse the SEDATIVE effects of benzodiazepines when used as an adjunct to general anaesthesia, in intensive care, as an ANTIDOTE in treating benzodiazepine overdose, or as a diagnostic agent. It is also reported to be of use in the treatment of the symptoms of acute alcohol withdrawal and alcohol intoxication. It may also have anxiogenic or proconvulsant activity.

flumecinol [INN] (RGH 3332) is a benzhydrol. It induces hepatic cytochrome P-450 isoenzyme and is a hepatoprotective agent. It has been investigated for treatment of hyperbilirubinaemia and cholestatic pruritus.

flumequine [BAN, INN, USAN] is a 4-quinolone ANTIBACTERIAL, which can be used in urinary tract infections.

flumetasone ➡ **flumethasone**.

flumethasone [BAN, USAN] (flumetasone [INN]; flumethasone pivalate [BAN, USAN]; diflorasone [INN]; diflorasone diacetate [JAN, USAN]; NSC 54702; NSC 107680; Florone™; Maxiflor™) is a CORTICOSTEROID, a GLUCOCORTICOID, with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically in the treatment of inflammatory skin disorders, particularly eczema or the outer ear, sometimes in combination with an ANTIMICROBIAL (e.g. Locortan-Vioform™).

flumethasone pivalate ➡ **flumethasone**.

flumethiazide [BAN, INN] is a thiazide formerly used as a DIURETIC.

flumethrin [BAN] is an INSECTICIDE, an ectoparasiticide, now superseded.

flunarizine [BAN, INN, JAN] (flunarizine hydrochloride [USAN]) is a piperazine derivative with CALCIUM-CHANNEL BLOCKER and HISTAMINE H_1-RECEPTOR ANTAGONIST activity. It was formerly used as a peripheral and central VASODILATOR to treat various vascular disorders and as an ANTIMIGRAINE AGENT.

flunarizine hydrochloride ➡ **flunarizine**.

flunisolide [BAN, INN, JAN, USAN] (flunisolide acetate [USAN]; fluoxolonate; RS 1320; Aerobid™; Nasalide™; Syntaris™ and many other names) is a CORTICOSTEROID, a GLUCOCORTICOID, with ANTIINFLAMMATORY and ANTIALLERGIC

properties. It is used topically by nasal spray in the treatment of nasal rhinitis.

flunisolide acetate ➡ **flunisolide**.

flunitrazepam [BAN, INN, JAN, USAN] (Ro 5-4200; Rohypnol™ and many other names) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It is used orally, as one of the long-duration group, to treat insomnia. It is used in some countries as an adjunct to a GENERAL ANAESTHETIC, or for induction of anaesthesia.

flunoxaprofen [INN] (RV 12424) is one of the propionic acid series, a CYCLOOXYGENASE INHIBITOR, with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

fluocinolone acetonide [BAN, INN, USAN] (NSC 92339; Lydex™; Dermacin™; Synalar™ and many other names) is a very potent CORTICOSTEROID, a GLUCOCORTICOID, with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically in the treatment of inflammatory skin disorders, such as eczema and psoriasis. It is also a constituent in compound preparations containing ANTIBACTERIALS or ANTIMICROBIALS.

fluocinonide [BAN, IN, USAN] (flucinolide; fluocinolone acetonide acetate; NSC 101791; Metosyn™) is a derivative of **flunisolide**. It is a CORTICOSTEROID, a potent GLUCOCORTICOID, with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used in the treatment of severe, acute inflammatory skin disorders, such as eczema and psoriasis, that are unresponsive to less powerful corticosteroids.

fluocinolone acetonide acetate ➡ **fluocinonide**.

fluocortin ➡ **fluocortin butyl**.

fluocortin butyl [BAN] (fluocortin [INN]) is a CORTICOSTEROID, a GLUCOCORTICOID, with ANTIINFLAMMATORY and ANTIALLERGIC properties. It has been used topically in the treatment of allergic rhinitis.

fluocortolone [BAN, INN, USAN] (fluocortolone caproate [USAN]; fluocortolone pivalate; Ultralanum™ and many other names) is a CORTICOSTEROID, a GLUCOCORTICOID, with ANTIINFLAMMATORY and ANTIALLERGIC properties. It has been used topically in the treatment of inflammatory skin disorders, such as eczema and psoriasis.

fluocortolone caproate ➡ **fluocortolone**.

fluocortolone pivalate ➡ **fluocortolone**.

fluopromazine [BAN] (triflupromazine [INN, USAN]; triflupromazine hydrochloride [USAN]; Trifluoropromazine™; Vesprin™ and many other names) is a phenothiazine with general properties similar to **chlorpromazine**, including SEDATIVE, HYPOTENSIVE and MUSCARINIC CHOLINOCEPTOR ANTAGONIST and ANTIEMETIC actions. It is used by injection as an ANTIPSYCHOTIC to treat and tranquillize psychotic patients (such as schizophrenics), particularly those experiencing some form of behavioural disturbance.

fluorescein (fluorescein dilaurate [BAN]; fluorescein sodium [BAN, USAN]; resorcinolphthalein; C.I. Solvent yellow 94) is a fluorescent dye with numerous applications, including as a diagnostic agent, acting as a corneal trauma indicator and a fluorescent labelling reagent for proteins.

fluorescein dilaurate ➡ **fluorescein**.

fluorescein sodium ➡ **fluorescein**.

fluorocarbon 123B1 ➡ **halothane**.

5-fluorocytosine ➡ **flucytosine**.

fluorometholone [BAN, INN] (fluorometholone acetate [USAN]; NSC 33001; FML™ and many other names) is a very potent CORTICOSTEROID, a GLUCOCORTICOID, with ANTIINFLAMMATORY and ANTIALLERGIC properties It is used as a short-term topical treatment of inflammatory eye conditions (sometimes with preparations incorporating **neomycin** or **sulphacetamide**).

fluorometholone acetate ➡ **fluorometholone**.

Fluoroplex™ ➡ **fluorouracil**.

fluorouracil [BAN, INN, JAN, USAN] (NSC 19893; Ro 2-9757; Adrucil™; Efudex™; Efudix™; Fluoroplex™; Fluorouracil™) is a halogenated pyrimidine derivative, a cytotoxic ANTICANCER AGENT that prevents cell replication. It is used primarily in oral treatment of solid tumours (e.g. of the colon and breast) and malignant skin lesions. Also, it is used in combination with **adrenaline** by local injection in the treatment of genital warts (AccuSite™).

Fluorouracil™ ➡ **fluorouracil**.

fluoruridindeoxyribose ➡ **floxuridine**.

Fluothane™ ➡ **halothane**.

fluoxetine [BAN, INN, USAN] (LY 110140; Prozac™) is a benzenepropanamine unrelated to the tricyclics or mono-amine oxidase inhibitor ANTIDEPRESSANT classes. It is a SSRI, a selective serotonin (re-) uptake inhibitor, and is extensively used orally to treat depressive illness, with the advantage over some other antidepressants in that it has relatively less sedative and anticholinergic side-effects. It has recently been used for bulimia nervosa and obsessive-compulsive disorders. The onset of action may take some weeks to reach full effect and offset on discontinuation is also slow. In 1996 it was the 5th best-selling prescription drug in the world.

fluoxolonate ➡ **flunisolide**.

fluoxymesterone [BAN, INN] (NSC 12165; Halotestin™ and many other names) is a steroid, an ANABOLIC and ANDROGEN. It is used in the treatment of hypogonadism, and has been tried as an ANTICANCER AGENT for breast cancer.

flupenthixol [BAN] (flupentixol [INN]; flupentixol dihydrochloride [JAN]; flupentixol decanoate; Lu 7-105; FX 703; LC 44;. Lu 5-110; N 7009; SKF 10812; Depixol™; Fluanxol™ and many other names) is chemically one of the thioxanthenes, which have properties similar to the phenothiazine derivatives. It is used orally as an ANTIPSYCHOTIC in the treatment of schizophrenia and other psychoses, particularly where there is apathy and withdrawal, but not for mania or psychomotor hyperactivity. It is also used (at a lower dose) as a short-term ANTIDEPRESSANT. Flupenthixol decanoate is the form used for depot injections for long-term treatment.

flupentixol ➡ **flupenthixol**.

flupentixol decanoate ➡ **flupenthixol**.

flupentixol dihydrochloride ➡ **flupenthixol**.

fluperamide [INN, USAN] is one of the phenylpiperidine series, an analogue of **loperamide**. It is an OPIOID RECEPTOR AGONIST which has OPIOID ANALGESIC and ANTIDIARRHOEAL properties. It also has CALCIUM-CHANNEL BLOCKER activity.

fluphenazine [BAN, INN] (fluphenazine hydrochloride [USAN]; fluphenazine enanthate [BAN, JAN, USAN]; fluphenazine decanoate [BAN]; fluphenazine caproate; trifluoromethylphenothiazine; NSC 62323; Decazate™; Modecate™; Moditen™; Motipress™; Motival™; Prolixin™ and many other names) is one of the phenothiazine group (with a piperazine side-chain), and has general properties similar to those of **chlorpromazine**. It is used as an ANTIPSYCHOTIC in the treatment of psychoses, such as schizophrenia, and for the short-term control of severe manic, violent or agitated states. It can also be used for the short-term treatment of severe anxiety. Administration of the hydrochloride salt is oral, and the decanoate salt by depot deep intramuscular injection for long-term control.

fluphenazine caproate ➡ **fluphenazine.**
fluphenazine decanoate ➡ **fluphenazine.**
fluphenazine enanthate ➡ **fluphenazine.**
fluphenazine hydrochloride ➡ **fluphenazine.**
flupirtine [BAN, INN] (flupirtine maleate [USAN]; D 9998; W 2964M) is a pyridylcarbamate, a non-opioid **ANALGESIC**, with an undefined mode of action. It is a possible (NMDA) **GLUTAMATE RECEPTOR ANTAGONIST.**
flupirtine maleate ➡ **flupirtine.**
fluprednidene [BAN, INN] (fluprednylidene) is a **CORTICOSTEROID**, a **GLUCOCORTICOID**, with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties. It has been used topically in the treatment of inflammatory skin disorders.
fluprednisolone [BAN, INN, USAN] (fluprednisolone acetate; fluprednisolone valerate [USAN]; fluprednisolone hemisuccinate; NSC 47439) is a **CORTICOSTEROID**, a **GLUCOCORTICOID**, with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties. It has been used orally in the treatment of inflammatory conditions.
fluprednisolone acetate ➡ **fluprednisolone.**
fluprednisolone hemisuccinate ➡ **fluprednisolone.**
fluprednisolone valerate ➡ **fluprednisolone.**
fluprednylidene ➡ **fluprednidene.**
fluprofen [BAN, INN] is one of the propionic acid series, a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity.
fluprostenol [BAN, INN] (fluprostenol sodium [USAN]; ICI 81008) is a synthetic prostaglandin, a **PROSTANOID RECEPTOR AGONIST.** It is a veterinary **LUTEOLYTIC AGENT.**
fluprostenol sodium ➡ **fluprostenol.**
flurandrenolide ➡ **flurandrenolone.**
flurandrenolone [BAN] (fludroxycortide [INN]; flurandrenolide [USAN]; fluoroandrenolone; L 33379; LT 86; Cordran™; Haelan™) is a moderately potent **CORTICOSTEROID**, a **GLUCOCORTICOID**, with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties. It is used topically in the treatment of inflammatory skin disorders.
fluoroandrenolone ➡ **flurandrenolone.**
flurazepam [BAN, INN, JAN] (flurazepam hydrochloride [JAN, USAN]; Ro 5-6901; Dalmane™) is one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST**, with most properties similar to **diazepam**. It has **HYPNOTIC, ANTICONVULSANT** and **ANXIOLYTIC** activity. It is used orally as one of the long-duration group, to treat insomnia.
flurazepam hydrochloride ➡ **flurazepam.**
flurbiprofen [BAN, INN, JAN, USAN] (BTS 18322; Froben™; Ocufen™ and many other names) is one of the propionic acid series, a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity. It is used particularly in the treatment of pain and inflammation in musculoskeletal disorders, period pain and postoperative pain. It is also used as a **MYDRIATIC AGENT** in ocular surgery. The (SD)-form is esflurbiprofen [BAN, INN].
Fluress™ ➡ **fluorescein; oxybuprocaine.**
flurofamide [INN, USAN] (EU 4534) is a benzamide, a **UREASE INHIBITOR.**
flurogestone acetate ➡ **flugestone acetate.**
flurothyl [BAN, USAN] (flurotyl [INN]; SKF 6539) is a trifluoroethylether, a volatile liquid, which acts by inhalation as a **CNS STIMULANT.** It was formerly used as an **ANTIDEPRESSANT** for the treatment of severe depression as an alternative to electroconvulsive therapy.
flurotyl ➡ **flurothyl.**
flusoxolol [BAN, INN] is a **β-ADRENOCEPTOR ANTAGONIST.**
fluspirilene [BAN, INN, USAN] is a **CALCIUM-CHANNEL BLOCKER** with central actions.
flutamide [BAN, INN, USAN] (Sch 13521; Drogenil™; Eulexin™) is a non-steroidal **ANTIANDROGEN** used as an **ANTICANCER AGENT** for prostate cancer, and also for hirsutism. It can be used in conjunction with the **LH-RH RECEPTOR AGONIST** analogues, e.g. **leuprolide.**
flutazolam [INN, JAN] (Ro 7-6102) is one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST**, with most properties similar to **diazepam**. It has **HYPNOTIC, ANTICONVULSANT** and **ANXIOLYTIC** activity, and has been used orally to treat anxiety states.
flutemazepam [INN] (SAS 646) is one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST**, with most properties similar to **diazepam**. It has **HYPNOTIC, ANTICONVULSANT** and **ANXIOLYTIC** activity, and has been used orally to treat anxiety states.
fluticasone [BAN, INN] (fluticasone propionate; Cutivate™; Flixonase™) is a fluoro-analogue of **cloticasone**, a **CORTICOSTEROID**, a moderately potent **GLUCOCORTICOID**, with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties. It is used topically for inflammatory skin disorders, such as dermatitis and eczema, that are unresponsive to less potent corticosteroids, and also for psoriasis. It can also be used by nasal spray for nasal allergy and rhinitis.
fluticasone propionate ➡ **fluticasone.**
flutoprazepam [INN, JAN] (KB 509) is one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST**, with most properties similar to **diazepam**. It has **HYPNOTIC, ANTICONVULSANT** and **ANXIOLYTIC** activity, and has been used orally to treat anxiety states.
flutropium bromide [INN, JAN] is a quaternary ammonium **MUSCARINIC CHOLINOCEPTOR ANTAGONIST**, with **BRONCHODILATOR** activity and which can be used to treat respiratory tract disorders.
fluvastatin [BAN, INN] (fluvastatin sodium [USAN]; XU 62-320; Lescol™) is one of the fungal antimetabolite series of **HMG-COA REDUCTASE INHIBITORS**, and is used as an **ANTIHYPERLIPIDAEMIC.**
fluvastatin sodium ➡ **fluvastatin.**
fluvoxamine [BAN, INN] (fluvoxamine maleate [USAN]; DU 23000; MK 264; Faverin™ and many other names) is a compound unrelated to the tricyclics or monoamine oxidase inhibitor **ANTIDEPRESSANT** classes; it is a SSRI, a selective serotonin (re-) **UPTAKE INHIBITOR.** It is extensively used orally to treat depressive illness, and has the advantage over some other antidepressants in that it has relatively less sedative and anticholinergic side-effects.
fluvoxamine maleate ➡ **fluvoxamine.**
FML™ ➡ **fluorometholone.**
fMLP (formyl-Met-Leu-Phe; FMLP) is a bacterial chemotactic tripeptide factor released from bacterial cell walls in infection, acting in the host as a **FORMYL RECEPTOR AGONIST.** It is one of the chemotaxins that act in the body to promote neutrophil migration and infiltration. Chemotaxins, including fMLP, attract neutrophils to actively migrate through the walls of blood vessels to the site of the invading pathogen to engulf and digest them.
FMLP ➡ **fMLP.**
FMRF amide (neuropeptide C; molluscan cardioexcitatory peptide) is a tetrapeptide isolated from the mollusc *Macrocallista nimbosa*, and is a putative molluscan neurotransmitter acting at an ion-channel-receptor complex. It has **CARDIAC STIMULANT** properties.
Folex™ ➡ **methotrexate.**

folic acid [BAN, INN] (pteroylglutamic acid; vitamin Bc; vitamin M; coenzyme F) is a VITAMIN of the B complex, and is an essential cofactor for many aspects of body biochemisty, including an important role in the synthesis of nucleic acids (DNA and RNA). It is found in many foodstuffs and chemically exists in the form of its homologues, having extended alkyl side-chains. Therapeutically, it is used to supplement deficient diets; and normally before and during pregnancy in order to help prevent neural tube defects (spina bifida). Also, it can be used as a haemopoietic and ANTIANEAEMIC in certain forms of anaemia (e.g. megaloblastic anaemia). It is also used as the calcium salt, **calcium folinate**.

folinic acid (formylpteroylglutamic acid; citrovorum factor; Leucovorin™) is a derivative of tetrahydrofolic acid, the active form of the B complex VITAMIN folic acid. The (-)-L-form is the biologically active natural stereoisomer. Therapeutically, it is also used in the form of the Ca salt **calcium levofolinate**, or the (*dl*)-L-form racaemic form (calcium folinate), as an antidote to the toxic effects caused by the folate-antagonist activity of (antimetabolite) cytotoxic drugs used in anticancer chemotherapy.

follicle-stimulating hormone (FSH; follitropin) is a gonadotropic PITUITARY HORMONE (MW ca. 36,000) secreted by the anterior pituitary gland of species including humans, horses, pigs and sheep. It regulates activity of the ovary and testis. Follitropin occurs in two main forms: α and β. α-Follitropin (follitropin alfa [INN]; choriogonadotropin alfa [INN]; Gonal-F™) is now available in recombinant (synthetic) form. β-Follitropin (follitropin beta [INN]; Puregon™) is also now available in recombinant (synthetic) form. FSH is commonly used as **human menopausal gonadotrophin** preparations also containing FSH (see **menotrophin**). A further preparation from human menopausal urine, urofollitrophin [BAN] (urofollitropin [INN, USAN]), contains FSH activity only. Similar FSH/LH biological activity is found in human **chorionic gonadotropin**. The main therapeutic use of FSH preparations is by injection in infertility treatment in women to stimulate ovulation.

follicle stimulating hormone releasing factor ➡ **gonadotrophin-releasing hormone**.

follicular hormone ➡ **oestrone**.

folliculostatin ➡ **inhibin**.

follitropin ➡ **follicle-stimulating hormone**.

α-follitropin ➡ **follicle-stimulating hormone**.

β-follitropin ➡ **follicle-stimulating hormone**.

follitropin alfa ➡ **follicle-stimulating hormone**.

follitropin beta ➡ **follicle-stimulating hormone**.

fominoben [INN] (fominoben hydrochloride [JAN]; PB 89) is a benzamide, a centrally acting ANTITUSSIVE, reported to be a RESPIRATORY STIMULANT. It has ANXIOLYTIC actions believed to be mediated via benzodiazepine receptors.

fominoben hydrochloride ➡ **fominoben**.

fomocaine [BAN, INN] (P 652) is an ester series LOCAL ANAESTHETIC, which has been used by topical application for local pain relief.

Forane™ ➡ **isoflurane**.

forasartan [INN, USAN] (SC 52458) is a triazolyltetrazol-phenylpyridine, an (AT_1) ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE properties, which can be used in the treatment of congestive heart failure.

formebolone [BAN, INN] is a steroid, with ANABOLIC activity. It has been given orally and by injection.

formestane [BAN, INN] (CGP 32349; Lentaron™) is a form of the steroid androstanetrione, and is an AROMATASE INHIBITOR, an irreversible 'suicide' inhibitor of the oestrogen synthase system, preventing the conversion of androgens to oestrogens. It is thus an indirect hormone inhibitor, and is used by intramuscular injection as an ANTICANCER AGENT to treat hormone-dependent advanced breast cancer in post-menopausal women.

forminitrazole [BAN, INN] is an ANTIPROTOZOAL, ANTITRICHOMONAL AGENT no longer marketed.

formocortal [BAN, INN, JAN, USAN] is a CORTICOSTEROID, a GLUCOCORTICOID, with ANTIINFLAMMATORY and ANTIALLERGIC properties. It has been used topically in the treatment of eye disorders.

formononetin (formoononetin; biochanin B) is an isoflavone constituent of red and subterranean clovers (*Trifolium pratense* and *Trifolium subterraneum*) and of Chana (*Cicer arietinum*), and widely distributed in the Leguminosae (Papilionoideae). It has OESTROGEN properties.

formoononetin ➡ **formononetin**.

***N*-formylmescaline** ➡ **mescaline**.

formyl-Met-Leu-Phe ➡ **fMLP**.

formylpteroylglutamic acid ➡ **folinic acid**.

FORMYL RECEPTOR AGONISTS act at a site with the unofficial name formyl receptors which recognize the chemotactic tripeptide **fMLP** (formyl-Met-Leu-Phe; FMLP). This bacterial chemotactic factor is released from bacterial cell walls in infection. and is one of the chemotaxins that act in the body to promote neutrophil migration and infiltration. Attracted by chemotaxins including fMLP, neutrophils actively migrate through the walls of blood vessels to the site of the invading pathogen, and are capable of engulfing, killing and digesting microorganisms. The discovery of formyl-*N*-blocked agents stemmed from the idea that neutrophils might be able to recognize products of prokaryotic cells, not found in eukaryotes; and ribosomal protein synthesis commences with *N*-formylmethionine in the former, but not in the latter. As a chemoattractant, fMLP is widely used experimentally, and has some possible therapeutic uses (*vide infra*).

There are a number of end-responses to fMLP that have been measured in activated cells, including phosphatidylinositol activation and calcium mobilization, membrane potential changes (hyperpolarization and depolarization), superoxide production and release of granule enzymes. Possible therapeutic intervention might well be directed to limiting superoxide production, which though toxic to the invading organism may also cause cellular damage.

There have been quite extensive SAR studies of the structural requirements for agonists and antagonists activity at formyl receptors, mainly within the tripeptide structure, but no non-peptides have been demonstrated to bind selectively. Analogues known to have high chemotactic activity include: *N*-formyl-Met-Ile-Phe-Leu, *N*-Acetyl-Met-Leu-Phe, *N*-formyl-Met-Leu-Ile-Phe and simlar analogues. In contrast, some appear to be inhibitors or antagonists: see FORMYL RECEPTOR ANTAGONISTS.

Rot, A. *et al.* (1987) A series of six ligands for the human formyl peptide receptor: tetrapeptides with high chemotactic potency and efficacy. *Proc. Natl. Acad. Sci. U. S. A.*, **84**, 7967-7971.

Allen, R.A. *et al.* (1989) Identification of a human neutrophil protein of Mr 24 000 that binds N-formyl peptides: co-sedimentation with specific granules. *Biochim. Biophys. Acta.*, **991**, 123-133.

Schultz, P. *et al.* (1992) Complementation of formyl peptide receptor-mediated signal transduction in Xenopus laevis oocytes. *Biochem. J.*, **284 (Pt 1)**, 207-212.

Torrini, I. *et al.* (1996) Modified chemotactic peptides: synthesis, conformation, and activity of HCO-Thp-Ac6c-Phe-OMe. *Biopolymers*, **39**, 327-337.

FORMYL RECEPTOR ANTAGONISTS act at formyl receptors which recognize the chemotactic tripeptide

chemotaxin **fMLP** (FMLP) and its analogues. There are some antagonists at formyl receptors that can be used experimentally and diagnostically. SAR and other studies have been directed at defining the requirement at the binding site(s) (see FORMYL RECEPTOR AGONISTS). Chemotaxis of rabbit peritoneal leucocytes stimulated by fMLP has also been shown to be inhibited by Glu-Glu-Glu-Glu-Tyr-Pro-Met-Glu (MT peptide) and Leu-Ile-Glu-Asp-Asn-Glu-Tyr-Thr-Ala-Arg-Glu-Gly (Src peptide). Neither peptide inhibited binding of [^{3}H]-formyl-Nle-Leu-Phe, a chemoattractant, to neutrophils, suggesting that the peptides inhibit the events distal to the chemotactic receptors. The peptide analogue Boc-Phe-Leu-Phe-Leu-Phe appears to be an inhibitor or antagonist in some systems, and has been used experimentally quite extensively. There are some studies showing that some iodinated radiographic contrast agents, specificaly sodium diatrizoate, inhibited the effect of fMLP on granulocyte locomotion. The 3,5-pyrazolidinedione (3,5-P) drugs, **phenylbutazone** and **sulphinpyrazone**, have been reported to bind to formyl receptors, and to behave as functional antagonists of fMLP in human and rabbit neutrophils. Whether there are subtypes of receptor, and if they are a competitive antagonists at the binding site, has not been fully established

Levesque, L. *et al.* (1991) The interaction of 3,5-pyrazolidinedione drugs with receptors for f-Met-Leu-Phe on human neutrophil leukocytes: a study of the structure- activity relationship. *Can. J. Physiol. Pharmacol.*, **69**, 419-425.

Levesque, L. *et al.* (1992) Comparison of two classes of non-peptide drugs as antagonists of neutrophil receptors for f-Met-Leu-Phe. Pyrazolons and iodinated radiographic contrast agents. *Biochem. Pharmacol.*, **43**, 553-560.

Derian, C.K. *et al.* (1996) Selective inhibition of N-formylpeptide-induced neutrophil activation by carbamate-modified peptide analogues. *Biochemistry*, **35**, 1265-1269.

Fortagesic™ ➡ **pentazocine**.

Fortral™ ➡ **pentazocine**.

foscarnet sodium [BAN, INN, USAN] (Foscavir™) is a synthetic non-nucleoside analogue of pyrophosphate, which acts as a REVERSE TRANSCRIPTASE INHIBITOR, and can be used as an ANTIVIRAL. Clinically, its main use is in treating cytomegalovirus retinitis in AIDS immunocompromised patients.

Foscavir™ ➡ **foscarnet sodium**.

fosfestrol [BAN, INN, JAN] (stilphostrol; stilbestrol diphosphate; stilboestrol diphosphate) is a synthetic non-steroid OESTROGEN, which has been used as an ANTICANCER AGENT for prostate cancer.

fosfomycin [BAN, INN, USAN] (fosfomycin calcium [JAN]) is a broad-spectrum phosphonic acid ANTIBIOTIC, with ANTIBACTERICIAL properties effective against Gram-negative bacteria.

fosfomycin calcium ➡ **fosfomycin**.

fosinopril [BAN, INN] (fosinopril sodium [USAN]; Monopril™; Staril™) is the prodrug of fosinoprilat, a phosphinyl derivative with ACE INHIBITOR activity. It can be used as an ANTIHYPERTENSIVE and in HEART FAILURE TREATMENT.

fosinopril sodium ➡ **fosinopril**.

fosmidomycin [INN] is a phosphonic acid ANTIBIOTIC (similar to **fosfomycin**) produced by *Streptomyces lavendulae*. Clinically, it is a useful antibiotic active against Gram-negative bacteria. It shows synergism with β-lactam antibiotics.

fotemustine [BAN, INN] (S 10036) is a nitrosourea analogue of **carmustine**, an alkylating ANTICANCER AGENT that directly damages DNA, interfering with cell replication. It has been used to treat disseminated malignant melanoma and cerebral metastases.

411F ➡ **vinaxanthone**.

450191 S ➡ **rilmazafone**.

fox green ➡ **indocyanine green**.

Foy™ ➡ **gabexate**.

FPL 63547 ➡ **utibapril**.

FR 1314 ➡ **zotepine**.

FR 30385 ➡ **zimeldine**.

FR 74366 ➡ **zenarestat**.

FR 139317 is a peptoid compound, which acts as a subtype-selective (ET_A) ENDOTHELIN RECEPTOR ANTAGONIST. It is used as a pharmacological tool.

FR 173657 is a non-peptide quinolinyl derivative (B_2-subtype) BRADYKININ RECEPTOR ANTAGONIST. It did not advance to clinical development, but has been used as a pharmacological tool.

FR 900409 ➡ **FK 409**.

FR 900506 ➡ **tacrolimus**.

fradafiban [INN] is a biphenyl-oxopyrrolidineacetic acid derivative, a fibrinogen receptor antagonist.

framycetin sulphate [BAN, INN] (neomycin B; Soframycin™) is an (aminoglycoside) ANTIBIOTIC. Clinically, it has broad-spectrum ANTIBACTERIAL properties, but is too toxic to use by injection, though it can be used in treating some superficial bacterial infections.

Fraxiparin™ ➡ **nadroparin calcium**.

Freon 123B1 ➡ **halothane**.

Froben™ ➡ **flurbiprofen**.

froxiprost [INN] (ONO 995) is a prostaglandin and synthetic analogue of **dinoprost**, and is a (selective FP) PROSTANOID RECEPTOR AGONIST, active in contracting uterine smooth muscle. It is used as a pharmacological tool.

frusemide [BAN] (furosemide [INN, JAN, USAN]; Fursemide™; Lasix™ etc.) is a (loop) DIURETIC which can be used as an ANTIHYPERTENSIVE and to treat pulmonary oedema.

Frusene™ ➡ **triamterene**.

FSF ➡ **factor XIII**.

FSH ➡ **follicle-stimulating hormone**.

ftalofyne [INN] (phthalofyne [USAN]) is a veterinary ANTHELMINTIC.

FTS ➡ **nonathymulin**.

Fucidin™ ➡ **fusidic acid**.

Fudr™ ➡ **floxuridine**.

fugu poison ➡ **tetrodotoxin**.

Fulcin™ ➡ **griseofulvin**.

Fulvicin™ ➡ **griseofulvin**.

fumaric acid (paramaleic acid; glaucic acid; boletic acid) occurs in many plants, e.g. *Fumaria officinalis, Boletus scaber, Fomes igniarius*, and is produced by *Rhizopus nigricans*. It is an essential component of the tricarboxylic acid cycle in tissue respiration. It can be used as a dermatological agent in topical and systemic treatment of psoriasis.

Furacin™ ➡ **nitrofurazone**.

Furadantin™ ➡ **nitrofurantoin**.

furaltadone [BAN, INN] is an ANTIBACTERIAL and ANTIPROTOZOAL AGENT.

furazabol [INN, JAN] (DH 245) is a steroid, with ANABOLIC activity and is used as an ANTILIPIDAEMIC AGENT.

furazolidone [BAN, INN] (Furoxone™) is a synthetic nitrofuran with ANTIMICROBIAL activity, including ANTISEPTIC, ANTIPROTOZOAL and ANTIBACTERIAL properties. It can be used for broad-spectrum antibacterial treatment, to treat giardiasis, and also as a poultry food additive.

furegrelate [INN] (furegrelate sodium [USAN]) is a pyridinylbenzofuran derivative, a THROMBOXANE SYNTHETASE INHIBITOR.

furegrelate sodium ➡ **furegrelate**.

furethidine [BAN, INN] (TA 48) is one of the

phenylpiperidine series, an OPIOID RECEPTOR AGONIST, and has been used as an OPIOID ANALGESIC.

furfenorex [INN] is an **amphetamine**-like agent with SYMPATHOMIMETIC properties. It was formerly used as an APPETITE SUPPRESSANT.

furosemide ➡ **frusemide**.

Furoxone™ ➡ **furazolidone**.

Fursemide™ ➡ **frusemide**.

furtrethonium iodide [INN] is a furan derivative with potent PARASYMPATHOMIMETIC actions. It is a MIOTIC AGENT.

fusafungine [BAN, INN] is a (depsipeptide) ANTIBIOTIC from *Fusarium* spp., showing ANTIBACTERIAL and ANTIFUNGAL activity. It can be used as an aerosol for local application for treatment of upper respiratory tract infections.

fusaric acid (5-butylpicolinic acid; the amide is bupicomide) is isolated from *Fusarium* spp. It is a plant growth inhibitor with INSECTICIDAL activity and DOPAMINE β-HYDROXYLASE INHIBITOR with ANTIHYPERTENSIVE properties.

fusaric acid is a pyridinecarboxylic acid derivative, isolated from *Fusarium* spp. It is a plant growth inhibitor with INSECTICIDAL activity and a DOPAMINE β-HYDROXYLASE INHIBITOR, inhibiting synthesis of catecholamines, and shows ANTIHYPERTENSIVE properties.

fusidate sodium ➡ **fusidic acid**.

fusidic acid [BAN, INN, USAN] (sodium fusidate [BAN, INN, JAN]; fusidate sodium [USAN]; Fucidin™) is a steroid ANTIBIOTIC with narrow-spectrum ANTIBACTERIAL activity (also some ANTIVIRAL activity in HIV). Clinically, it can be used orally or topically against staphylococcal infections.

FUT 175 ➡ **nafamostat**.

FUT-187 ➡ **sepimostat**.

Fysostigmin™ ➡ **physostigmine**.

fytic acid [INN] (sodium phytate [USAN]; phytic acid; myo-inositol hexakisphosphate) is widely distributed in the Gramineae and seeds of many other higher plants. It is a CHELATING AGENT or complexing agent for the removal of traces of heavy metals. It has been used therapeutically as a CALCIUM METABOLISM MODIFIER, as a hypocalcaemic agent.

FX 703 ➡ **flupenthixol**.

G

G/18 ➡ **isobromindione**.

G 34586 ➡ **clomipramine**.

G 35020 ➡ **desipramine**.

G 704650 ➡ **alendronic acid**.

GABA ➡ **γ-aminobutyric acid**.

gabapentin [BAN, INN, USAN] (Go 3450; Neurontin™) is a recently introduced **GABA**-like amino acid which penetrates the blood–brain barrier and acts as a CNS DEPRESSANT. It has ANTICONVULSANT activity and is used as an ANTIEPILEPTIC to assist in the control of seizures that have not responded to other antiepileptics.

GABA RECEPTOR AGONISTS act at recognition sites at which GABA (γ-aminobutyric acid) and other agonist ligands act. There are two main and contrasting types; $GABA_A$ and $GABA_B$ receptors. In vertebrates, GABA is largely confined to the CNS (but is found in all the nervous systems of some invertebrates: see CHLORIDE-CHANNEL ACTIVATORS; INSECTICIDES). GABA receptors themselves have a wider distribution, being found on neurons outside the mammalian CNS and in a number of peripheral cell types. GABA is widely accepted to be a major neurotransmitter within the mammalian CNS, where it is thought to be responsible for more than 40% of all inhibitory transmission. A number of important drug classes have members that exert their actions through enhancing (or antagonizing) the actions of GABA.

The $GABA_A$ receptor has a main 'competitive site' that directly affects channel gating, and here GABA and some natural or unnatural chemicals can act to open the channels (e.g. **muscimol**, **gaboxadol** (THIP), isoguvacine, piperidine-4-sulphonic acid and avermectins). Also acting through this site, though indirectly, is the antiepileptic drug **vigabatrin** (γ-vinyl GABA), which inhibits endogenous GABA degradation. See ANTICONVULSANTS.

Other agents act more indirectly. These include ANXIOLYTICS, anticonvulsant and ANTIEPILEPTICS, as well as HYPNOTIC and SEDATIVE drugs (see also TRANQUILLIZERS). A number of these drugs are chemically benzodiazepines or work through interaction with the benzodiazepine-binding 'modulatory site' of the $GABA_A$ receptors. The key feature of this interaction is a positive allosteric modification of binding and action of GABA at a main 'competitive site' concerned with ion channel opening. BENZODIAZEPINE BINDING-SITE AGONISTS and GABA mutually enhance binding at the $GABA_A$ receptors; the former increase the number of channels that are opened by a given concentration of GABA, rather than increasing the average open channel time or channel conductance. Benzodiazepines cannot by themselves effect channel opening, though some other agents such as the barbiturates can; there is evidence that the latter interact in different ways or at different modulatory sites. The mechanism of actions of agents – both benzodiazepines and non-benzodiazepines, acting at the benzodiazepine binding-site – are discussed elsewhere. See BENZODIAZEPINE BINDING-

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SITE INVERSE AGONISTS and BENZODIAZEPINE BINDING-SITE ANTAGONISTS.

Recently, a further type of chloride-channel receptor has been proposed – termed $GABA_C$ – and this form is not sensitive to **bicuculline**, nor is it not sensitive to modulation by benzodiazepines, barbiturates or neurosteroids. It is expressed strongly in certain sites, including the retina, and contains novel σ subunits. Whether this proposed subtype simply represents a further characteristic aggregation of oligomeric subunits is not yet clear. In any event, it may represent a target for novel non-benzodiazepine drug action.

$GABA_B$ receptors are of the seven-transmembrane G-protein-coupled type, and they have a widespread distribution in the body. Agonists at this receptor site include L-**baclofen**, CGP 27492 and CGP 35024. The receptors are negatively coupled to cAMP, and typical responses in neurons are to inhibit excitability by opening potassium channels or closing calcium channels. These inhibitory actions can be harnessed clinically; for instance, **baclofen** is used as a muscle relaxant and has actions mainly at the spinal level within the CNS (see SKELETAL MUSCLE RELAXANTS). See GABA RECEPTOR ANTAGONISTS.

Sieghart, W. (1995) Structure and pharmacology of γ-aminobutyric $acid_A$ receptor subtypes. *Pharmacol. Rev.*, **47**, 181-234.

Johnston, G.A. (1996) $GABA_A$ receptor pharmacology. *Pharmacol. Ther.*, **69**, 173-198.

Bowery, N.G. (1997) Metabotropic $GABA_B$ receptors cloned at last: *Trends Pharmacol. Sci.*, **18**, 103.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.* **19**, 1-98.

GABA RECEPTOR ANTAGONISTS The main receptors at which GABA (γ-aminobutyric acid) and its antagonists act are of two main and contrasting types (see GABA RECEPTOR AGONISTS). Antagonists acting on the 'competitive site' of the $GABA_A$ channels include **bicuculline**, **picrotoxin** (active principle picrotoxinin: non-competitive), SR 95531, **gabazine** and insecticides such as the cyclodienes. Also, the $GABA_A$ receptor has a very important 'modulatory site' benzodiazepine binding-site. See BENZODIAZEPINE BINDING-SITE AGONISTS; BENZODIAZEPINE BINDING-SITE ANTAGONISTS. Some other drug classes act at non-benzodiazepine regions of the modulatory site, but nevertheless have some similarities in their actions. The binding site for barbiturates may well be an important part of their mechanism of action, and these drugs do potentiate the action of GABA. Some aspects of the action of **ethanol** are through yet another region, and there is some evidence of partial reversal of its action by benzodiazepine inverse agonists.

$GABA_B$ receptors are of the seven-transmembrane G-protein-coupled type, and they have a widespread distribution in the body. Agonists at this receptor site include GABA and L-**baclofen**, which have inhibitor effects on neurons and neurotransmitter release. These agonists can be antagonized by **saclofen**, **hydroxysaclofen**, **phaclofen**, **TBPS** and **CGP 35348**.

Narahashi, T. *et al.* (1989) The role of ion channels in insecticide action, in *Insecticide Action: From Molecule to Organism*, (eds T. Narahashi *et al.*), Plenum Press, New York, pp. 55–84.

Krogsgaard-Larsen, P. *et al.* (1994) $GABA_A$ receptor agonist, partial agonists and antagonists. Design and therapeutic prospects. *J. Med. Chem.*, **37**, 2489-2505.

gabazine is a pyridazinebutanoic acid derivative, a (MAO_A) MONOAMINE-OXIDASE INHIBITOR. It is also a potent and selective ($GABA_A$) GABA RECEPTOR ANTAGONIST.

gabexate [INN] (gabexate mesilate [JAN]; Foy™ and many other names) is a guanidinohexanoate derivative, an ENZYME INHIBITOR active as a (serine) PROTEASE INHIBITOR. It can be used in the treatment of pancreatitis, and as an ANTICOAGULANT in haemodialysis.

gabexate mesilate ➡ **gabexate**.

gaboxadol [INN] (THIP) is a ($GABA_A$), an isoxazolopyridinone, a GABA RECEPTOR AGONIST, used as a pharmacological tool.

galactin ➡ **prolactin**.

GALANIN RECEPTOR AGONISTS act at sites that recognize galanin and related peptides. Galanin is a 30 amino acid peptide in the form found in humans. A number of species variants are recognized, including a 29 residue porcine amidated version; these have a conserved 1-14 amino acid sequence. It is a gastrointestinal hormone first found in porcine intestine. It contracts smooth muscle, including that of the intestine, has effects on secretion and modulates hormone release. It is now recognized as having a specific neuronal distribution, especially in sensory neurons, and is co-stored with acetylcholine in the CNS. It is suggested to affect antinociception, modification of feeding behaviour, cognitive function, the reproductive axis and feeding. Direct administration of galanin into the rat third ventricule stimulates food intake, increases plasma growth hormone and prolactin levels and decreases dopamine levels in the median eminence. Intravenous infusion in dog and humans induces a hyperglycemia and glucose intolerance, and inhibits insulin, somatostatin and pancreatic polypeptide secretion from pancreas. Galanin is an oestrogen-stimulated peptide in that oestrogens increase dramatically the synthesis of their mRNA and the peptide in the rat pituitary, and it may play a role in hypothalamic and pituitary function.

Two or more G-protein-coupled receptors (GAL1 and GAL2) have now been cloned. There are no agonists specific for these subtypes, though galanin(2-29) is more active at GAL2 receptors. Ligands binding at the galanin receptors are thought to have therapeutic potential in Alzheimer's disease, feeding disorders, pain and depression.

Bartfai, T. *et al.* (1992) Galanin and galanin antagonists: Molecular and biochemical perspectives. *Trends Pharmacol. Sci.*, **13**, 312-317.

Bartfai, T. *et al.* (1993) Galanin: a neuroendocrine peptide. *Crit. Rev. Neurobiol.*, **7**, 229-274.

Crawley, J.N. (1995) Biological actions of galanin. *Regul. Pept.*, **59**, 1-16.

Kask, K. *et al.* (1997) Galanin receptors: involvement in feeding, pain, depression and Alzheimer's disease. *Life Sci.*, **60**, 1523-1533.

GALANIN RECEPTOR ANTAGONISTS act at sites recognizing the neuropeptide galanin. There are a number of possible applications of antagonists at these receptors. Centrally administered galanin inhibits acetylcholine release in the rat ventral hippocampus, producing deficits in learning and memory tasks. In Alzheimer's disease, galanin is overexpressed in terminals innervating the nucleus basalis of Meynert cell bodies. Galanin receptor antagonists provide a novel approach for increasing cholinergic function, as a potential adjunct to the clinical treatment of dementias. Few antagonists are yet available. Galantide (galanin-1-13-substance P-5-11 amide) can act as an antagonist.

Arletti, R. *et al.* (1997) Galantide improves social memory in rats. *Pharmacol. Res.*, **35**, 317-319.

Korolkiewicz, R. *et al.* (1997) Galanin, galantide and galanin (1-14)-[alpha-aminobutyric $acid^8$]-scyliorhinin-I: structure dependent effects on the rat isolated gastric fundus. *Pharmacol. Res.*, **35**, 7-16.

Ceresini, G. *et al.* (1998) Effects of galanin and the galanin receptor antagonist galantide on plasma catecholamine levels during a psychosocial stress stimulus in rats. *Neuroendocrinology*, **67**, 67-72.

galanthamine is a benzazepin, an ANTICHOLINESTERASE and ANALGESIC. It has been investigated for treatment of Alzheimer's disease, and is in clinical use in Russia.

Galcodine™ ➡ **codeine**.

galdansetron [BAN] (GR 81225X) is an imidazolylcarbazolone, a selective ($5\text{-}HT_3$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST, with ANTIEMETIC activity.

Galfer™ ➡ **ferrous fumarate.**

gallamine [BAN] (gallamine triethiodide [INN, USAN]; benzcurine iodide; Flaxedil™) is a tristerary aromatic amine NICOTINIC CHOLINOCEPTOR ANTAGONIST, a (competitive) NEUROMUSCULAR BLOCKING AGENT which can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia. Also, it is a (M_2-subtype-selective) MUSCARINIC CHOLINOCEPTOR ANTAGONIST which interacts allosterically, and acts as a pharmacological tool in cholinoceptor subtype studies. It is also an ($I_{SK(Ca)}$) POTASSIUM-CHANNEL BLOCKER.

gallamine triethiodide ➡ **gallamine.**

gallium nitrate [USAN] (Ganite™; NSC 15200) is a CALCIUM METABOLISM MODIFIER used to treat cancer-related hypercalcaemia by reducing calcium-resorption from the bone, and as an adjunct in ANTICANCER treatment.

gallopamil [BAN, INN] is a CALCIUM-CHANNEL BLOCKER that is a coronary VASODILATOR, OXYTOCIC AGENT and ANTIANGINAL.

GALLSTONE DISPERSING AGENTS may be used to disperse gallstones. Cholesterol is the usual constituent of stones in countries where gallstone disease is common. Some stones are composed very largely of cholesterol, whilst others also contain bile pigments, calcium and protein. The composition largely determines treatment: medical treatment may be used where cholesterol is the major constituent, but surgical treatment is required where stones are calcified.

Choleretic agents stimulate the secretion of bile by the liver, thereby increasing the flow of bile. Examples include **chenodeoxycholic acid**, **ursodeoxycholic acid** and a semisynthetic cholate, **dehydrocholic acid**. Chenodeoxycholic acid appears to work by inhibiting HMG-CoA reductase. Dehydrocholic acid produces thin watery bile, so is used to flush small calculi out of the bile ducts, particularly after surgery. These agents are discussed in more detail in other articles: see ANTIHYPERLIPIDAEMIC AGENTS; CHOLERETIC AGENTS; HMG-COA REDUCTASE INHIBITORS.

Terpenes are reputed to increase cholesterol solubility in bile, though are less effective than bile acids. There are two such preparations available, Rowatinex™ and Rowachol™, containing some combination of the following: **anethol**, **borneol**, **camphene**, **cineole**, **mendone**, **menthol**, **pipene** and **renchone**, in olive oil. Direct contact dissolution by direct injection of organic solvents, such as **methyl tert-butyl ether** (MTBE), is sometimes used.

Berg, C.L., *et al.* (1993) Pharmacology of hepatobiliary disease, in *Gastrointestinal Pharmacotherapy*, (ed. M.M. Wolfe), W.B. Saunders Co., Philadelphia, pp. 245-264.

Hofmann, A.F. (1993) The enterohepatic circulation of bile acids in health and disease, in *Gastrointestinal Disease*, 5th edn, (eds M.H. Sleisinger *et al.*), W.B. Saunders Co., Philadelphia, pp. 127-150.

Paumgartner, G. (1993) Nonoperative management of gallstone disease, in *Gastrointestinal Disease*, 5th edn, (eds M.H. Sleisinger *et al.*), W.B. Saunders Co., Philadelphia, pp. 1844-1857.

Portincasa, P. *et al.* (1995) Cholesterol gallstone formation in man and potential treatments of the gallbladder motility defect. *Scand. J. Gastroenterol., Suppl.* 212, **30**, 63-78.

Gamimune™ ➡ **globulin, immune.**

gammalinolenic acid ➡ **gamolenic acid.**

gamma benzene hexachloride ➡ **lindane.**

gamma-BHC ➡ **lindane.**

Gammar™ ➡ **globulin, immune.**

gamolenic acid [BAN, INN] (γ-linolenic acid; GLA ; gammalinolenic acid; Epogam™; Efemast™) is isolated from evening primrose seed oil. It is a minor component of many animal lipids. It is thought to be of value given orally for a variety of conditions, including atopic eczema, mastalgia, for diabetic neuropathy and as an ANTIHYPERLIPIDAEMIC.

ganciclovir [BAN, INN, USAN] (Cymevene™; Cytovine™) is a synthetic (nucleoside) ANTIVIRAL. Clinically, it can be used against cytomegalovirus infection in immunocompromised patients (e.g. ANTI-HIV treatment).

Ganda™ ➡ **guanethidine.**

GANGLION BLOCKING AGENTS (ganglion blockers) act at nicotinic cholinergic receptors in the ganglia of the peripheral autonomic nervous system. Nicotinic receptors are involved in fast neurotransmission, and are of the oligomeric intrinsic-ion-channel superfamily. They may be composed, in molecular terms, of various assemblies of pentameric receptor protein, but seem to fall into a number of groups, including muscle, ganglionic and neuronal CNS types. These channels are permeant to ions in the selectivity order $Na^+/K^+/Ca^{2+}$, so have an equilibrium potential leading to marked depolarization (a further subtype, α7, is rather more permeable to Ca^{2+}). These structural groups are reflected in slightly different receptor recognition properties, which can be taken advantage of in drug design.

Nicotine itself has an initial stimulatory agonist action at the skeletal neuromuscular junction, autonomic ganglia and within the CNS. This stimulation quickly gives way to refractoriness of responses to other nicotinic agonists, including the neurotransmitter **acetylcholine**, with consequent paralysis of transmission. Agonist ligands discriminate little between nicotinic receptor subtypes, though antagonists do to some extent. **Lobeline** and **DMPP** seem to be selective for the ganglionic site. In terms of drug development, there are a number of initiatives to probe neuronal nicotinic receptors. **Anatoxin** shows some selectivity for the **α-bungarotoxin** sensitive neuronal site. A poison frog toxin, **epibatidine**, is a unique alkaloid which shows some agonist selectivity for the α-bungarotoxin-insensitive neuronal site. See NICOTINIC CHOLINOCEPTOR AGONISTS; NICOTINIC CHOLINOCEPTOR ANTAGONISTS; NEUROMUSCULAR BLOCKING AGENTS.

ganirelix [BAN, INN] (ganirelix acetate [USAN]; RS 26306) is a synthetic peptide analogue of **gonadorelin** (**gonadotrophin-releasing hormone**) and is a long-acting LH-RH RECEPTOR ANTAGONIST. It can, in principle, be used as a LUTEOLYTIC AGENT to inhibit ovulation. A projected use is for the treatment of sex-hormone-related diseases, especially as part of ANTICANCER hormone-therapy of sex-hormone-dependent tumours. It is related to **cetrorelix**, **detirelix** and **ramorelix**.

ganirelix acetate ➡ **ganirelix.**

Ganite™ ➡ **gallium nitrate.**

Gantanol™ ➡ **sulphamethoxazole.**

Gantrisin™ ➡ **sulphafurazole.**

Garamycin™ ➡ **gentamicin.**

Garantose™ ➡ **saccharin.**

GASTRIC MOTILITY STIMULANTS (prokinetic agents) are drugs used to stimulate gastric emptying and facilitate small intestine transit, and they may also enhance the strength of oesophageal sphincter contraction. They have a number of uses, including the treatment of gastric stasis and various disorders of gastric emptying, speeding of transit of barium meals, non-ulcer dyspepsia and oesophageal reflux, and to help reduce the vomiting that accompanies radiotherapy and chemotherapy. The control of gastric and gastrointestinal motility involves complex neural pathways and a number of neurotransmitters and hormones, so, in principle, increased motility could be induced by many different classes of agents. Cholinergic stimulants, including muscarinic agonists (see MUSCARINIC CHOLINOCEPTORS AGONISTS) and ANTICHOLINESTERASES, have been be used, but they lack selectivity of action – in particular, tending to cause

an undesirable increase in gastric acid secretion.

A number of useful agents show degrees of mixed activities as dopamine D_2-receptor antagonists (see **DOPAMINE RECEPTOR ANTAGONISTS**) – which imparts useful **ANTIEMETIC** activity – with prokinetic activity, through activation of neural cholinergic mechanisms, mainly via 5-hydroxytryptamine receptor activation or α_1-adrenoceptor antagonism. Drugs of this type include benzamides, such as **cisapride**, **metoclopramide** and **trimethobenzamide**, and benzimidazole derivatives, such as **domperidone**. Increasingly, it is realized that activation of cholinergic mechanisms through agents having an agonist action at the recently recognized 5-HT_4 subtype constitutes a useful approach to drug development, and such agents include cisapride, and substituted benzimidazoles such as **renzapride**. Initiatives are in progress to develop more selective drugs. **Motilin**, a 22 amino acid gastrointestinal hormone, stimulates specific receptors causing gastric emptying and postprandial gastric emptying: the antibiotic **erythromycin** and other derivatives of the macrolide group are thought to have an agonist action at these receptors and show promise as a new class of prokinetic agents.

Weber, F.H. *et al.* (1993) Erythromycin: a motilin agonist and gastrointestinal prokinetic agent. *Am. J. Gastroenterol.*, **42**, 551-568.

Buchheit, K.-H. *et al.* (1995) The serotonin 5-HT_4 receptor. 1. Design of a new class of agonists and receptor map of the agonist recognition site. *J. Med. Chem.*, **38**, 2326-2330.

Buchheit, K.-H. *et al.* (1995) The serotonin 5-HT_4 receptor. 2. Structure-activity studies of the indole carbazimidamide class of agonists. *J. Med. Chem.*, **38**, 2331-2338.

Kilbinger, H. *et al.* (1995) Benzimidazolones and renzapride facilitate acetylcholine release from guinea-pig myenteric plexus via 5-HT_4 receptors. *Naunyn-Schmiedeberg's Arch. Pharmacol.*, **351**, 229-236.

GASTRIC PROTON PUMP INHIBITORS act to reduce gastric acid secretion in the stomach. They act at the H^+/K^+-ATPase – the proton pump – which is the mechanism through which hydrochloric acid in an isotonic solution with a pH of less than 1 is secreted by the parietal cells of the stomach. The H^+/K^+-ATPase is unique to the parietal cells, and links to Cl^-, Na^+ and HCO_3^- exchange within the apical or basal membranes (see **ATPASE INHIBITORS**). This enzyme is a target for the so-called proton pump inhibitors, the first of which was the substituted benzimidazole **omeprazole**. This acts by irreversibly blocking the H^+/K^+-ATPase, and markedly reduces both basal and stimulated gastric acid secretion. It has a pKa of 3.97 and is inactive at neutral pH, but on oral administration it accumulates in the acid environment of the stomach, and is active at a pH of less than 3, probably by protonation. It is thought to react with sulphydryl groups of the proton pump. Its selectivity of drug action depends, in part, on these activation characteristics. It is valuable in the treatment of peptic ulcers resistant to histamine H_2 antagonists, in reflux oesophagitis and is the drug of choice for Zollinger-Ellison syndrome. This drug may also be used, concurrently with antimicrobial agents, to eliminate *Helicobacter pylori* infection, which is a bacterium peculiar to the environment of the stomach and thought to be involved with the aetiology of peptic ulcers (and possibly carcinoma of the stomach). Further drugs of this type in clinical use include **lansoprazole**, **pantoprazole** and **rabeprazole**. See also **GASTRIC SECRETION INHIBITORS**.

McTavish, D. *et al.* (1991) Omeprazole. An updated review of its pharmacology and therapeutic use in acid-related disorders. *Drugs*, **42**, 138-170.

Nelson, N. (1991) Structure and pharmacology of the proton-ATPases. *Trends Pharmacol. Sci.*, **12**, 71-75.

Sachs, G. *et al.* (1995) The pharmacology of the gastric acid pump: The H+,K+ ATPase. *Annu. Rev. Pharmacol. Toxicol.*, **35**, 277-305.

GASTRIC SECRETION INHIBITORS act at some stage in the control process to inhibit the enzymic or gastric acid secretions of the stomach, with the latter being a major therapeutic target. The neuronal, hormonal and paracrine control of gastric acid secretion from the parietal cells of the gastric mucosa is complex. The pathways involved include **acetylcholine** via the parasympathetic innervation of the stomach, the hormone **gastrin**, the paracrine agent **histamine** and possibly the paracrine hormone **gastrin-releasing peptide**.

Anticholinergic agents have not proved very valuable in the long-run, having a limited ability to reduce acid secretion at doses that can be tolerated in view of widespread side-effects. Some more recently developed agents show gastric-selectivity (they are M_1-cholinoceptor-preferring ligands, which may be the reason for their selectivity), e.g. **pirenzepine** and **telenzepine**: see **MUSCARINIC CHOLINOCEPTOR ANTAGONISTS**.

Gastrin receptor antagonists and gastrin-releasing peptide antagonists have now been developed for experimental use, but it is not yet clear if either will be useful clinically. See **BOMBESIN RECEPTOR ANTAGONISTS**; **CHOLECYSTOKININ RECEPTOR ANTAGONISTS**.

Histamine H_2-receptor antagonists are very effective in reducing acid secretion and have considerable usage, e.g. **cimetidine**, **famotidine**, **nizatidine** and **ranitidine**. These agents are used to treat gastric and duodenal ulcer, dyspepsia, reflux oesophagitis, Zollinger-Ellison syndrome and a number of related disorders. They are relatively safe and free of side-effects. See **HISTAMINE H_2-RECEPTOR ANTAGONISTS**.

Gastric proton pump inhibitors act to reduce gastric acid secretion in the stomach, by irreversibly blocking the H^+/K^+-ATPase, and markedly reduce both basal and stimulated gastric acid secretion. Examples of those so far in use are **lansoprazole**, **omeprazole**, **pantoprazole** and **rabeprazole**, and they react with sulphydryl groups of the proton pump. This type of drug is valuable in the treatment of peptic ulcers resistant to histamine H_2 antagonists, for reflux oesophagitis and are the drugs of choice for Zollinger-Ellison syndrome. They may also be used concurrently with antimicrobial agents to eliminate *Helicobacter pylori* infection, a bacterium peculiar to the environment of the stomach and thought to be involved with the aetiology of peptic ulcers (and possibly carcinoma of the stomach). See **GASTRIC PROTON PUMP INHIBITORS**.

Other agents that are effective in healing peptic ulceration probably do not work through inhibiting gastric acid secretion, but have some other form of protective action. These other agents include prostaglandin analogues (e.g. **misoprostol**: see **PROSTANOID RECEPTOR AGONISTS**), bismuth chelates (e.g. tripotassium dicitratobismuthate), complexes: (e.g. **sucralfate**) and liquorice derivatives (e.g. **carbenoxolone**).

McTavish, D. *et al.* (1991) Omeprazole. An updated review of its pharmacology and therapeutic use in acid-related disorders. *Drugs*, **42**, 138-170.

Graham, D.Y. (1993) Treatment of peptic ulcers caused by *Helicobacter pylori*. *N. Engl. J. Med.*, **328**, 349-350.

Hersey, S.J. *et al.* (1995) Gastric acid secretion. *Physiol. Rev.*, **75**, 155-190.

Sachs, G. *et al.* (1995) The pharmacology of the gastric acid pump: The H^+,K^+ ATPase. *Annu. Rev. Pharmacol. Toxicol.*, **35**, 277-305.

gastrin is the name of members of a family of peptide hormones secreted in the neuroendocrine cells of the mucosa of the stomach, and secreted into the portal blood. It is involved in the control of gastric secetion. The main member of the series is a 17 amino acid residue linear peptide, which has a structure similar to **cholecystokinin**, and is a (CCK_B/gastrin receptor subtype) **CHOLECYSTOKININ RECEPTOR AGONIST**. There are large numbers of species-

dependent analogues and fragements known.

gastrin-releasing peptide (GRP) is a 27 residue endogenous peptide, with a local hormone role in activating release of the hormone **gastrin**. It is a **BOMBESIN RECEPTOR AGONIST** more active at the BB_2 receptor subtype.

gastrin-releasing peptide 18–27 (GRP18-27; neuromedin C) is an active sequence of the 27 residue peptide hormone, gastrin-releasing peptide. It is a **BOMBESIN RECEPTOR AGONIST** with a range of actions on smooth muscle and exocrine glands similar to **gastrin-releasing peptide** and **neuromedin B**.

gastrins are a family of peptide hormones. The parent member of the series is a 17 amino acid residue linear peptide, a (CCK_B/gastrin receptor subtype) **CHOLECYSTOKININ RECEPTOR AGONIST**.

Gastrobid™ ➡ metoclopramide.

Gastrocote™ ➡ magnesium hydroxide; magnesium trisilicate; sodium bicarbonate.

Gastrocrom™ ➡ cromoglycic acid.

Gastroflux™ ➡ metoclopramide.

Gastromax™ ➡ metoclopramide.

Gastrozepin™ ➡ pirenzepine.

Gaviscon™ ➡ aluminium hydroxide; calcium carbonate; magnesium hydroxide; magnesium trisilicate; sodium bicarbonate.

G-CSF ➡ filgrastim; lenograstim.

Ge 132 ➡ propagermanium.

GEA 6414 ➡ tolfenamic acid.

gefarnate [BAN, INN] (geranyl farnesylacetate) is a tetradecatrienoate, which has been used as a **GASTRIC SECRETION INHIBITOR** and **ANTIULCEROGENIC** for the treatment of peptic ulcers and other gastrointestinal disorders.

GelTears™ ➡ carbomer.

gemcitabine [BAN, INN, USAN] (gemcitabine hydrochloride [USAN]; Gemzar™) is an antimetabolite cytotoxic **ANTICANCER** and **ANTIVIRAL AGENT**. Clinically, it can be used systemically for the treatment of lung cancer and other solid tumours.

gemcitabine hydrochloride ➡ gemcitabine.

Gemcor™ ➡ gemfibrozil.

gemeprost [BAN, INN, JAN, USAN] (ONO 802; Gemeprost™) is a prostaglandin and synthetic analogue of **alprostadil** (PGE_1), a **PROSTANOID RECEPTOR AGONIST**. It is active and is used in early pregnancy by application to the cervix by pessary to cause softening in therapeutic abortion, and also to remove the foetus following intra-uterine death. It is a **LUTEOLYTIC AGENT** and **OXYTOCIC** (uterine stimulant).

Gemeprost™ ➡ gemeprost.

gemfibrozil [BAN, INN, USAN] (CI 719; Gemcor™; Lopid™ and many other names) is one of the fibrate group and is an **ANTIHYPERLIPIDAEMIC**.

Gemzar™ ➡ gemcitabine.

GENERAL ANAESTHETICS are important drugs used during surgical and manipulative procedures to reduce sensation in the whole body through induction of unconsciousness – in contrast to **LOCAL ANAESTHETICS** which affect sensation in a specific local area without loss of consciousness. A number of explanations have been advanced for the mechanism of action of this diverse group of simple and structurally unreactive compounds. Those relating to inhalation anaesthetics mostly build on the century-old theory of Overton & Meyer, relating anaesthetic potency to lipid solubility; thus suggesting that anaesthesia involves interaction with a hydrophobic domain of the cell. There have been various extensions to this general theory, including a proposed induced increase in membrane fluidity, and a specific interaction with synaptic transmission.

The general anaesthetic used to initially induce anaesthesia is often different from the drug or drugs used to maintain it. For induction, short-acting general anaesthetics that are commonly injected are convenient (e.g. **etomidate, methohexitone sodium, midazolam, propofol, thiopentone sodium**); but for maintenance of anaesthesia during longer operations, inhalation anaesthetics may be used (e.g. **cyclopropane, diethylether, enflurane, halothane, isoflurane, nitrous oxide**). **Ketamine** is known as a dissociative anaesthetic and has atypical actions, including a propensity to cause hallucinations (see **PSYCHOTROPHIC AGENTS**). In order to minimize the depth of anaesthesia necessary for a surgical procedure, some sort of premedication with, or concurrent use of, other drugs is commonly necessary: see **ANALGESICS; ANXIOLYTIC AGENTS; NEUROMUSCULAR BLOCKERS; SKELETAL MUSCLE RELAXANTS.**

Franks, N.P. *et al.* (1987) What is the molecular nature of the general anaesthetic target sites? *Trends Pharmacol. Sci.*, **8**, 169-174.

Halsey, M.J. (1989) Physicochemical properties of inhalation anaesthetics, in *General Anaesthesia*, (eds J.F. Nunn *et al.*), Butterworth, London.

Miller, R.D (1990) *Anaesthesia*, Churchill Livingstone, New York.

Little, H.J. (1996) How has molecular pharmacology contributed to our understanding of the mechanism(s) of general anesthesia? *Pharmacol. Ther.*, **69**, 37-58.

genistein (genisteol; K 2541; differenol A) is an isoflavone that is very widely distributed in the Leguminosae subfamily (subfamily Papilionoideae), also in *Podocarpus spicatus* (Podocarpaceae) and *Prunus* spp. (Rosaceae). It is thought to be produced by microorganisms *Streptomyces vulgare* and other *Streptomyces* spp., *Aspergillus niger, Mycobacterium phlei* and *Micromonospora halophytica*. It is a weak **OESTROGEN** and **ANTIOXIDANT**. It shows insect antifeedant and weak **ANTIBACTERIAL** activity against *E. coli* and *Xanthomonas oryzae*. Experimentally, it is used as a **PROTEIN KINASE INHIBITOR** against protein tyrosine kinases, including those activated by epidermal growth factor (EDRF) and platelet-derived growth factor (PDGF) receptors. It has claimed **ANTICANCER** preventive activity. Methylgenistein, isogenistin and methylisogenistin were all impure genistein.

genisteol ➡ genistein.

Genotropin™ ➡ human pituitary growth hormone.

gentamicin [BAN, INN] (Cidomycin™; Garamycin™; Genticin™) (micronomicin [INN, JAN] = gentamicin C2) is an (aminoglycoside) **ANTIBIOTIC** complex, consisting of a mixture of closely related and structurally similar components (gentiomycin C1, C2, C2b etc.). Clinically, it has **ANTIBACTERIAL** properties, being active against many Gram-positive bacteria, but ototoxic and nephrotoxic and other effects limit its use by injection and so it is now used in treating some superficial bacterial infections. It is often used in combination with other drugs.

gentamicin B ➡ isepamicin.

gentian violet ➡ crystal violet.

Genticin™ ➡ gentamicin.

gentisic acid [INN] (sodium gentisate [INN]; hydroquinonecarboxylic acid; 5-hydroxysalicylic acid; gentisinic acid; 2,5-dihydroxybenzoic acid and many other names) is widely distributed in higher plants and is also a metabolite of *Penicillium* spp. It can be used clinically as a topical **COUNTER-IRRITANT** (rubefacient or topical analgesic) for some painful conditions, including rheumatism and arthritis (and also in the form of its methyl ester).

gentisinic acid ➡ gentisic acid.

Geocillin™ ➡ carindacillin.

geographutoxin I ➡ μ-conotoxin GIIIA.

geographutoxin II ➡ μ-conotoxin GIIIB.

gepirone [INN] (gepirone hydrochloride [USAN]; BMY 13805-1; MJ 13805) is one of the azaspirone group structurally related to **buspirone** and with similar properties. It is a **5-HYDROXYTRYPTAMINE RECEPTOR AGONIST**, a partial agonist at the $5HT_{1A}$ receptor subtype. It is a novel **ANXIOLYTIC** under investigation for treatment of anxiety and depression.

gepirone hydrochloride ➡ **gepirone**.

GER 11 ➡ **pimagedine**.

geranyl farnesylacetate ➡ **gefarnate**.

Geref 50™ ➡ **sermorelin**.

gestodene [BAN, INN, USAN] (SHB 331) is a synthetic steroid and analogue of **levonorgestrel**, and is a potent **PROGESTOGEN** which is used as a component of numerous oral combined contraceptive preparations (with an **OESTROGEN**).

Gestone™ ➡ **progesterone**.

gestonorone caproate ➡ **gestronol**.

gestrinone [BAN, INN, USAN] (A 46745; R 2323; RU 2323; ethylnorgestrienone; Dimetriose™) is a synthetic steroid reported to have activity as an **ANTIPROGESTOGEN, ANTIOESTROGEN** and **ANDROGEN**. It is used in the treatment of endometriosis, and possibly fibroids.

gestronol [BAN] (gestonorone caproate [INN, JAN, USAN]; gestronol hexanoate; NSC 84054;SH 582; Depostat™) is a synthetic steroid and analogue of **levonorgestrel**, and is a long-acting **PROGESTOGEN** that is given by oily deep intramuscular injection as an **ANTICANCER AGENT** for endometrial cancer and benign prostatic hyperplasia.

gestronol hexanoate ➡ **gestronol**.

GGA ➡ **teprenone**.

GH ➡ **human pituitary growth hormone**.

α-GHI ➡ **acarbose**.

GH-RIF ➡ **somatostatin**.

GHRP-6 ([His^1,Lys^6]GH-RP) is a synthetic hexapeptide, a truncated analogue of the **HYPOTHALAMIC HORMONE, growth hormone-releasing hormone**, that stimulates release of growth hormone *in vivo*. It also has sequence homology with **melanocyte-stimulating hormone**, and is a competitive inhibitor of α-MSH in frog skin (this compound having been discovered in a research programme searching for this type of activity). It also acts as a functional antagonist of somatostatin in somatotrope cells.

[His^1,Lys^6]GH-RP ➡ **GHRP-6**.

GI 87084B ➡ **remifentanil**.

ginkgolide B (BN 52021) is a terpene isolated from the Chinese tree *Ginkgo biloba*. It is a **PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST**. It is an **ANTIASTHMATIC** and has other activities. BN 52063 is a mixture of ginkgolides and has a similar type of activity.

giractide [INN] is a synthetic peptide, a structural **CORTICOTROPHIN ANALOGUE**, which has been used clinically.

GLA ➡ **gamolenic acid**.

glafenine [INN, JAN] (R 1707) is one of the fenemate series, a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity. Reported adverse effects (anaphylactic reactions, nephrotoxicity, hepatotoxicity, gastrointestinal disturbances) have led to its withdrawal in some countries.

Glauber's salt ➡ **sodium sulphate**.

glaucic acid ➡ **fumaric acid**.

glaucine (tetramethoxyaporphine; boldine dimethyl ether) is an alkaloid from a wide variety of genera in the Annonaceae, Berberidaceae, Euphorbiaceae and others, but particularly from *Glauccium flavum* (Papaveraceae). It shows **ANTITHROMBOTIC, ANALGESIC, ANTIINFLAMMATORY** and **ANTIFUNGAL** activity. It produces narcosis and convulsions in animals, also hypotension and respiratory depression. It has been used (in eastern Europe) as an **ANTITUSSIVE** with similar potency to codeine.

GL enzyme ➡ **hyalosidase**.

glibenclamide [BAN, INN, JAN] (glyburide [USAN]; Daonil™; Euglucon™ etc.) is one of the sulphonylurea group of (oral) **HYPOGLYCAEMICS**. It increases insulin secretion from the pancreas by acting as a **POTASSIUM-CHANNEL BLOCKER** at certain ATP-sensitive K^+-channels. It can be used as an **ANTIDIABETIC** in non-insulin-dependent diabetes mellitus (NIDDM).

Glibenese™ ➡ **glipizide**.

glibornuride [BAN, INN, USAN] is one of the sulphonylurea group of (oral) **HYPOGLYCAEMICS**. It can be used as an **ANTIDIABETIC** in Type 2 diabetes. (Note: the name glibornuride has frequently but erroneously been applied to glibenclamide.)

gliclazide [BAN, INN, JAN] (Diamicron™ etc.) is one of the sulphonylurea group of (oral) **HYPOGLYCAEMICS**. It increases insulin secretion from the pancreas by acting as a **POTASSIUM-CHANNEL BLOCKER** at certain ATP-sensitive K^+-channels. It can be used as an **ANTIDIABETIC** in Type 2 diabetes.

glimepiride [BAN, INN, USAN] (Hoe 490; Grimepiride™) is one of the sulphonylurea group of (oral) **HYPOGLYCAEMICS**. It is thought to increase insulin secretion from the pancreas by acting as a **POTASSIUM-CHANNEL BLOCKER** at certain ATP-sensitive K^+-channels. It can be used as an **ANTIDIABETIC** in Type 2 diabetes. It also has **CYCLOOXYGENASE INHIBITOR** activity.

glipizide [BAN, INN, USAN] (Glibenese™; Minodiab™ etc.) is one of the sulphonylurea group of (oral) **HYPOGLYCAEMICS**. It increases insulin secretion from the pancreas by acting as a **POTASSIUM-CHANNEL BLOCKER** at certain ATP-sensitive K^+-channels. It can be used as an **ANTIDIABETIC** in Type 2 diabetes.

gliquidone [BAN, INN] (Glurenorm™ etc.) is one of the sulphonylurea group of (oral) **HYPOGLYCAEMICS**. It increases insulin secretion from the pancreas by acting as a **POTASSIUM-CHANNEL BLOCKER** at certain ATP-sensitive K^+-channels. It can be used as an **ANTIDIABETIC** in non-insulin-dependent diabetes mellitus (NIDDM).

glisentide [INN] is one of the sulphonylurea group of (oral) **HYPOGLYCAEMICS**. It can be used as an **ANTIDIABETIC** in Type 2 diabetes.

glisolamide [INN] is one of the sulphonylurea group of (oral) **HYPOGLYCAEMICS**. It can be used as an **ANTIDIABETIC** in Type 2 diabetes.

glisoxepide [BAN, INN] is one of the sulphonylurea group of (oral) **HYPOGLYCAEMICS**. It can be used as an **ANTIDIABETIC** in Type 2 diabetes.

globulin, immune [USAN] (Gamimune™; Gammar™; Iveegam™; Sandoglobulin™; Venoglobulin-I™ and many other names) is a sterile solution of a group of heterogeneous human proteins produced by human lymphocytes and other plasma cells. It is divided into classes according to structure and properties. It is used by intravenous or intramuscular injection as an immunizing agent to confer immediate active immunity in a variety of states, including primary humoral immunodeficiency, in bone marrow transplantation, thrombocytopenic purpurea and for various infections. The UK preparation, called normal immunoglobulin, is essentially the same. Various specific immunoglobulins are available separately, including rabies immunoglobulin, rubella immunoglobulin, varicella-

zoster immunoglobulin, hepatitis B immunoglobulin and tetanus immunoglobulin.

GLPS ➡ **sulglycotide**.

GlucaGen™ ➡ **glucagon rDNA**.

glucagon [BAN, INN, JAN, USAN] (hyperglycaemic-glycogenolytic factor; HG-factor; HGF; glucagonoid) is a 29 residue peptide hormone (MW *c.* 3550) produced in the alpha cells of the islets of Langerhans of the pancreas. The primary structure of glucagon from all mammalian species so far studied is similar. Its physiological action is to raise blood glucose, in opposing balance to **insulin**, by activating hepatic glycogenolysis. Clinically, it is a HYPERGLYCAEMIC (administered as HCl salt) used in treating insulin overdose, in cases where a pancreatic tumour causes excessive secretion of insulin, for its (inotropic) CARDIAC STIMULANT action in the treatment of β-blocker overdosage, and as a diagnostic agent. Beef- or pork-derived material has generally been used clinically, but recombinant material is now also available: see **glucagon rDNA**.

glucagonoid ➡ **glucagon**.

glucagon rDNA (GlucaGen™) is a recombinant DNA product developed as a nasal formulation of glucagon for use as a HYPERGLYCAEMIC in the treatment of insulin-induced hypoglycaemia.

glucalox ➡ **glycalox**.

glucametacin [INN] is one of the fenemate series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

D-glucitol hexanicotinate ➡ **sorbinicate**.

Glucobay™ ➡ **acarbose**.

glucochloralose ➡ **chloralose**.

GLUCOCORTICOIDS are members of the CORTICOSTEROID family, with actions similar to the steroid hormones secreted by the adrenal cortex. There are two main types of corticosteroids: glucocorticoids and MINERALOCORTICOIDS. Glucocorticoids that are important physiologically include **hydrocortisone** (cortisol), **corticosterone** and **cortisone**. These are essential for utilization of carbohydrate, fat and protein in the body, and in the normal response to stress. Naturally occurring and synthetic glucocorticoids have a powerful antiinflammatory effect. In contrast, the mineralocorticoids (e.g. **aldosterone**) are necessary for the regulation of the salt and water balance of the body. Corticosteroids can be used in hormone replacement therapy. For instance, the glucocorticoid hydrocortisone and the mineralocorticoid fludrocortisone can be given to patients for replacement therapy where there is a deficiency, or in Addison's disease, or following adrenalectomy or hypopituitarism. The glucocorticoids are potent ANTIINFLAMMATORY and ANTIALLERGIC AGENTS, frequently used to treat inflammatory and/or allergic reactions of the skin, airways and elsewhere. Absorption of a high dose of corticosteroid over a period of time may also cause undesirable systemic side-effects. They are relatively safe when given by local application (skin-creams), inhalation into the lungs in the prophylactic treatment of asthma, or by local injection (e.g. into the region of tendinitis, or sometimes intrathecally). Systemic use is normally kept for short-term use, or emergencies such as anaphylactic shock.

Glucocorticoid effects involve interaction between the steroids and intracellular receptors that belong to the nuclear receptor superfamily. The effect is mediated via an interaction with DNA and modified gene transcription. Nuclear receptors for glucocorticoids are widely distributed and after activation undergo a conformational change which exposes DNA-binding domains. The steroid receptor complex then binds to DNA, and either induces (initiates transcription) or represses (prevents transcription) of particular genes. Some of the effects of glucocorticoids on gene transcription are mediated by interaction of the steroid–receptor complex with a transcription factor activator protein termed AP-1. In turn, AP-1 is involved in the induction of several genes, e.g. inducible cyclooxygenase (COX-2) and for IL-2. The results of these changes in gene transcription are multiple. In particular, glucocorticoids decrease prostanoid production (by inhibition of COX-2), and possibly by inhibiting transcription of the gene for phospholipase A_2, and also inhibition of the antiinflammatory mediator lipocortin-1.

Glucocorticoids have a very wide application as antiinflammatory agents in therapeutics. The route by which they are administered depends largely on their relative freedom from dangerous side-effects. Many are used by topical application, but some are intrinsically more powerful than others and may only be used when weaker corticosteroids have failed. Different salts may be used for certain purposes.

Some examples of current uses follow. **Betamethasone** is used for many purposes, including the treatment of cerebral oedema and congenital adrenal hyperplasia. **Cortisone** has both glucocorticoid and mineralocorticoid properties (in approximately equal measures), and can be used orally to correct hormonal deficiency, e.g. following adrenalectomy. It is converted in the body to hydrocortisone, and is now rarely used. **Dexamethasone** is used for many purposes, ranging from the suppression of inflammatory and allergic disorders, in shock, diagnosis of Cushing's disease, congenital adrenal hyperplasia, cerebral oedema and in the treatment of rheumatic disease. **Hydrocortisone** has both glucocorticoid and mineralocorticoid properties (in approximately equal measures), and can be used orally to correct hormonal deficiency, e.g. following adrenalectomy. More commonly, it is used to treat inflammation, including arthritis, adrenocortical insufficiency, shock, inflammatory bowel disease, haemorrhoids and hypersensitivity reactions. Administration is in a number of forms (hydrocortisone, hydrocortisone acetate, hydrocortisone butyrate, hydrocortisone sodium phosphate, hydrocortisone sodium succinate) and by many routes. **Methylprednisolone** is used to treat allergic reactions, cerebral oedema, shock, rheumatic disease and inflammatory skin disorders, such as eczema and psoriasis. Administration (as methylprednisolone, methylprednisolone acetate or methylprednisolone sodium succinate) is oral in the form of tablets, as a topical cream or by injection. **Prednisolone** is used for the treatment of a number of rheumatic and allergic conditions (particularly those affecting the joints or the lungs), collagen disorders, for ulcerative colitis, inflammatory bowel disease, Crohn's disease, haemorrhoids and as an immunosuppressant in myasthenia gravis. It may also be used for systemic corticosteroid therapy. Administration (as prednisolone, prednisolone acetate and prednisolone sodium phosphate) is oral, as suppositories or by injection. **Prednisone** is converted in the body into prednisolone, and is used orally for a variety of inflammatory and allergic disorders. See also DERMATOLOGICAL AGENTS.

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Flower, R.J. *et al.* (1994) Lipocortin-1: Cellular mechanisms and clinical relevance. *Trends Pharmacol. Sci.*, **15**, 71-76.

Cronstein, B.N. *et al.* (1995) Targets for antiinflammatory drugs. *Annu. Rev. Pharmacol. Toxicol.*, **35**, 449-462.

Wilckens, T. (1995) Glucocorticoids and immune function: Physiological relevance and pathogenic potential of hormonal dysfunction. *Trends Pharmacol. Sci.*, **16**, 193-197.

Glucophage™ ➡ **metformin**.

glucosylceramidase (human placenta isoenzyme protein moiety reduced) ➡ **alglucerase**.

glue sugar ➡ **glycine**.

Glurenorm™ ➡ **gliquidone**.

GLUTAMATE RECEPTOR AGONISTS act at sites that can conveniently be divided into two groups with different structural or mechanistic characteristics.

Firstly, *ionotropic glutamate receptors* are composed of receptors of the oligomeric intrinsic-ion-channel superfamily, divided into NMDA, AMPA and kainate receptors. These receptors are called ionotropic glutamate receptors, since ion channels are involved, to distinguish them from the metabotropic glutamate receptors (*vide infra*). These ligand-gated channels are permeant to cations (Na^+/K^+ and in some cases Ca^{2+}), so their effect on the membrane is excitatory. The receptors are of the heterooligomeric intrinsic-ion-channel superfamily, involved in fast neurotransmitter signalling. They consist of a number of different aggregations of subunits, which have been cloned. In vertebrates the endogenous ligands may be glutamate, aspartate and possibly homocysteate, and the receptors are found largely in the CNS. On the basis of studies with agonists and antagonists, three main subtypes of these excitatory receptors can be distinguished.

1. *NMDA receptors* are activated by glutamate and aspartate, and selectively by **NMDA (N-methyl-D-aspartate)** and **tetrazolylglycine**; all acting at the 'competitive site'. This channel is permeant to Ca^{2+} (as well as Na^+/K^+) and is involved not only in fast excitatory synaptic transmission, but it may have more subtle functions. These further functions include long-term potentiation (LTP), a term used to describe a long-lasting enhancement of transmission, which can be regarded as a synaptic 'learning' process probably of great physiological importance. There is also a 'modulatory site' at which **glycine** binds and has a facilitatory physiological role. At this site, **D-serine** is also an agonist and **HA 966** a partial agonist or sometimes an antagonist.

2. *AMPA receptors* (previously called quisqualate receptors) are permeant to Na^+/K^+ (and Ca^{2+} in some heteromeric combinations) and are involved in fast excitatory synaptic transmission. They are activated by **glutamate**, and selectively by **AMPA** and (s)-5-fluorawillardine, and are used as pharmacological tools.

3. *Kainate receptors* are permeant to Na^+/K^+ (and Ca^{2+} in some heteromeric combinations) and are involved in fast excitatory synaptic transmission. They are activated by glutamate, and selectively by **kainate**, **domoic acid** and 4-methyl glutamic acid.

Secondly, *metabotropic glutamate receptors* are members of the seven-transmembrane G-protein-coupled superfamily and are divided into eight or more classes denoted $mGlu_1$–$mGlu_8$ (previously called $mGluR_1$–$mGluR_8$), each a product of different genes. The presumed endogenous ligand at these receptors is glutamate. This class of receptor is found both presynaptically and postsynaptically, and they are coupled to G-proteins, including those for the $InsP_3$/DAG systems ($mGlu_{1,5}$), or negatively coupled to adenylyl cyclase ($mGlu_{2,3,4,6,7,8}$). They have multiple modulatory roles. Selective agonist ligands include: for $mGlu_1$–$mGlu_4$, ACPD, and trans-(1S,2*R*)-ACPD; at $mGlu_{4,6,7}$, L-AP-4; at $mGlu_5$, DHPG; and at $mGlu_8$, L-CCGI.

Nakanishi, S. *et al.* (1994) Molecular diversity and functions of glutamate receptors. *Annu. Rev. Biophys. Biomol. Struct.*, **23**, 319-348.

Bettler, B. *et al.* (1995) Review: neurotransmitter receptors. II. AMPA and kainate receptors. *Neuropharmacology*, **34**, 123-139.

Knopfel, T. *et al.* (1995) Metabotropic glutamate receptors: novel targets for drug development. *J. Med. Chem.*, **38**, 1417-1426.

Alexander, S.P.H. et al. (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

GLUTAMATE RECEPTOR ANTAGONISTS act at one or other of the two groups of receptor sites with different structural or mechanistic characteristics: see **GLUTAMATE RECEPTOR AGONISTS**.

Firstly, *ionotropic glutamate receptors* are composed of receptors of the oligomeric intrinsic-ion-channel superfamily, divided into NMDA, AMPA and kainate receptors. NMDA receptors are activated by endogenous **glutamate** and **aspartate**. Selective antagonists include **CGS 19755 (selfotel)**, D-AP5, CPP and CGP 37849. AMPA receptors (previously called quisqualate receptors) are permeant to Na^+/K^+ and are involved in fast excitatory synaptic transmission. They are activated by glutamate, and blocked selectively by GYKI 52466 (non-competitive), **NBQX** (FG 9202), and YM 90K, LY 215490 and LY 293558. Kainate receptors are activated by glutamate, and selectively blocked by NS 102. There is also a 'modulatory site' at which glycine binds, where antagonists include 5,7-dichlorokynurenate, L 689560 and MNQX.

Secondly, *metabotropic glutamate receptors* are divided into eight or more classes denoted $mGlu_1$–$mGlu_8$ and selective antagonist ligands include $mGlu_{1,2,3}$, α-methyl(carboxyphenyl)glycine; for some of the remainder MAP4.

Applications of these antagonists include their use as tools for analysing physiological roles of glutamate and other amino acids at various receptors. Also, possible therapeutic uses include for the treatment of neurodegenerative disorders and epilepsy. However, a number of the available compounds do not penetrate the blood–brain barrier, so are not effective when given systemically. Since the binding of glycine is required for activation of the receptor by glutamate, blocking of this site can also be effective. **Kyanurenic acid** derivatives act in this way. Another way to block activation of the NMDA receptor, is to block the ion channel. **Phencyclidine**, **ketamine** **dizocilpine** and selfotel are able to work in this way and these agents are able to reach the CNS. The potential use of antagonists of this type includes prevention of Ca^{2+}-entry (excitotoxicity), which leads to brain injury after stroke, and may be of value in preventing firing in epilepsy. Dizocilpine was shown to protect against excitotoxicity on ischaemic challenge, but has potential psychotomimetic liability. Ketamine can be used as a veterinary and human 'dissociative anaesthesia' especially in trauma surgery, though it has some propensity to cause hallucinations. Though these agents cause psychotic episodes – which limits their usefulness – it remains to be seen if these two aspects of their action may be separable (see **PSYCHOTROPIC AGENTS**).

Lodge, D. *et al.* (1990) Noncompetetive excitatory amino acid receptor antagonists. *Trends Pharmacol. Sci.*, **11**, 81-86.

Wong, E.H.F. *et al.* (1991) Sites for antagonism on the *N*-methyl-D-aspartate receptor channel complex. *Annu. Rev. Pharmacol. Toxicol.*, **31**, 401-425.

Lipton, S.A. (1993) Prospects for clinically tolerated NMDA antagonists: Open-channel blockers and alternative redox states of nitric oxide. *Trends Neurosci.*, **16**, 527-532.

Rogawski, M.A. (1993) Therapeutic potential of excitatory amino acid antagonists: Channel blockers and 2,3-benzodiazepines. *Trends Pharmacol. Sci.*, **14**, 325-331.

glutethimide [BAN, INN] (Doriden™) is a piperidinedione

previously used as a short-acting HYPNOTIC and SEDATIVE.

Gly ➡ **glycine**.

Glybigide™ ➡ **buformin**.

glyburide ➡ **glibenclamide**.

Glybutamide™ ➡ **carbutamide**.

glybuzole [INN, JAN] has a structure distinct from the biguanide, sulphonamidopyrimidine and sulphonylurea groups of (oral) HYPOGLYCAEMICS. It can be used as an ANTIDIABETIC in Type 2 diabetes.

glycalox [BAN] (glucalox [INN]) is a complex of **glycerol** with **aluminium hydroxide**, and can be used as an oral non-systemic ANTACID.

glycerin ➡ **glycerol**.

glycerine ➡ **glycerol**.

glycerol [INN] (glycerin [JAN, USAN]; glycerine) has a number of actions and can be used as a mild LAXATIVE, oral DIURETIC, emollient DERMATOLOGICAL AGENT, DIGESTIVE AGENT, a sweetening substance for medications, and orally for short-term ANTIGLAUCOMA TREATMENT.

glyceryl guaiacol ➡ **guaiphenesin**.

glyceryl guethol ➡ **guaietolin**.

glyceryl PABA ➡ **lisadimate**.

glyceryl trinitrate (glycerol trinitrate; nitroglycerin [USAN]; NTG; nitroglycerol and numerous proprietary names) is an organic nitrate, and a nitric oxide (NO) donor and NITRERGIC STIMULANT. It is a VASODILATOR and is widely used as an ANTIANGINAL AGENT for the short-term symptomatic relief of symptoms of angina pectoris. It may be taken sublingually (including modified-release preparations), by aerosol spray, percutaneously as prophylaxis, or intravenously in myocardial infarction etc.

glycine (aminoacetic acid; glue sugar; Gly) is an amino acid that is incorporated widely into peptides and proteins. It is a neurotransmitter within the mammalian CNS, particularly within the spinal cord. It is a GLYCINE RECEPTOR AGONIST, and also a GLUTAMATE RECEPTOR AGONIST in as much as it has a facilitatory role at the 'modulatory site' of the NMDA glutamate receptor subtype. It has a sweet taste and is used as a dietary additive and as a nutrient in a dietary supplement. It is also used in urogenital isotonic irrigating solutions for some surgical procedures.

GLYCINE RECEPTOR AGONISTS act at sites recognizing **glycine**, and are of the heterooligomeric intrinsic-ion-channel superfamily. These ligand-gated channels are permeant to chloride ions, so their effect on membrane excitability is normally inhibitory. Glycine receptors are pentamers, and there are four different isoforms of the α-subunit (α_1–α_4) and one variant of the β-subunit (β1). The α-unit contains the binding site, and the β-unit determines the channel conductance. In vertebrates glycine is largely confined to the CNS, in greater amounts in the spinal cord, but it is found throughout the nervous system of some invertebrates (see CHLORIDE-CHANNEL ACTIVATORS). The endogenous natural activator of these receptor channels is glycine, but some other agents may activate or modulate them in such a way as to make them more permeant to chloride, e.g. **β-alanine** and **taurine**.

Walstrom, K.M. *et al.* (1994) Mechanism for the channel-opening reaction of strychnine-sensitive glycine receptors on cultured embryonic mouse spinal cord cells. *Biochemistry*, **33**, 7718-7730.

Kuhse, J. *et al.* (1995) The inhibitory glycine receptor: architecture, synaptic localization and molecular pathology of a postsynaptic ion-channel complex. *Curr. Opin. Neurobiol.*, **5**, 318-323.

Rajendra, S. *et al.* (1997) The glycine receptor. *Pharmacol. Ther.*, **73**, 121-146.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

GLYCINE RECEPTOR ANTAGONISTS act at receptors recognizing **glycine**. These heterooligomeric intrinsic-ion-channels are permeant to chloride ions, so their effect is normally inhibitory, so the effects of antagonists is excitatory (see CHLORIDE-CHANNEL BLOCKERS). The endogenous activator of these receptor channels is glycine itself, but a number of unnatural chemicals may modulate, or block their action so as to reduce chloride entry and thus increase overall membrane excitability, for example, cyanotriphenylborate, **picrotoxin**, PMBA and **strychnine**. These agents have excitatory actions, progressively causing ataxia and muscle rigidity, seizures or convulsions, paralysis and death.

Pullan, L.M. *et al.* (1992) Comparison of binding at strychnine-sensitive (inhibitory glycine receptor) and strychnine-insensitive (*N*-methyl-D-aspartate receptor) glycine binding sites. *Neurosci. Lett.*, **148**, 199-201.

Rundström, N. *et al.* (1994) Cyanotriphenylborate: Subtype-specific blocker of glycine receptor chloride channels. *Proc. Natl. Acad. Sci. USA*, **91**, 8950-8954.

Saitoh, T. *et al.* (1994) A novel antagonist, phenylbenzene ω-phosphono-α-amino acid, for strychnine-sensitive glycine receptors in the spinal cord. *Br. J. Pharmacol.*, **113**, 165-170.

glyclopyramide [INN, JAN] is one of the sulphonylurea group of (oral) HYPOGLYCAEMICS. It can be used as an ANTIDIABETIC in Type 2 diabetes.

glycobiarsol ➡ **bismuth glycollylarsanilate**.

glycol salicylate (Algipan™; Cremalgin™; Ralgex™ and many other names) is the hydroxyethyl ester of **salicylic acid**, and is one of the salicylate series of NSAID ANALGESICS. It is used topically as a COUNTER-IRRITANT (rubefacient or topical analgesic) for symptomatic relief of underlying pain.

glycopyrronium bromide [BAN, INN, JAN]; glycopyrrolate [USAN]; Robinul™) is a quaternary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST (with actions similar to **atropine**) which can be used parenterally as an anticholinergic in preoperative medication to reduce airways secretions, and postoperatively with ANTICHOLINESTERASES in reversing the actions of (competitive) NEUROMUSCULAR BLOCKING AGENTS.

glycyclamide [BAN, INN] is one of the sulphonylurea group of (oral) HYPOGLYCAEMICS. It can be used as an ANTIDIABETIC in Type 2 diabetes.

glycyrrhetic acid ➡ **enoxolone**.

glycyrrhetin ➡ **enoxolone**.

glycyrrhetinic acid ➡ **enoxolone**.

α-glycyrrhetinic acid ➡ **enoxolone**.

glymidine [BAN] (glymidine sodium [JAN, USAN]) is one of the sulphonylurea group of (oral) HYPOGLYCAEMICS. It can be used as an ANTIDIABETIC in Type 2 diabetes.

glymidine sodium ➡ **glymidine**.

glyoxylic diureide ➡ **allantoin**.

Glypressin™ ➡ **terlipressin**.

Glyvenol™ ➡ **tribenoside**.

GM-CSF ➡ **molgramostim**.

GM 6001 ➡ **ilomastat**.

GnRH ➡ **gonadotrophin-releasing hormone**.

Go 560 ➡ **febarbamate**.

Go 919 ➡ **piprozolin**.

Go 3450 ➡ **gabapentin**.

gold sodium thiomalate [JAN, USAN] (sodium aurothiomalate [INN]; Aurolate™; Myochrysine™) is a gold derivative, which is used by injection as an ANTIINFLAMMATORY in arthritic and rheumatic treatment.

gonadorelin ➡ **gonadotrophin-releasing hormone**.

gonadorelin acetate ➡ **gonadotrophin-releasing hormone**.

gonadorelin hydrochloride ➡ **gonadotrophin-releasing hormone**.

gonadotrophin is the name of any of several PITUITARY

HORMONES (and similar placental hormones) which are endocrine agents secreted by adenohypophysis (or chorion of the placenta), and which act on the ovary in women and the testes in men to promote the production in turn of other sex hormones and of ova or sperm, respectively. The major gonadotrophins are **follicle-stimulating hormone** (FSH) and **luteinizing hormone** (LH). In pregnancy, large amounts of a similar hormone are released by the placenta, so it is called CHORIONIC GONADOTROPHIN, and this is the basis of most pregnancy tests. These hormones are used in infertility treatment. There are many forms and preparations. See also **menotrophin**; **serum gonadotrophin**.

gonadotrophin-releasing hormone (gonadorelin [BAN, INN]; gonadorelin acetate [USAN]; gonadorelin hydrochloride [USAN]; luteinizing hormone-releasing hormone; LH-RH; LHRH; luteinizing hormone-releasing factor; LH-RF; GnRH; follicle stimulating hormone releasing factor; LRF; Abbott 41070; AY 24031; Hoe 471; Fertiral™; Relefact™; Lutrepulse™ and many other names) is an amidated decapeptide hypothalamic hormone secreted naturally by the hypothalamus. Through activation of LH-RH receptors, it causes the release from the pituitary of luteinizing hormone (LH) and follicle-stimulating hormone (FSH), which in turn physiologically causes the induction of ovulation. Therapeutically, a synthetic version, in this context termed gonadorelin, is used as a LH-RH RECEPTOR AGONIST for a number of purposes. It is used as a diagnostic agent (to assess pituitary function), and in the treatment of primary pituitary amenorrhoea. In infertility treatment, to promote ovulation, it is given for a short period by pulsatile subcutaneous or intravenous infusion. Alternatively, gonadorelin and other LH-RH receptor agonist analogues, can be given continuously (intranasally or by injection); when after an initial stimulation phase, they down-regulate pituitary gonadotrophin secretion, leading to inhibition of ovarian steroid secretion. In this latter manner gonadorelins are effective in the treatment of endometriosis, can be used as part of in assisted conception (IVF) protocols, and are potential CONTRACEPTIVES. Through suppressing sex steroid hormone secretion, they can also be used as ANTICANCER AGENTS for breast and prostate cancer. See also synthetic analogues of gonadorelin: **buserelin**, **deslorelin**, **fertirelin**, **ganirelix**, **goserelin**, **histrelin** **leuprorelin acetate**, **lutrelin** and **nafarelin**.

Gonal-F™ ➡ **follicle-stimulating hormone**.

gonatropin ➡ **chorionic gonadotropin**.

Gopten™ ➡ **trandolapril**.

goralatide [INN] (Ac-SDKP) is a tetrapeptide derivative isolated from foetal calf bone marrow, and has IMMUNOMODULATOR/IMMUNOSUPPRESSANT activity, and inhibits proliferation of bone marrow stem cells and protects against haematotoxicity of chemotherapeutic agents.

goserelin [BAN, INN, USAN] (ICI 118630; Zoladex™) is a synthetic peptide analogue of **gonadorelin** (**gonadotrophin-releasing hormone**), an LH-RH RECEPTOR AGONIST, with similar properties. It is used as an ANTICANCER AGENT in the treatment of breast and prostate cancer, and in the management of endometriosis.

gossypol is extracted from cottonseed oil and exhibits CONTRACEPTIVE activity as an antifertility agent in men. It has undergone widespread trials in China. Also, it is claimed to be an ANTICANCER AGENT, and a potential treatment for gliomas. It also shows ANTI-HIV activity.

GP 1-110 ➡ **acadesine**.

GP 47680 ➡ **oxcarbazepine**.

GR 43175C ➡ **sumatriptan**.

GR 64349 is a pseudopeptide, a TACHYKININ RECEPTOR AGONIST, reasonably selective at the NK_2-receptor subtype. It is used as a pharmacological tool.

GR 68755 ➡ **alosetron**.

GR 81225X ➡ **galdansetron**.

GR 87442 N ➡ **lurosetron**.

GR 11 3808 is a selective (5-HT_4-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It reduces alcohol intake in animal model. It is used as a pharmacological tool.

GR 117289 ➡ **zolasartan**.

GR 122311X ➡ **ranitidine bismutrex**.

GR 127935 is a ($5HT_{1B/D}$-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST with partial agonist actions. It is used as a pharmacological tool.

GR 138950 ➡ **saprisartan**.

GR 159897 is an indolylpiperidine, a TACHYKININ RECEPTOR ANTAGONIST selective for the NK_2-receptor subtype. It shows ANXIOLYTIC properties in animal models.

gramicidin S [INN] is a (cyclic peptide) ANTIBIOTIC. Active as an ANTIBACTERIAL and used clinically topically against Gram-positive bacteria.

grammotoxin SIA ➡ **o-grammotoxin SIA**.

o-grammotoxin SIA (grammotoxin SIA) is a peptide with 26 amino acid residue, a venom isolated from the Chilli Rose tarantula *Grammostola spatulata*. It is a CALCIUM-CHANNEL BLOCKER at neuronal N-, P- and Q-type channels, eliminating potassium-evoked neurotransmitter release in several systems. It is used as a pharmacological tool.

granisetron [BAN, INN] (granisetron hydrochloride [BAN]; BeL 43694A; Kytril™) is a azabicycloindazole, a (5-HT_3) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It is an ANTIEMETIC and antinauseant used, orally or by injection, especially for patients receiving cytotoxic radiotherapy or chemotherapy.

granisetron hydrochloride ➡ **granisetron**.

Granocyte™ ➡ **lenograstim**.

grayanotoxin (GTX) is a diterpenoid isolated from leaves of *Rhododendron*, *Kalmia* and *Leucothoe* (Ericaceae), and is a NEUROTOXIN that acts as a SODIUM-CHANNEL ACTIVATOR which binds to Na^+-channels, leading to depolarization.

grepafloxacin is a quinoline ANTIBACTERIAL effective against respiratory tract infections.

GRF ➡ **growth hormone-releasing hormone**.

GRF44 ➡ **growth hormone-releasing hormone**.

GRH ➡ **growth hormone-releasing hormone**.

GHRH ➡ **growth hormone-releasing hormone**.

Grimepiride™ ➡ **glimepiride**.

griseofulvin [BAN, BSI, INN, ISO, JMAF] (Fulcin™; Fulvicin™; Grisovin™ etc.) is a an ANTIBIOTIC used clinically as an ANTIFUNGAL with affinity for keratin, and most commonly used topically or orally for large-scale skin infections, especially those that prove resistant to other drugs.

Grisovin™ ➡ **griseofulvin**.

growth hormone ➡ **human pituitary growth hormone**.

growth hormone-releasing factor ➡ **growth hormone-releasing hormone**.

growth hormone-releasing hormone (somatoliberin; growth hormone-releasing factor; GRH; GRF; GRF44; GHRH; somatorelin [INN]; somatorelin acetate [JAN]; SR 95228) is a peptide HYPOTHALAMIC HORMONE. Somatoliberins from different mammalian species have slightly different structures of 43-44 amino acid residues (44

for human). Release from the hypothalamus stimulates synthesis and release of growth hormone (**somatotropin**) by the anterior pituitary gland. It can be used by injection as a diagnostic agent to test for secretion of growth hormone. Recently, the 1-29 sequence has been introduced also for this purpose (**sermorelin**).

growth hormone release-inhibiting factor ➡ **somatostatin**.

GRP ➡ **gastrin-releasing peptide**.

GRP_{18-27} ➡ **gastrin-releasing peptide GRP18–27**.

GS 95 ➡ **thiethylperazine**.

GTX ➡ **grayanotoxin**.

guacetisal [INN] (guaiacol acetylsalicylate) has been used orally for its NSAID ANALGESIC and ANTIPYRETIC properties. It is also an EXPECTORANT.

guaiacol acetylsalicylate ➡ **guacetisal**.

guaiacol glycerol ether ➡ **guaiphenesin**.

guaietolin [INN] (glycerylguethol) is an analogue of **guaphenesin**, and has been used as an oral EXPECTORANT.

guaifenesin ➡ **guaiphenesin**.

guaiphenesin [BAN] (guaifenesin [INN, USAN]; glycerylguaiacol; guaiacol glycerol ether; Robitussin™; Organidin™ and many other names) is a phenoxypropanediol, reported to reduce the viscosity of sputum and is used as an EXPECTORANT. It is a constituent of many proprietary OTC compound ANTITUSSIVE preparations.

guamecycline [BAN, INN] is a semisynthetic (tetracycline) ANTIBIOTIC which can be used as an ANTIBACTERIAL.

guanabenz [INN, USAN] (guanabenz acetate [JAN, USAN]; Wytensin™) is an aminoguanidine derivative with properties similar to the (α_2-subtype) α-ADRENOCEPTOR AGONIST, **clonidine**. It is a centrally acting ANTIHYPERTENSIVE.

guanabenz acetate ➡ **guanabenz**.

guanadrel [INN] (guanadrel sulfate [USAN]; Hylorel™) is a guanidine derivative similar in action to **guanethidine**. It has ANTISYMPATHETIC activity and acts as an ADRENERGIC NEURON BLOCKING AGENT. It can be used as an ANTIHYPERTENSIVE.

guanadrel sulfate ➡ **guanadrel**.

guanethidine [BAN, INN] (guanethidine sulfate [USAN]; guanethidine monosulfate [USAN]; Ganda™; Ismelin™) is a guanidine derivative, an ANTISYMPATHETIC which acts as an ADRENERGIC NEURON BLOCKING AGENT. It can be used as an ANTIHYPERTENSIVE and also in ANTIGLAUCOMA TREATMENT.

guanethidine monosulfate ➡ **guanethidine**.

guanethidine sulfate ➡ **guanethidine**.

guanfacine [BAN, INN, JAN] (guanfacine hydrochloride [USAN]; Tenex™) is a phenylacetylguanidine derivative, an (α_2-selective) α-ADRENOCEPTOR AGONIST, and is an ANTIHYPERTENSIVE (acting at CNS level).

guanfacine hydrochloride ➡ **guanfacine**.

guanidine hydrochloride (carbamidine; iminourea hydrochloride) is a NEUROTRANSMITTER-RELEASE-MODIFYING AGENT which enhances acetylcholine release from nerve endings. It can be used to treat botulism, myasthenia gravis and other muscle weakness states.

guanoclor [BAN, INN] (guanoclor sulfate [USAN]) is an aminoguanidine derivative, an ANTISYMPATHETIC which acts as an ADRENERGIC NEURON BLOCKING AGENT. It can be used as an ANTIHYPERTENSIVE.

guanoclor sulfate ➡ **guanoclor**.

guanoxan [BAN, INN] (guanoxan sulfate [USAN]) is a guanidine derivative, an ANTISYMPATHETIC which acts as an ADRENERGIC NEURON BLOCKING AGENT. It can be used as an ANTIHYPERTENSIVE.

guanoxan sulfate ➡ **guanoxan**.

guanylhydrazine ➡ **pimagedine**.

gusperimus [INN] (gusperimus trihydrochloride [USAN]; BMS 181173; NKT 01; BMY 42215-1; NSC 356894) is isolated from *Bacillus laterosporus* and is reported to have IMMUNOSUPPRESSANT/IMMUNOMODULATOR, ANTICANCER and angiogenesis inhibitor properties.

gusperimus trihydrochloride ➡ **gusperimus**.

Gutron™ ➡ **midodrine**.

GV 150013 tricyclobenzodiazepine, is a selective (CCK_B/gastrin subtype) CHOLECYSTOKININ RECEPTOR ANTAGONIST. It has experimental ANXIOLYTIC actions. It is used as a pharmacological tool.

GVG ➡ **vigabatrin**.

Gynol™ ➡ **nonoxinol 9**.

H

H 33 ➡ **febuprol**.
H 88/32 ➡ **6-hydroxydopamine**.
H 102/09 ➡ **zimeldine**.
H 814 ➡ **fenethylline**.
H 3625 ➡ **cortivazol**.
HA-1A ➡ **nebacumab**.
HA 966 is an aminopyrrolidine derivative, a non-competitive (NMDA) GLUTAMATE RECEPTOR ANTAGONIST (acting at the glycine modulatory site, sometimes as a weak partial agonist), and acting as a chronic NEUROTOXIN. The (*R*)-(+)-form is the active isomer. It is used as a pharmacological tool.
HA 1077 ➡ **fasudil**.
hachimycin [BAN, INN] is a (polyene group) ANTIBIOTIC with some ANTIFUNGAL activity which can be used in the treatment of trichomoniasis.
Haelan™ ➡ **flurandrenolone**.
haematopoietin 1 ➡ **interleukin-1**.
haemopoietin 3 ➡ **interleukin-3**.
HAEMOSTATIC AGENTS enhance the process of haemostasis, which is the arrest of blood loss from damaged blood vessels, and is essential to life. It involves three key components and their processes: platelets, blood vessels (the vascular endothelium and smooth muscle of the wall), and the blood-borne coagulation cascade system. To an extent, these components can be separated, but proper formation of the haemostatic plug *in vivo* requires interaction of all. For instance, blood coagulation *in vitro* is rapid and efficiently forms a clot as such, but it is not the same entity as the thrombus of platelets enmeshed in fibrin that constitutes the functional haemostatic plug which is required in haemostasis to prevent haemorrhage. Similarly, *in vivo*, in a patient with a deficiency of platelets, there may be spontaneous bleeding giving a purple coloration in the skin (thrombocytopenic purpurea); though the clotting time of the blood is unchanged, the bleeding time is prolonged.

The processes involved in formation of fibrin are described in more detail at ANTITHROMBINS and ANTICOAGULANTS. Briefly, some agents are direct-acting thrombin antagonists, binding avidly to this enzyme and thus preventing the key stage in blood coagulation (e.g. **hirudin** and certain other agents still being evaluated, including **hirugen**, **hirulog-1** and **argatroban**). Other agents work as indirect-acting thrombin antagonists in as much as their action involves enhancement of the actions of the endogenous anticoagulant factor, antithrombin III, which inhibits thrombin by binding to the active serine of this serine protease. Agents such as **heparin** enhance the rate of this reaction by binding to antithrombin III and producing a conformational change (see antithrombins). Other, even more indirect agents, act essentially as vitamin K antagonists, so preventing its key role in the formation of clotting factors (e.g. **dicoumarins**, notably **warfarin**).

The role of platelets in the clotting process is discussed in more detail at PLATELET AGGREGATION INHIBITING AGENTS. Such agents include **aspirin**, a cyclooxygenase inhibitor that reduces synthesis by platelets of **thromboxane A_2** (TXA_2), which is thrombotic and a vasoconstrictor. Similarly, TXA_2-synthase inhibitors (e.g. dazoxiben) and TXA_2-receptor antagonists (e.g. **vapiprost**) have been investigated with a view to their use as antiplatelet agents, as have drugs that combine these activities (e.g. **ridogrel**). Also, **prostacyclin** (available as **epoprostenol**) is a potent inhibitor of platelet aggregation, and can help disintegrate platelet clumps. It inhibits the transduction mechanisms for the expression of membrane glycoprotein receptors (GPIIb/IIIa), which are critical for aggregation. Similarly, **ticlopidine** inhibits expression of the platelet GPIIb/IIIa receptors into the high-affinity ligand-binding state; also, monoclonal antibodies to GPIIb/IIIa receptors are effective inhibitors of platelet function.

The formation of fibrin – coagulation – and the degradation of fibrin – fibrinolysis – are in balance in normal physiology. Clotting, and the subsequent repair of blood vessel walls and other tissue elements, is part of a continuing process. Therapeutically, most aspects of these processes need to be modified in certain circumstances. One very extensive use of haemostatic agents is in the treatment of myocardial infarction, and the possible sequelae where fragment break-off from thrombi can cause stroke. Various combinations of antiplatelet agent (aspirin), anticoagulant or antithrombin agents (heparin) and fibrinolytic agents (**streptokinase**, **anistreplase** or **t-PA**) are very effective, halving mortality.

Genetically, determined clotting diseases include classical haemophilia, which is due to lack of factor VIII, and there is another form of haemophilia due to deficiency of factor IX (Christmas factor). These are treated by giving fresh donor blood or plasma, preparations of factor VIII or factor IX, or increasingly as one of the recombinant versions which are becoming available.

Acquired coagulation defects are more common, and may be due to liver disease (since bile is required for absorption of vitamin K), dietary deficiency of vitamin K, or ingestion of oral anticoagulant agents. Most of these can be treated by giving **vitamin K** and its congeners, **menadiol sodium phosphate** or **phytomenadione**.

Protamine can be used as an antidote in heparin overdose. **Ethamsylate** reduces capillary bleeding, and is used in the treatment of menorrhagia and probably works by correcting impaired platelet adhesion.

The role of the blood vessels themselves, is an important part of haemostasis. Both the vascular endothelium and smooth muscle are important. The damaged endothelium releases agents (e.g. the prostanoids) that affect both platelet aggregation and/or act on smooth muscle to constrict the vessel. Further, damage to the endothelium exposes collagen which promotes, and provides a substrate, for platelet adhesion. Activated platelets release a number of vasoactive substances (e.g. **5-hydroxytryptamine**) that affect the tone of the blood vessels. In general, a profound local vasoconstriction is an important factor in haemostasis in preventing blood loss and enhancing the effectiveness of the haemostatic plug. Sometimes such vasoconstrictors (**vasopressin**, **adrenaline**, **noradrenaline** and 5-hydroxytryptamine) are administered therapeutically to suppress bleeding. See 5-HYDROXYTRYPTAMINE RECEPTOR AGONISTS; PROSTANOID RECEPTOR AGONISTS; VASOPRESSIN RECEPTOR AGONISTS.
Hageman factor ➡ **factor XII**.
halazepam [BAN, INN, USAN] (Sch 12041; Paxipam™) is one

of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity, and is used orally as to treat anxiety states.

Halciderm™ ➡ **halcinonide**.

halcinonide [BAN, INN, JAN, USAN] (Halciderm™; Halog™ and many other names) is a very potent CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically to treat inflammatory skin disorders, such as recalcitrant eczema and psoriasis, which are unresponsive to less potent corticosteroids.

Halcion™ ➡ **triazolam**.

Haldol™ ➡ **haloperidol**.

Haldol decanoate™ ➡ **haloperidol**.

Halfan™ ➡ **halofantrine**.

halofantrine [BAN, INN] (halofantrine hydrochloride [USAN]; Halfan™) is a 9-phenanthrenemethanol derivative, an ANTIMALARIAL, clinically used mainly for chloroquine-resistant infections.

halofantrine hydrochloride ➡ **halofantrine**.

halofenate [BAN, INN, USAN] (MK 185) is a benzeneacetate, an ANTIHYPERLIPIDAEMIC and URICOSURIC AGENT.

halofuginone [BAN, INN] has AMOEBICIDAL activity and can be used in veterinary trichomoniasis.

Halog™ ➡ **halcinonide**.

halometasone [INN] (halomethasone; C 48401) is a CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically to treat inflammatory skin disorders, such as recalcitrant eczema and psoriasis.

halomethasone ➡ **halometasone**.

haloperidol [BAN, INN, JAN, USAN] (haloperidol decanoate [USAN]; Dozic™; Haldol™; Haldol decanoate™; Serenace™ and many other names) is the archetype member of the butyrophenone group of major tranquillizers. It is a DOPAMINE RECEPTOR ANTAGONIST, though it is also reported to have activity on a number of other systems, including sigma and NMDA receptors and as a (I_{KCa}) POTASSIUM-CHANNEL BLOCKER. It is used as a powerful ANTIPSYCHOTIC to treat and tranquillize patients with psychotic disorders (such as schizophrenia) and is particularly suitable for treating manic forms of behavioural disturbance, especially for emergency control. It can also be used in the short-term treatment of severe anxiety. Quite separately from these uses, it can be administered to treat other conditions that may cause tremor, tics, involuntary movements or involuntary utterances (e.g. Gilles de la Tourette syndrome). Administration is oral or by injection (including depot deep intramuscular injection) of the undecanoate salt. Extrapyramidal disorders are relatively common when used therapeutically.

haloperidol decanoate ➡ **haloperidol**.

haloprogin [INN, JAN, USAN] (Halotex™) is an ANTIBACTERIAL and ANTIFUNGAL, used clinically for superficial yeast infections.

halopyramine [BAN] (chloropyramine [INN]; chloropyribenzamine; chlorpyramine) is one of the ethylenediamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS.

Halotestin™ ➡ **fluoxymesterone**.

halothane [BAN, INN] (fluorocarbon 123B1; Freon 123B1; Fluothane™ and many other names) is a halogenated hydrocarbon volatile liquid, used as an inhalation GENERAL ANAESTHETIC.

Halotex™ ➡ **haloprogin**.

haloxazolam [INN, JAN] (CS 430) is one of the [1,4]benzodiazepines, A BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity, and has been used orally for insomnia.

haloxon [BAN, INN] is an organophosphate ANTICHOLINESTERASE. It is used as a veterinary ANTHELMINTIC.

α-hANP ➡ **carperitide**.

harmaline (harmidine; dihydroharmine) is a β-carboline alkaloid isolated from peganum, the seeds of *Peganum harmala*, and also *Passiflora incarnata*, *Banisteria caapi* and some *Banisteriopsis* spp. (Zygophyllaceae, Passifloraceae, Malphigiaceae). It is a CNS STIMULANT and PSYCHOTROPIC (a component of a South American hallucinogenic drink). It possesses ANTIPARKINSONIAN properties, and is closely related to **harmine**.

harmidine ➡ **harmaline**.

harmine (telepathine; yageine; banisterine) is a β-carboline alkaloid isolated from peganum, the seeds of *Peganum harmala*, and also *Passiflora incarnata*, *Banisteria caapi* and some *Banisteriopsis* spp. (Zygophyllaceae, Passifloraceae, Malphigiaceae). It is a CNS STIMULANT and PSYCHOTROPIC (a component of a South American hallucinogenic drink). It possesses ANTIPARKINSONIAN properties, and is closely related to **harmaline**.

Harmogen™ ➡ **estropipate**; **oestrone**.

Harmonyl™ ➡ **deserpidine**.

hashish ➡ **dronabinol**; **Δ^8-tetrahydrocannabinol**; **Δ^9-tetrahydrocannabinol**.

HBT ➡ **thioxolone**.

HC3 ➡ **hemicholinium 3**.

HCFU ➡ **carmofur**.

HCG ➡ **chorionic gonadotropin**.

HE 10004 ➡ **tasuldine**.

HE 90371 ➡ **arpromidine**.

HEART FAILURE TREATMENT is used to rectify the functioning of the failing heart. This normally chronic condition is characterized by the heart failing to cope with its workload in distributing blood to the lungs and the rest of the body. There can be many causes or contributory factors involved in left-sided or right-sided heart failure. It follows that in those types of failure amenable to treatment with drugs, a number of different drugs classes are involved. A major symptom is caused by inadequate blood supply to the myocardium due to blockage of the coronary arteries, resulting in ischaemia causing angina pain. Various VASODILATOR treatments (which are generally also antihypertensive) are of general value, particularly the nitrates (e.g. **glyceryl trinitrate**, **isosorbide dinitrate**, **pentaerythritol tetranitrate**), ACE INHIBITORS (e.g. **captopril**, **enalapril**) and CALCIUM-CHANNEL BLOCKERS (e.g. **nicardipine**, **verapamil**). Also, some PHOSPHODIESTERASE INHIBITORS (e.g. **enoximone** and **milrinone**) are valuable, and some exert most of their effect on the myocardium (those acting at a heart-specific subtype of this enzyme (type III phosphodiesterase) to raise the intracellular concentration of cAMP) and may be used as positive inotropic agents in short-term treatment of severe congestive cardiac failure: see CARDIAC STIMULANTS). General ANTIHYPERTENSIVE treatments are of value in treating heart failure, especially the DIURETICS (e.g. **amiloride hydrochloride**, **bumetanide**, **chlorothiazide**, **ethacrynic acid**, **frusemide**), β-ADRENOCEPTOR RECEPTOR ANTAGONISTS (though these can precipitate failure in some conditions) and ANGIOTENSIN RECEPTOR ANTAGONISTS (e.g. **valsartan**).

Certain agents with specific actions on the contractility of the heart are commonly used for some types of heart failure,

especially the CARDIAC GLYCOSIDES (e.g. **digitoxin, digoxin**) which increase the force of contraction and have been widely used in congestive heart failure treatment, nowadays usually in conjunction with other drugs. The efficient functioning of the heart is impaired by conduction defects, and these may be treated with ANTIARRHYTHMIC AGENTS. In acute heart failure, it may be necessary to use cardiac stimulants of the SYMPATHOMIMETIC type (e.g. **dopexamine hydrochloride** and **dobutamine**).

HECNU ➡ **elmustine**.

hedaquinium chloride [BAN, INN] is an ANTIFUNGAL and ANTHELMINTIC which was never marketed.

helodermin is a 35 amino acid residue *N*-terminally amidated linear peptide, isolated from the venom of the Gila monster *Heloderma suspectum*. It is a VASOACTIVE INTESTINAL PEPTIDE RECEPTOR AGONIST and stimulates adenylate cyclase in rat pancreatic membranes.

hemicholinium 3 (HC3) is a choline UPTAKE INHIBITOR (competes with choline for the carrier), so eventually acts as a NEUROTRANSMITTER RELEASE MODULATING AGENT that decreases release of the neurotransmitter **acetylcholine**. It has general anticholinergic actions and is a NEUROMUSCULAR BLOCKING AGENT. As a NEUROTOXIN it is a pharmacological tool for studying choline transport.

henna ➡ **lawsone**.

heparan sulphate (heparitin sulphate; Na salt is suleparoid sodium [INN]) is a (parenteral) ANTICOAGULANT, chemically similar to **heparin** and also naturally occurring in the body, but with different sulphate and acetyl contents. It can be used in the treatment of deep-vein thrombosis.

heparin [BAN, USAN] (heparinic acid; see also heparin sodium) is a (parenteral) ANTICOAGULANT, chemically a family of straight-chain sulphated anionic mucopolysaccarides called glycosaminoglycan, polymers mainly of two disaccharide repeating units. It is found naturally in the body in a range of molecular weights from 3,000 to 40,000 (especially mast cells and blood vessels). Commercially, for medical use, it is extracted from beef lung or porcine intestinal mucosa. It is available in various forms, including the low molecular-weight forms **certoparin, dalteparin, enoxaparin** and **tinzaparin**. Also, there are heparinoid forms (**danaparoid sodium**). Administration is generally by injection (e.g. during surgery) to prevent or treat thrombosis and similar conditions. Its effect does not last long and treatment may have to be repeated frequently, or it can be given by constant infusion.

heparin cofactor ➡ **antithrombin III**.

heparinic acid ➡ **heparin**.

heparin sodium [BAN, INN, USAN] (Monoparin™; Uniparin™ and many other names) is a (parenteral) ANTICOAGULANT, the sodium salt of **heparin**.

heparitin sulphate ➡ **heparan sulphate**.

hepatitis B immunoglobulin ➡ **globulin, immune**.

heptaminol [BAN, INN] is an aminoheptanol derivative, a coronary VASODILATOR and CARDIAC STIMULANT, formerly used to treat cardiovascular disorders.

Hermesetas™ ➡ **saccharin**.

heroin ➡ **diamorphine**.

Herpid™ ➡ **ibacitabine**.

Herplex™ ➡ **ibacitabine**.

hetacillin [BAN, INN, USAN] (hetacillin potassium [JAN, USAN]; methoxymethyl ester = sarpicillin [INN, USAN]) is a semisynthetic (penicillin) ANTIBIOTIC, a prodrug for **ampicillin**, giving CNS penetration. It can be used clinically as an ANTIBACTERIAL to treat certain infections.

hetacillin potassium ➡ **hetacillin**.

Hexaalen™ ➡ **altretamine**.

hexabiscarbacholine ➡ **carbolonium bromide**.

hexachloroethane is an ANTHELMINTIC, used by dispersion in pyrotechnics and chemical smokes.

hexachlorophane [BAN] (hexachlorophene [INN]; Dermalex™; Septisol™; PhisoHex™; Ster-Zac™) is a skin DISINFECTANT, veterinary ANTHELMINTIC and a pharmacological tool for inducing brain damage (cytotoxic brain oedema).

hexachlorophene ➡ **hexachlorophane**.

hexacyprone [INN] is a cyclohexanepropanoic acid derivative, which has been used as a CHOLERETIC AGENT.

hexadimethrine bromide [BAN, INN] is a polymer that acts as a heparin antagonist.

hexadiphane ➡ **prozapine**.

Hexadrol™ ➡ **dexamethasone**.

hexahydrodesoxyephedrine ➡ **propylhexedrine**.

hexahydrothymol ➡ **menthol**.

hexamethonium bromide (hexamethonium dibromide; C6; hexamethylenebistrimethylammonium; hexonium) is a GANGLION-BLOCKING AGENT, probably acting through channel-blocking at nicotinic cholinoceptors (rather than acting as a competitive NICOTINIC CHOLINOCEPTOR ANTAGONIST at this site as was once thought). It is no longer used therapeutically as an ANTIHYPERTENSIVE in view of extensive side-effects. It is widely used in experimental pharmacology as an analytical tool.

hexamethonium dibromide ➡ **hexamethonium bromide**.

hexamethylenebistrimethylammonium ➡ **hexamethonium bromide**.

hexamethylmelamine ➡ **altretamine**.

hexamidine [INN] is a dibenzamide derivative with ANTISEPTIC and DISINFECTANT properties; also reported to be an ENZYME INHIBITOR (thrombin, trypsin and kallikrein).

hexamine hippurate [BAN] (methenamine [INN]; methenamine hippurate [JAN, USAN]; methenamine mandelate [USAN]) is an ANTIBACTERIAL used therapeutically for urinary tract infections.

hexanestrol ➡ **hexestrol**.

hexanicotinoylinositol ➡ **inositol nicotinate**.

hexanolamino-PAF is an acetylglycerophospho-trimethylhexanolamine, with activity as a partial PLATELET-ACTIVATING FACTOR RECEPTOR AGONIST that can inhibit PAF-induced platelet aggregation.

hexaprofen [BAN, INN] (BTS 13622; UR 336) is one of the propionic acid series of CYCLOOXYGENASE INHIBITORS, with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

hexapropymate [BAN, INN] (L 2103) is a carbamate, formerly used as a HYPNOTIC and SEDATIVE.

hexarelin ➡ **examorelin**.

hexcarbacholine bromide ➡ **carbolonium bromide**.

hexestrol [INN] (hexanestrol; hexoestrol; hexestrol dicaprylate; NSC 9894; dihydrostilboestrol and many other names) is a synthetic non-steroid OESTROGEN and analogue of **stilboestrol**. It has been used therapeutically to make up hormonal deficiencies, for instance, in HRT. Derivatives have been used in ANTICANCER therapy for hormone-dependent carcinomas.

hexestrol dicaprylate ➡ **hexestrol**.

hexetidine [BAN, INN] is an ANTIBACTERIAL and ANTIFUNGAL AGENT.

hexobarbital ➡ **hexobarbitone**.

hexobarbitone [BAN] (hexobarbital [INN]) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT with

properties similar to **amylobarbitone**. It has been used to treat anxiety and insomnia.

hexobendine [BAN, INN, USAN] is a *bis*methyliminobezoate derivative, an adenosine UPTAKE INHIBITOR with VASODILATOR properties.

hexocyclium methylsulfate [BAN] (hexocyclium metilsulfate [INN]) is a quaternary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST, with actions similar to ATROPINE). It can be used as a visceral ANTISPASMODIC.

hexocyclium metilsulfate ➡ **hexocyclium methylsulfate**.

hexoestrol ➡ **hexestrol**.

hexonium ➡ **hexamethonium bromide**.

Hexopal™ ➡ **inositol nicotinate**; **nicotinic acid**.

hexoprenaline [BAN, INN] (hexoprenaline hydrochloride [JAN]) is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype that therapeutically can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.

hexoprenaline hydrochloride ➡ **hexoprenaline**.

hexuronic acid ➡ **ascorbic acid**.

hexylcaine [INN] (hexylcaine hydrochloride [USAN]) is an ester series LOCAL ANAESTHETIC, used by topical application for the local relief of pain.

hexylcaine hydrochloride ➡ **hexylcaine**.

hexylresorcinol [USAN] is a urinary ANTISEPTIC and an ANTHELMINTIC. It inhibits melanosis (blackspot) in shrimps, and is used as a food additive for prevention of enzymic browning in shrimps and fruits.

hexyltheobromine ➡ **pentifylline**.

HF 1854 ➡ **clozapine**.

HGF ➡ **glucagon**.

HG-factor ➡ **glucagon**.

HH 50 ➡ **nonivamide**.

himbacine is an alkaloid from the bark of *Himantandra* spp. (Himantandraceae). It is a (M_4) MUSCARINIC CHOLINOCEPTOR ANTAGONIST and ANTISPASMODIC, and can be used as a pharmacological analytical tool in studies of receptor subtypes.

Hipsalazine™ ➡ **vipsalazide**.

Hirudex™ ➡ **hirudin**.

hirudin (Hirudex™) is an *O*-sulphonated 65 residue peptide isolated from the salivary glands of the medicinal leech (*Hirudo medicinalis*). It acts as an ENZYME INHIBITOR, an ANTITHROMBOTIC active as a (parenteral) ANTICOAGULANT. It is now made by recombinant DNA techniques (**lepirudin**). Clinically, it can be used in thromboembolytic disorders.

Hirudo medicinalis isoform HVI ➡ **lepirudin**.

hirugen acts as an ENZYME INHIBITOR, a synthetic dodecapeptide fragment derived from **hirudin**. It is an ANTITHROMBOTIC active as a (parenteral) anticoagulant which can be used in thromboembolytic disorders.

hirulog ➡ **bivalirudin**.

hirulog I ➡ **bivalirudin**.

Hismanal™ ➡ **astemizole**.

histadonylamine succinate ➡ **doxylamine**.

Histadyl™ ➡ **methapyrilene**.

histaguanidine (imidazolguanidine) is a HISTAMINE H_2-RECEPTOR ANTAGONIST.

histamine (histamine dihydrochloride [USAN]; histamine phosphate [USAN]; ergamine) is a 4-aminoethyl-imidazole, a local mediator (and probably a neurotransmitter) found particularly in mammalian mast cells; also in putrid *Claviceps purpurea* and many other plants. It is a HISTAMINE RECEPTOR AGONIST. It is a potent VASODILATOR, and contributes to the oedema and erythaema on the triple response in irritation of mammalian skin, and other facets of neurogenic inflammation. It is released from mast cells in allergic reaction and anaphylactic shock, and many drugs are histamine releasers. Physiologically, it is a gastric secretion stimulant (it can be used as a diagnostic agent).

histamine dihydrochloride ➡ **histamine**.

HISTAMINE H_1-RECEPTOR ANTAGONISTS act to block at receptors of the H_1-subtype that recognize histamine and analogues. They are the classic 'antihistamines'. The 'first-generation' compounds were first developed in the 1940s and some of these are still in use. Such agents include ethylenediamines (e.g. **mepyramine** and **tripelennamine**), ethanolamine (e.g. **carbinoxamine**, **cetirizine**, **clemastine**, **dimenhydrinate**, **diphenhydramine**), alkylamines (e.g. **brompheniramine**, **chlorpheniramine**), piperazines (e.g. **cyclizine**, **hydroxyzine**, **meclozine**) and phenothiazines (e.g. **promethazine**).

'Second-generation' compounds have been developed in order to minimize the sedative effects of the earlier compounds, which is achieved by modifying structures in such a way as to limit access to the CNS. They include alkylamines (e.g. **acrivastine**) and piperazines (e.g. **cetirizine**) and piperidines (e.g. **astemizole**, **levocabastine**, **loratadine** and **terfenadine**).

Many H_1-receptor antagonists are regarded as selective for use in analytical pharmacology, as they have little activity at H_2 and H_3 receptors, e.g. **chlorpheniramine**, **pyrilamine** (**mepyramine**) and **triprolidine** are in common use.

Most antihistamines have anticholinergic atropine-like actions and cause a dry mouth and similar side-effects. The clinical uses of H_1 antihistamines are extensive, particularly for the symptomatic relief of allergy, such as hay fever and urticaria, and (together with corticosteroids) in the acute treatment of anaphylactic shock. Many antihistamines also have antinauseant properties and are used, for instance, to prevent travel sickness (though this property may well result from their anticholinergic actions). The older antihistamines produce drowsiness and this sedative action may be used to help sleep (e.g. promethazine).

Krstenansky, P.M. (1987) Astemizole: a long-acting, nonsedating antihistamine. *Drug Intell. Clin. Pharm.*, **21**, 947-953.

Simons, F.E. *et al.* (1988) H_1 receptor antagonist treatment of chronic rhinitis. *J. Allergy Clin. Immunol.*, **81**, 975-980.

McMahon, S.B. *et al.* (1992) Itching for an explanation. *Trends Neurosci.*, **15**, 497-501.

Woosley, R.L. *et al.* (1993) Mechanism of the cardiotoxic actions of terfenadine. *J. Am. Med. Assoc.*, **269**, 1532-1536.

HISTAMINE H_2-RECEPTOR ANTAGONISTS act at H_2-receptors, originally recognized in the stomach by the very different relative potencies of analogues of histamine at this site, as compared to 'classical' sites. The histamine in the stomach is released from a mast-cell-like source, 'histaminocytes', and acts on histamine H_2-receptors on parietal cells, and this results in secretion of hydrogen ions. Modifications of the basic chemical agonist requirement to give the first H_2 antagonists, from **burimamide** and **metiamide** through to **cimetidine**, have been well documented. **Zolantidine** is an H_2-receptor antagonist that penetrates the brain, so is a valuable pharmacological tool for investigating possible physiological and pathological roles for histamine in the CNS. Selective labelled H_2 antagonists are useful in mapping receptor distributions, and [^{125}I]iodoaminopotentidine is one of the highest affinity H_2-receptor antagonists known, and has revealed an interesting CNS distribution of H_2-receptors.

The H_2 antagonists are very effective in reducing acid

secretion, and have considerable usage: e.g. cimetidine, **famotidine**, **nizatidine**, **ranitidine**. These agents are used to treat gastric and duodenal ulcer, dyspepsia, reflux oesophagitis, Zollinger-Ellison syndrome and a number of related disorders. They are relatively safe and free of side-effects. They have been repeatedly shown in clinical trials to actually promote healing, rather than simply provide symptomatic relief. However, they are now also available without prescription for short-term treatment of dyspepsia and oesophagitis. See also **ANTIULCEROGENIC AGENTS**; **GASTRIC SECRETION INHIBITORS**.

Calcutt, C.R. *et al.* (1988) Zolantidine (SK&F 95282) is a potent selective brain-penetrating histamine H_2-receptor antagonist. *Br. J. Pharmacol.*, **93**, 69-78.
Feldman, M. *et al.* (1990) Histamine$_2$-receptor antagonists. Standard therapy for acid-peptic diseases (1). *N. Engl. J. Med.*, **323**, 1672-1680.
Feldman, M. *et al.* (1990) Histamine$_2$-receptor antagonists. Standard therapy for acid-peptic diseases (2). *N. Engl. J. Med.*, **323**, 1749-1755.
Black, J. (1993) Reflections on the analytical pharmacology of histamine H_2-receptor antagonists. *Gastroenterology*, **105**, 963-968.

HISTAMINE H_3-RECEPTOR ANTAGONISTS that are used experimentally include **clobenpropit**, impentamine, iodophenpropit and **thioperamide**. The action of these agents is well established in a number of systems, including *in vitro* inhibition of electrically evoked contractions in intestinal preparations and binding studies in cortical tissues. For mapping receptor distribution in the brain, [^{125}I]iodoproxyfan is a very high affinity ligand. It has demonstrated a heterogenous distribution of H_3-receptors with high labelling of anterior cerebral cortex, ventral striatum and other limbic areas, cerebral cortex and the hippocampal formation. Hence, this probe should be useful for sensitive assay and localization of the H_3-receptor.

Some of these agents appear to have a very selective action at H_3-receptors, though there is some cross-talk with 5-HT_3 receptors. None of these agents are used therapeutically yet, but suggested applications include inhibition of neurogenic microvascular leakage in airways, prevention of myocardial ischaemia, as anticonvulsants, appetite suppressants and cognition enhancers.

Arrang, J.M. *et al.* (1987) Highly potent and selective ligands for histamine H_3-receptors. *Nature*, **327**, 117-123.
Martinez-Mir, M.I. *et al.* (1990) Three histamine receptors H_1, H_2 and H_3 visualised in the brain of human and non-human primates. *Brain Res.*, **526**, 322-327.
Leurs, R. *et al.* (1995) Evaluation of the receptor selectivity of the H_3 receptor antagonists, iodophenpropit and thioperamide: An interaction with the 5-HT receptor revealed. *Br. J. Pharmacol.*, **116**, 2315-2321.
Leurs, R. *et al.* (1998) Therapeutic potential of histamine H_3 receptor agonists and antagonists. *Trends Pharmacol. Sci.*, **19**, 177-183.

histamine phosphate ➡ **histamine**.

HISTAMINE RECEPTOR AGONISTS act at one or more of the three receptor types that have been defined – H_1, H_2 and H_3. Histamine itself can act at any of these sites, which have a variety of contrasting properties. The basic properties of these will be described, then followed by a description of the pharmacology of histamine. Antagonists at these receptors are described under separate headings: see **HISTAMINE H_1-RECEPTOR ANTAGONISTS**; **HISTAMINE H_2-RECEPTOR ANTAGONISTS**; **HISTAMINE H_3-RECEPTOR ANTAGONISTS**.

Histamine H_1-receptors are of the seven-transmembrane G-protein-coupled superfamily, and couple to the $InsP_3$/DAG ($G_{q/11}$) pathway. Selective agonists include 2-(*3*-fluorophenyl)histamine, 2-(*3*-bromophenyl)histamine and 2-(*3*-trifluoromethyl)phenylhistamine, and though such agents are full agonists on the guinea-pig ileum, they may act as partial agonists on other H_1-receptor systems. Other agents used experimentally include 2-methylhistamine, 2-pyridylethylamine and 2-thiazolylethylamine. The majority of the 'classic' and well-recognized actions of histamine, detailed below, are mediated through this ubiquitous receptor. The main exceptions are stimulation of gastric secretion, and some vasodilator actions of histamine that are H_2-receptor mediated; and also those of the H_3-receptors that consist largely of prejunctional inhibitory effects.

Histamine H_2-receptors are of the seven-transmembrane G-protein-coupled superfamily, and couple positively to the adenylyl cyclase (G_s) pathway. Selective agonists include **amthamine**, **dimaprit** and **impromidine**. They also have actions at the other histamine receptor types: impromidine and dimaprit have H_3-antagonist properties, and amthamine is a weak agonist at the H_3 receptor. Also, 4(5)-methylhistamine has been used experimentally.

Histamine H_3-receptors appear to couple through a G-protein mechanism, but the coupling pathway is not yet fully resolved. Selective agonists include **imetit**, **immepip**, immepyr and (R)-α-methylhistamine. Action of these receptors in several cases oppose those of H_1 receptors. H_3-receptor-mediated effects include *in vitro* inhibition of electrically evoked contractions in intestinal preparations, inhibition of [^{3}H]-noradrenaline release from sympathetic nerves in the human saphenous vein, negative chronotropic actions on the atria, down-regulation of histamine and gastrin levels in the gastric mucosa, and effects on wakefulness. These receptors appear to be largely presynaptic with an autoreceptor function, and can inhibit both the release and synthesis of histamine. They also inhibit release of acetylcholine, noradrenaline, dopamine and 5-HT. Some of the H_3-receptor ligands appear to have a very selective action at H_3 receptors, though there is some cross-talk with 5-HT_3 receptors. None of these agents are used therapeutically yet, but suggested applications include inhibition of neurogenic microvascular leakage in airways and in prevention of myocardial ischaemia.

The main actions of histamine are now well recognized. The basic properties were described at the beginning of this century, and subsequently its distribution in the body is fully catalogued. It is formed from **histidine** by histidine decarboxylase, and this process may be pharmacologically inhibited (see **HISTIDINE DECARBOXYLASE INHIBITORS**). A key finding has been the recognition that much of the histamine in the body is stored in mast cells or basophils, which are largely in the lungs, skin and gut. Histamine, which is basic, is stored at high concentration, held in intracellular granules associated with **heparin** and acidic protein. It is this histamine that is secreted following various kinds of challenge, and then gives rise to allergic symptoms, including reddening and wheal in the skin, due to vasodilation of the small arteries and increased permeability of the postcapillary venules. There may be stimulation of sensory nerves to give itch or mild pain. Most smooth muscle in the body contracts, particularly that of the airways and gut. Indeed, bronchoconstriction, together with increased secretions, is a major causative factor in allergic airways diseases, and presents a problem in anaphylactic shock. In some vascular beds histamine causes vasodilation, either through H_2 receptors, or release of nitric oxide from the vascular endothelium following H_1 receptor activation.

Histamine release from mast cells can be caused by a wide variety of basic substances, including mediators such as **substance P**, **bradykinin** and venoms such as **mastoparan** (from wasp venom). It is thought that this interaction involving endogenous mediators is a normal part of pathophysiology; involved, for instance, in the triple response in skin. It has been proposed that the non-receptor-

mediated release of histamine by these structurally unrelated endogenous and exogenous bases, is a specific process involving direct G-protein activation. Many other basic agents cause histamine release, including compound 48/80, **morphine** and **tubocurarine**. The histamine in the stomach is released from a mast-cell-like source, histaminocytes, and acts on histamine H_2 receptors on parietal cells, and this results in secretion of hydrogen ions. The presence of these novel receptors in the stomach was originally recognized by the very different relative potencies of analogues of histamine in causing acid secretion (and in stimulation of the guinea-pig heart), as compared to other sites. The subsequent modifications of the basic chemical agonist requirement in order to give the first H_2 antagonists, from **burimamide** and **metiamide** through to **cimetidine**, have been well documented. Agonists at H_2 receptors can be used for gastric acid secretion diagnostic tests, and these include histamine itself, **betazole** and more recently impromidine.

The histamine in the brain is in two main sites, the mast cells and certain nerve tracts. The role of the latter has long been a subject of debate, but the recent recognition of the H_3 receptor type has gone some way to resolve the question. The histamine is localized in vesicles and shows a Ca^{2+}-dependent release. Histidine decarboxylase is present in these neurons and acts as a good marker for histochemical purposes. These central neurons originate in the hypothalamus and run in the median forebrain bundle to the large areas of the cortex and midbrain. Stimulation of these tracts produces inhibition that is partly blocked by **metiamide**, an H_2 antagonist. Many of the excitatory actions of histamine in the brain are blocked by H_1 receptor antagonists. The H_3 receptor seems largely to lead to presynaptic inhibition and this is now known also to be the case in the peripheral nervous system, e.g. on sympathetic nerves. What role histamine plays in brain function is not clear.

The most specific metabolizing enzyme is imidazole *N*-methyl-transferase ('histamine acetylase'), which can be inhibited *in vivo* by **amodiaquine**, **chloroquine** and **metoprine**. Histamine is also metabolized by 'histaminase', and this enzyme can be inhibited by **aminoguanidine**, **metronidazole** and **pentamidine** (see DIAMINE OXIDASE INHIBITORS). Metabolites in the urine can be measured to give some index of histamine turnover.

Hill, S.J. (1990) Distribution, properties, and functional characteristics of three classes of histamine receptor. *Pharmacol. Rev.*, **42**, 45-83.
Schwartz, J.C. *et al.* (1991) Histaminergic transmission in the mammalian brain. *Physiol. Rev.*, **71**, 1-51.
Leurs, R. *et al.* (1995) Molecular pharmacological aspects of histamine receptors. *Pharmacol. Ther.*, **66**, 413-463.
Shih, N.-Y. *et al.* (1995) A novel pyrrolidine analog of histamine as a potent, highly selective histamine H_3 receptor agonist. *J. Med. Chem.*, **38**, 1593-1599.

HISTIDINE DECARBOXYLASE INHIBITORS act at the amino acid decarboxylase, L-histidine decarboxylase, which forms **histamine** from the amino acid **histidine**. This enzyme is widely distributed and is present in mast cells (which contain much of the histamine in the body). The less specific enzyme aromatic amino acid decarboxylase (which is identical with dopa decarboxylase) can also catalyse this reaction. The activity of the histidine decarboxylase can be induced and increases, for instance, in stress and with infections. Noradrenaline and adrenaline can cause this, and may mediate the effects of stress. Levels of the enzyme (and of the degrading enzyme histaminase; see DIAMINE OXIDASE INHIBITORS) are raised in pregnancy and this observation has given rise to the notion that 'nascent histamine' is involved in cell proliferation. In the stomach **gastrin** has a similar action. Bacteria and other microorganisms contain an enzyme with this decarboxylase activity and some foodstuffs, yeast extracts and some wines contain histamine. Indeed, the original isolation of histamine in the early part of this century was from ergot samples with bacterial contamination. Histidine decarboxylase may be inhibited by active-site 'suicide' inhibitors, such as α-methyl and α-hydrazino analogues of histidine, which are relatively specific, having little action on aromatic amino acid decarboxylase. Apart from the inhibitors α-methylhistidine and α-hydrazinohistidine, the agent **brocresine** was developed to trial stage for the treatment of histamine-mediated disorders, including urticaria. Also, the analogue α-fluoromethylhistidine has been considered for the treatment of idiopathic cold urticaria.

Pipkorn, U. *et al.* (1987) The effect of a histamine synthesis inhibitor on the immediate nasal allergic reaction. *Allergy*, **42**, 496-501.
Westerberg, V.S. *et al.* (1987) Inhibitors of histidine decarboxylase decrease basal gastric acid secretion in the rat. *Pharmacol. Biochem. Behav.*, **28**, 419-422.
Savany, A. *et al.* (1988) Polymorphism of rat gastric mucosal histidine decarboxylase: effects of the coenzyme and sulfhydryl groups. *Biochem. Int.*, **17**, 345-357.
Cacabelos, R. *et al.* (1991) Histidine decarboxylase inhibition induced by α-fluoromethylhistidine provokes learning-related hypokinetic activity. *Agents Actions*, **33**, 131-134.

β-histine ➡ **betahistine**.

histrelin [INN, USAN] (ORF 17070; Supprelin™) is a synthetic substituted nonapeptide analogue of **gonadorelin** (**gonadotrophin-releasing hormone**), an LH-RH RECEPTOR AGONIST with similar properties. It is used to treat growth-problems in LH-RH-dependent precocious puberty.

Histryl™ ➡ **diphenylpyraline**.

Hivid™ ➡ **zalcitabine**.

hM-CSF ➡ **mirimostim**.

9 HME ➡ **elliptinium acetate**.

HMG ➡ **meglutol**.

HMG-CoA REDUCTASE INHIBITORS act as the rate-limiting enzyme in cholesterol synthesis. HMG-CoA reductase catalyses the conversion of HMG-CoA to mevalonic acid (HMG-CoA = 3-hydroxyl-3-methylglutaryl-coenzyme A). Several fungal metabolites are inhibitors of this enzyme. **Lovastatin**, **mevastatin**, **pravastatin** and **simvastatin** have been most studied. They are active at nanomolar concentrations and are in clinical use. These agents are antihypercholesterolaemic agents since the resulting decrease in hepatic cholesterol synthesis leads to increased synthesis of LDL receptors and thus to increased clearance of LDL. Large-scale clinical trials are underway to measure the effects of these agents on lipid-control and health-indicator parameters, but in the meantime they tend to be reserved for the treatment of severely affected patients – particularly those with familial hypercholesterolaemia or established atheromatous disease. Other drugs with this action are used in treating gallstones, e.g. **chenodeoxycholic acid**. See also ANTIHYPERLIPIDAEMIC AGENTS; CHOLERETIC AGENTS.

Todd, P.A. *et al.* (1990) Simvastatin. A review of its pharmacological properties and therapeutic potential in hypercholesterolaemia. *Drugs*, **40**, 583-607.
Endo, A. (1992) The discovery and development of HMG-CoA reductase inhibitors. *J. Lipid Res.*, **33**, 1569-1582.
Sirtori, C.R. (1993) Tissue selectivity of hydroxymethylglutaryl coenzyme A (HMG CoA) reductase inhibitors. *Pharmacol. Ther.*, **60**, 431-459.
Corsini, A. *et al.* (1995) Pharmacology of competitive inhibitors of HMG-CoA reductase. *Pharmacol. Res.*, **31**, 9-27.

HMM ➡ **altretamine**.

HMS ➡ **medrysone**.

HN 2 ➡ **mustine**.

Hoe 062 ➡ **roxatidine**.

Hoe 69 ➡ **secretin**.

Hoe 140 ➡ **icatibant**.

Hoe 234 ➡ **rilmakalim**.

Hoe 260 ➡ **dimoxaprost**.
Hoe 304 ➡ **desoxymethasone**.
Hoe 467A ➡ **tendamistat**.
Hoe 471 ➡ **gonadotrophin-releasing hormone**.
Hoe 490 ➡ **glimepiride**.
Hoe 731 ➡ **saviprazole**.
Hoe 766 ➡ **buserelin**.
Hoe 777 ➡ **prednicarbate**.
Hoe 825 ➡ **ociltide**.
Hoe 892 ➡ **tilsuprost**.
Hoe 7608 ➡ **roxatidine**.
Hoe 13233 ➡ **butanilicaine**.
Hoe 36801 ➡ **etifoxin**.
Hoechst 433 ➡ **alsactide**.
Hoechst 10446 ➡ **hydroxypethidine**.
Hoechst 10495 ➡ **norpipanone**.
Hoechst 10582 ➡ **normethadone**.
Hoechst 10720 ➡ **ketobemidone**.
Hoechst 10805 ➡ **dipipanone**.
'Hog' ➡ **phencyclidine**.

homatropine hydrobromide [JAN, USAN] (Isopto Homatropine™) is a tertiary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as a short-lived topical MYDRIATIC and cycloplegic agent.

homatropine methylbromide [BAN, INN, USAN] (methylhomatropine bromide) is a quaternary amine form of homatropine, which is used in place of **homatropine hydrobromide** to reduce access to the CNS. It is a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, formerly used orally as a visceral ANTISPASMODIC.

homocodeine ➡ **pholcodine**.

homoharringtonine is an alkaloid from various *Cephalotaxus* spp. (Cephalotaxaceae). It shows activity as an ANTICANCER AGENT, and is thought to work at the ribosome to inhibit protein synthesis. It has been used clinically against acute leukaemias and other neoplastic disorders.

homprenorphine [BAN, INN] (M 5202; R 5205-M) is one of the thebaine series and is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

HP 029 ➡ **velnacrine**.
HP 128 ➡ **suronacrine**.
HPEK 1 ➡ **tetroquinone**.
HR 102/09 ➡ **zimeldine**.
HR 158 ➡ **loprazolam**.
HR 837 ➡ **tiaprost**.
HS-3 ➡ **obidoxime chloride**.
5-HT creatine sulphate ➡ **5-hydroxytryptamine**.
5-HT sulphate ➡ **5-hydroxytryptamine**.
Humalog™ ➡ **insulin lispro**.
α-human atrial natriuretic peptide ➡ **carperitide**.
human-calcitonin precursor peptide ➡ **katacalcin**.
human chorionic gonadotropin ➡ **chorionic gonadotropin**.
human GRF(1-29)NH_2 ➡ **sermorelin**.
human growth hormone ➡ **human pituitary growth hormone**.

human insulin [BAN, INN, USAN] (Humulin™) is produced semisynthetically from porcine **insulin** by enzymatic amino acid replacement or by genetic engineering. Derivatives are also available, including insulin lispro, insulin arginine and insulin aspart.

human menopausal gonadotrophin ➡ **menotrophin**.

human pituitary growth hormone (somatotropin (human); somatropin [BAN, INN, JAN, USAN]: human growth hormone [JAN]; growth hormone; GH; CB 311; LY 137998; Genotropin™; Humatrope™; Norditropin™; Nutropin™; Saizen™; Zomacton™ and many other names) is the human variant of growth hormone, one of the pituitary hormones concerned with somatotrophic function. It consists of a single polypeptide chain of 191 amino acid amino acid residues and 2 disulphide bridges (MW = 22,125). Growth hormone is used in the treatment of growth hormone deficiency (including short stature in Turner syndrome); only the human type is effective since growth hormone is species specific. Growth hormone of human origin isolated from human pituitary glands is termed **somatotrophin**. In many countries it has been replaced by the product of recombinant DNA technology, termed **somatropin**, which has an identical sequence. There is a synthetic variant of human growth hormone, somatrem, [BAN, INN, JAN, USAN] (methionyl human growth hormone; Met-HGH; Protropin™), identical to somatropin but with an additional *N*-terminal methionine: it has similar uses. For bovine and porcine variants see **bovine pituitary growth hormone** and **porcine pituitary growth hormone**.

human prolactin ➡ **prolactin**.
human PTH (1-34) ➡ **teriparatide**.
human somatomedin C ➡ **mecasermin**.
Humatin™ ➡ **paromomycin**.
Humatrope™ ➡ **human pituitary growth hormone**.
Humegon™ ➡ **menotrophin**.
Humorsol™ ➡ **demecarium bromide**.
Humulin™ ➡ **human insulin**.
HWA 285 ➡ **propentofylline**.
Hyalase™ ➡ **hyaluronidase**.

hyalosidase [BAN, INN] (hyaluronoglucosaminidase; hyaluronoglucosidase; GL enzyme; thiomucase; E.C. 3.2.1.35) is a highly purified form of the ENZYME **hyaluronidase**. It has a specific action in depolymerizing **hyaluronic acid**. It has been used as a FIBRINOLYTIC in the treatment of myocardial infarction.

hyaluronidase [BAN, INN, JAN, USAN] (E.C. 3.2.1.96; Hyalase™; Wydase™ and many other names) is an ENZYME that has a specific action in depolymerizing **hyaluronic acid**. It is used in the treatment of subcutaneous and intravenous extravasation injuries, and to speed the absorption of injected drugs (e.g. local anaesthetics). It can be used in cataract sugery and other ophthalmological procedures.

hyaluronoglucosaminidase ➡ **hyalosidase**.
hyaluronoglucosidase ➡ **hyalosidase**.
Hybolin decanoate™ ➡ **nandrolone**.
Hycamtin™ ➡ **topotecan**.

hycanthone [INN, USAN] is an ANTISCHISTOMAL AGENT, and is an active metabolite of **lucanthone**.

hydralazine [BAN, INN] (hydralazine hydrochloride [USAN]; Apresoline™ etc.) is a hydrazinophthalazine derivative, with direct SMOOTH MUSCLE RELAXANT activity. It can be used as an ANTIHYPERTENSIVE, mainly in hypertensive crisis but sometimes in conjunction with thiazide DIURETICS.

hydralazine hydrochloride ➡ **hydralazine**.

hydrargaphen [BAN, INN] is a topical organic mercurial DISINFECTANT/ANTISEPTIC with ANTIFUNGAL properties.

hydrastine is a complex alkaloid from *Hydrastis canadensis* and several other plants. It has ANTIHYPERTENSIVE, ANTIBACTERIAL and SEDATIVE properties, and has been used as a HAEMOSTATIC to treat uterine haemorrhagia. Also, it has a claimed use in ophthalmology as a MYDRIATIC and topical LOCAL ANAESTHETIC.

hydrastinine is a synthetic analogue of part of the structure of the plant alkaloid **hydrastine**, and is a DOPAMINE RECEPTOR ANTAGONIST. It was formerly used as a uterine HAEMOSTATIC AGENT.

hydrated lime ➡ **calcium hydroxide**.

hydrazinecarboximidamide ➡ **pimagedine**.

Hydrea™ ➡ **hydroxyurea**.

Hydrenox™ ➡ **hydroflumethiazide**.

hydrochlorothiazide [BAN, INN] (Hydrodiuril™; HydroSaluric™; Esidrex™) is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy and to treat oedema. It is commonly used together with potassium-sparing DIURETICS and β-ADRENOCEPTOR ANTAGONISTS.

hydrocodeine ➡ **dihydrocodeine**.

hydrocodone [BAN, INN] (dihydrocodeinone) is one of the phenanthrene series, an OPIOID RECEPTOR AGONIST, which is an OPIOID ANALGESIC.

hydrocortal ➡ **hydrocortisone**.

hydrocortamate ➡ **hydrocortisone**.

hydrocortisone [BAN, INN, USAN] (cortisol; hydrocortone; hydrocortal; Kendall's compound F; Reichstein's Substance M; hydrocortisone acetate [USAN]; hydrocortisone aceponate [INN]; hydrocortisone butyrate [USAN]; hydrocortisone hemisuccinate [USAN]; hydrocortisone sodium succinate [USAN]; hydrocortamate [INN]; hydrocortisone valerate [USAN]; hydrocortisone cypionate [USAN]; Calmurid™; Colifoam™; Corlan™; Dioderm™; Efcortelan™; Efcortesol™; Hydrocortistab™; Hydrocortisyl™; Hydrocortone™; Locoid™; Mildison™) is the main natural adrenal cortical hormone, a CORTICOSTEROID with both GLUCOCORTICOID and MINERALOCORTICOID activity. It can therefore be used orally in its natural form, or as a derivative, in adrenocortical insufficiency. It can also be used for its ANTIINFLAMMATORY and ANTIALLERGIC properties to treat many kinds of inflammation, including arthritis, allergic conditions, shock, inflammatory bowel disease, haemorrhoids, eye and skin inflammation and hypersensitivity reactions, topically, systemically and orally. It is commonly administered in compound preparations with ANTIBACTERIALS, ANTIBIOTICS or ANTIFUNGALS.

hydrocortisone aceponate ➡ **hydrocortisone**.

hydrocortisone acetate ➡ **hydrocortisone**.

hydrocortisone butyrate ➡ **hydrocortisone**.

hydrocortisone cypionate ➡ **hydrocortisone**.

hydrocortisone hemisuccinate ➡ **hydrocortisone**.

hydrocortisone sodium succinate ➡ **hydrocortisone**.

hydrocortisone valerate ➡ **hydrocortisone**.

Hydrocortistab™ ➡ **hydrocortisone**.

Hydrocortisyl™ ➡ **hydrocortisone**.

hydrocortone ➡ **hydrocortisone**.

Hydrocortone™ ➡ **hydrocortisone**.

Hydrodiuril™ ➡ **hydrochlorothiazide**.

hydroflumethiazide [BAN, INN, USAN] (Hydrenox™; Diucardin™; Saluron™ etc.) is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy, commonly with other classes of diuretics.

hydrogen cyanamide ➡ **cyanamide**.

hydromorphine ➡ **dihydromorphine**.

hydromorphone [BAN, INN] (hydromorphone hydrochloride [USAN]; Dilaudid™) is one of the phenanthrene series, an OPIOID RECEPTOR AGONIST, which is an OPIOID ANALGESIC. It is used orally or by injection for the relief of moderate to severe pain.

hydromorphone hydrochloride ➡ **hydromorphone**.

hydroquinonecarboxylic acid ➡ **gentisic acid**.

HydroSaluric™ ➡ **hydrochlorothiazide**.

hydrotalcite [BAN, INN, JAN] (aluminium magnesium carbonate hydroxide hydrate; Altacite™) can be used as an oral non-systemic ANTACID and a dietary phosphate absorber. It is a component of co-simalcite [BAN].

hydroxocobalamin ➡ **hydroxycobalamin**.

***N*-hydroxyacetamide** ➡ **acetohydroxamic acid**.

hydroxyadamantanone ➡ **idramantone**.

hydroxyamfetamine ➡ **hydroxyamphetamine**.

hydroxyamphetamine [BAN] (hydroxyamphetamine hydrobromide [USAN]; hydroxyamfetamine [INN]; methyltyramine) is an **amphetamine** metabolite, which also has indirect-acting SYMPATHOMIMETIC actions. It can be used clinically as a MYDRIATIC, sometimes in combination with a local anaesthetic, particularly as a diagnostic agent (e.g. for Horner's syndrome).

hydroxyamphetamine hydrobromide ➡ **hydroxyamphetamine**.

hydroxyarginine vasopressin ➡ **argipressin**.

hydroxybenzylpindolol is a β-ADRENOCEPTOR ANTAGONIST, which chemically is a derivative of **pindolol**. It is used as a ^{125}I-labelled compound in receptor-labelling studies.

4-hydroxybutanoic acid (sodium oxybate; NSC 84223; WY 3478) is a HYPNOTIC agent that has been used as an adjunct to anaesthesia.

hydroxycarbamide ➡ **hydroxyurea**.

hydroxychloroquine [BAN, INN] (hydroxychloroquine sulfate [USAN]; Win 1258-2; Plaquenil™) is a quinine derivative, which can be used as an ANTIINFLAMMATORY in the treatment of lupus erythematosus. Sometimes it is used as an ANTIMALARIAL as an alternative to **chloroquine**.

hydroxychloroquine sulfate ➡ **hydroxychloroquine**.

1α-hydroxycholecalciferol ➡ **alfacalcidol**.

25-hydroxycholecalciferol ➡ **calcifediol**.

hydroxycobalamin [BAN, INN, USAN] (vitamin B12a; hydroxocobalamin; Cobalin-H™ and many other names) is a VITAMIN that acts as a haemopoietic factor. It can also be used as an ANTIDOTE of cyanide poisoning.

7-hydroxycoumarin ➡ **umbelliferone**.

6-hydroxydopamine (oxidopamine [INN, USAN]; H 88/32; NSC 23398) is an antiadrenergic, a NEUROTRANSMITTER-RELEASE-MODIFYING AGENT, which causes reversible sympathectomy, and is used in the treatment of glaucoma.

hydroxyethane ➡ **ethanol**.

hydroxyhexamide is the active metabolite of **acetohexamide**, and is one of the sulphonylurea group of (oral) HYPOGLYCAEMICS. It can be used as an ANTIDIABETIC for Type 2 diabetes.

[1-(2-Hydroxy-3-mercaptopropanoic acid)]oxytocin ➡ **hydroxyoxytocin**.

hydroxy-*N*-methylmorphinan (3-hydroxy-*N*-methylmorphinan) is one of the phenanthrene series, an OPIOID RECEPTOR AGONIST, OPIOID ANALGESIC and ANTITUSSIVE. It can be used in the (+)-form, **dextrorphan**; (-)-form, **levorphanol**; (±)-form, **racemorphan**; and the methyl ester derivatives of these.

3-hydroxy-*N*-methylmorphinan ➡ **hydroxy-N-methylmorphinan**.

3-hydroxymethylpyridine ➡ **nicotinyl alcohol**.

hydroxynormorphinone ➡ **naloxone**.

hydroxyoxytocin ([1-(2-Hydroxy-3-mercaptopropanoic acid)]oxytocin) is a synthetic analogue of **oxytocin** and an agonist at oxytocin receptors ((OT) VASOPRESSIN RECEPTOR

AGONIST) with OXYTOCIC activity. See also **argiprestocin**.

hydroxypethidine [BAN, INN] (Hoechst 10446; Win 771) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST which is an OPIOID ANALGESIC.

4-hydroxyphenethylamine ➡ **tyramine**.

***p*-hydroxyphenylethylamine** ➡ **tyramine**.

4-hydroxypiracetam ➡ **oxiracetam**.

hydroxyprogesterone [BAN, INN] (hydroxyprogesterone acetate [INN]; hydroxyprogesterone hexanoate; actetoxyprogesterone; Proluton™) is a PROGESTOGEN that is used to treat recurrent abortion (habitual abortion). Administration is often as hydroxyprogesterone hexanoate by long-lasting, intramuscular depot injection.

hydroxyprogesterone acetate ➡ **hydroxyprogesterone**.

hydroxyprogesterone hexanoate ➡ **hydroxyprogesterone**.

hydroxyquinonecarboxylic acid ➡ **gentisic acid**.

hydroxysaclofen is chemically related to **saclofen**, and is a ($GABA_B$) GABA RECEPTOR ANTAGONIST. It is used as a pharmacological tool.

5-hydroxysalicylic acid ➡ **gentisic acid**.

α-hydroxyscopolamine ➡ **anisodine**.

hydroxystilbamidine [BAN, INN] (hydroxystilbamidine isethionate [USAN]) is an organic antimonal derivative with ANTIPROTOZOAL, ANTIFUNGAL and ANTICANCER activity. It is used in the treatment of blastomycosis and leishmaniasis.

hydroxystilbamidine isethionate ➡ **hydroxystilbamidine**.

5-hydroxytryptamine (serotonin; enteramine; used as **serotonin sulphate** or **serotonin creatine sulphate** complex) is an indolamine found in vertebrate nervous tissue of the CNS and intestinal enteric nerve plexus, where it acts as a neurotransmitter, also found in neuroendocrine cells of the gastrointestinal mucosa, and in blood platelets (which have an active uptake pump). It is found in invertebrates, notably the sea anemone *Calliactis parasitica* and in wasp and scorpion venoms. In plants it is a widely distributed alkaloid from cowhage (*Mucuna pruriens*) (Leguminosae), nettles and bananas (*Musa* sp.) and other fruits and plants. It acts as the archetypal 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST; stimulates gastrointestinal motility, is a HAEMOSTATIC AGENT, being a potent VASOCONSTRICTOR and PLATELET AGGREGATION INDUCER. In the CNS it is particularly associated with mood, and several classes of drugs work through interaction with its production, release or reuptake (e.g. ANTIDEPRESSANTS).

5-HYDROXYTRYPTAMINE RECEPTOR AGONISTS act at receptors recognizing 5-hydroxytryptamine (5-HT, serotonin) and its analogues. These receptors are very diverse in structure and function, and they include both G-protein coupling and intrinsic ion channel receptors. In original studies where this mediator was shown to be released from blood platelets and cause vasoconstriction it acquired the name serotonin, whereas in other independent studies showing high concentrations in the gastro-enteric system it acquired the name enteramine. It is now known that 5-HT is found widely throughout the body, particularly in nerve tracts and areas in the brain where it is known to be one of the principal neurotransmitters. It is also an excitatory neurotransmitter in the enteric nervous system of the intestine, although the greatest content in the body is in the enterochromaffin cells in the mucosa of the gut. It is likely that disruption of the cells in cancer chemotherapy and radiotherapy releases 5-HT, and that this is responsible for the characteristic nausea and vomiting caused by this treatment, which is now treated with 5-HT_3 receptor antagonists. It is now known that the blood platelets cannot synthesize 5-HT, but have an effective uptake process for 5-HT, and probably acquire it largely from the gut cells. The number of actions and possible roles for 5-HT in the body is very extensive. Summarized these are: vasoconstriction (direct and neurally mediated); increased vascular permeability; platelet aggregation; increased gastrointestinal motility (direct and neurally-mediated); broncho-constriction; excitation and inhibition of central neurons and stimulation of peripheral pain fibres.

The 5-hydroxytryptamine 5-HT_1 receptor family has a fair degree of homology of structure within it; and also coupling of the subtypes appears similar – they are normally coupled negatively to adenylyl cyclase (i.e. G_i). Included in this family until recently was a receptor formally termed 5-HT_{1C}, but now termed 5-HT_{2C} (in view of its similarity to the other 5-HT_2 receptors in structure and coupling). There are a number of subclasses of 5-HT_1 receptors and their delineation is problematic in view of marked species heterogeneity and considerable changes in pharmacology with only very small changes in amino acid sequence. They will be described under subgroup headings recently assigned.

5-HT_{1A} receptors are activated selectively by 8-OH-DPAT (the *R*-(+)-isomer is a full agonist, whereas the *S*-(-)-isomer is a partial agonist); other agonists include **U 92016A**, 5-CT, *R*-(+)-UH 301 and *N,N*-dipropyl-5-CT.

5-HT_{1B} receptors (formerly human $5\text{-HT}_{1D\beta}$) have no wholly selective agonists (for this subtype), but are activated by 5-CT, **CP 93129** and **sumatriptan** (also activates 5-HT_{1D} receptors).

5-HT_{1C} receptors have now been redesignated as 5-HT_{2C}.

5-HT_{1D} receptors (formerly human $5\text{-HT}_{1D\alpha}$) is closely related to 5-HT_{1B}, and agonists acting at this site include sumatriptan, 5-CT, BRL 56905, NOT and L 694247.

Cloned receptor 5-HT_1 receptors awaiting expression and functional studies (and thus are denoted in lower-case) include 5-ht_{1E}, and the 5-ht_{1F} receptor (which have previously been referred to as $5\text{-HT}_{1E\beta}$ or 5-HT_6). The 5-ht_{1F} subtype is selectively activated by LY 334370.

5-HT_2 receptors couple to the $InsP_3$/DAG ($G_{q/11}$) system, show species variants, and are divided into 5-HT_{2A} (formerly 5-HT_2 or 'D') 5-HT_{2B} (formerly 5-HT_{2F}) and 5-HT_{2c} (formerly 5-HT_{1C}) at all of which α-methyl-5-HT is active. Some further agonists that are active include: at 5-HT_{2A} receptors, (±)-DOI and (±)-DOB; at 5-HT_{2B} receptors, (±)-DOI and **BW 723C86**; at 5-HT_{2C} receptors, (±)-DOB.

5-HT_3 receptors are of the fast-transmission intrinsic ion channel (cation) type (previously referred to as 'M' receptors, since their neuronal effects were blocked by morphine). This multiunit receptor shows marked species-dependent differences in isoforms. Selective agonists include *m*-chlorophenylbiguanide (m-CPBG), 2-methyl-5-HT and 5-HTQ (trimethylserotonin, a quaternary salt of serotonin).

5-HT_4 receptors couple positively to the adenylyl cyclase (G_s) system, at which **BIMU 1**, **BIMU 8**, **RS 67506**, **ML 10302**, RS 67333, RS 66331, SB 205149, SC 53116 and SC 49518 are selective agonists. A number of agonists acting at these receptors have clinical use, e.g. **cisapride**, **tropisetron** and **zacopride**.

5-HT_7 (5-HT_X) receptors couple positively to the adenylyl cyclase (G_s) system. There are no subtype selective agonists, but LSD is active here. See also **5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONISTS**.

Hoyer, D. *et al.* (1994) International Union of Pharmacology classification of receptors for 5-hydroxytryptamine (Serotonin). *Pharmacol. Rev.*, **46**, 157-203.
Martin, G.R. *et al.* (1994) Receptors for 5-hydroxytryptamine: current perspectives on classification and nomenclature. *Neuropharmacology*, **33**, 261-273.
Jackson, M.B. *et al.* (1995) The 5-HT receptor channel. *Annu. Rev. Physiol.*, **57**, 447-468.
Eglen, R.M. *et al.* (1997) The 5-HT_7 receptor: orphan found. *Trends Pharmacol. Sci.*, **18**, 104-107.

5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONISTS act at one or more of the 14 or so known 5-HT receptors (see **5-HYDROXYTRYPTAMINE RECEPTOR AGONISTS**), and commonly have actions on other systems (especially monoaminergic ones).

5-HT_{1A} receptors are antagonized by **spiperone**, WAY 100635, (-) form of **pindolol**, BMY 7378, NAN 190, S-(-)-UH 301 and *p*-MPPI. **Buspirone** is a clinically used **ANXIOLYTIC** that is thought to act at this site.

5-HT_{1B} receptors are antagonized by GR 55562, isamoltane and *N,N*-dipropyl-5-CT.

5-HT_{1D} receptors are antagonized by **isamoltane** and **GR 127935**.

At the 5-ht_{1E} and the 5-ht_{1F} receptors, **methiothepine** is a non-selective antagonist.

5-HT_{2A} receptors, were formerly called 5-HT_2 receptors; also 5-HT 'D' receptors – because they were irreversibly alkylated by the β-haloalkylamine, dibenamine. They are antagonized by MDL 100907, **ketanserin**, **ritanserin**, spiperone, **LY 53857**, **mesulergine** and AMI 193.

5-HT_{2B} (formerly 5-HT_{2F}) receptors are antagonized by **SB 204741**, **LY 53857**, SB 200646, SB 206553 and SDZ SER 082.

5-HT_{2C} (formerly 5-HT_{1C}) are blocked by mesulergine, SB 200646, SB 206553, LY 53857 and SDZ SER 082.

A number of 5-HT_2 receptor antagonists that are essentially subtype-nonselective are, or have been, in clinical trials, and in some cases are marketed for conditions that include: appetite suppression, migraine prophylaxis, intermittent claudication, hypertension, peripheral vascular disease, depression, schizophrenia, drug dependence and sleep disorders. Agents at some stage of clinical investigation include: ICI 69369, ICI 170809, **sergolexole**, seganserin, amperozide, irindalone, SR 46349B, MDL 100907 and RP 62203. Those marketed (in certain countries) for one or more of the indications mentioned, include: **cyproheptadine**, ketanserin, **methysergide**, **mianserin**, **naftidrofuryl**, **pizotifen**, **risperidone** and **sertindole**.

The 5-HT_3 receptors were originally known as 'M' receptors because their excitatory actions in the gut were blocked by morphine (though this is now known to be an indirect effect of the opioids via an inhibitory action on cholinergic neurons). Antagonists at 5-HT_3 receptors include **granisetron**, **LY 278584**, **ondansetron**, **tropisetron** and **zacopride**. Some agents of this class also act as 5-HT_4 receptor agonists (e.g. granisetron, zacopride) or antagonists (tropisitron). Ondansetron, granisetron and tropisetron are currently in use for the treatment of nausea and emesis associated with cancer chemotherapy and radiation therapy (see **ANTIEMETICS**). The use of 5-HT_3 receptor antagonists has also been proposed for use as anxiolytic and antipsychotic agents and for impaired cognitive function (see **NOOTROPIC AGENTS**). In principle, 5-HT_3 receptor antagonists could be used as peripherally acting analgesics, since 5-HT (e.g. released on platelet disruption) causes pain through sensory C-fibre stimulation. A number of other uses have been proposed for this class of drug.

5-HT_4 receptors are antagonized by agents of a variety of structures, including benzoates such as SDZ 205557 and RS 23597, benzodioxanes such as SB 20470, indoles such as GR 113808, GR 125487 and tropisetron (ICS 205930), and a number of other agents, including ML 10302, RS 39604, RS 67532 and DAU 6285. Some of these are also 5-HT_3 receptor antagonists (e.g. tropisetron).

5-HT_7 (formerly 5-HT_X) receptors have no selective antagonists, but clozapine has some affinity at this site. It is not clear to what extent clozapine owes its 'atypical' antipsychotic spectrum to activity at 5-HT receptors in addition to its action at dopamine receptors (see **DOPAMINE RECEPTOR ANTAGONISTS**).

Greenshaw, A.J. (1993) Behavioural pharmacology of 5-HT_3 receptor antagonists: A critical update on therapeutic potential. *Trends Pharmacol. Sci.*, **14**, 265-270.
Hoyer, D. *et al.* (1994) International Union of Pharmacology classification of receptors for 5-hydroxytryptamine (Serotonin). *Pharmacol. Rev.*, **46**, 157-203.
Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

5-HYDROXYTRYPTAMINE UPTAKE INHIBITORS are selective inhibitors of the 5-HT transporter system. The system is very similar to the noradrenaline uptake transporter system and it has proved difficult to develop agents showing selectivity between the two. There are a number of uptake processes in the body involving important mediators which can be manipulated pharmacologically. Commonly, the uptake process uses Na^+ and Cl^- as counter ions.

The older tricyclic agents show less than a ten-fold selectivity in inhibiting noradrenaline over that for 5-HT (e.g. **desipramine**, **imipramine**, **nortriptyline**) through **amitryptyline**, which shows virtually no selectivity, to **trazodone**, zimelidine and **clomipramine**, which are somewhat 5-HT selective. The newer Serotonin-Selective Reuptake Inhibitors (SSRIs) show a higher selectivity for inhibition of 5-HT reuptake in the brain, and have a different pharmacology. Examples clinically used include **citalopram**, **fluoxetine**, **fluvoxamine**, **nefazodone**, **paroxetine**, **sertraline**, **trazodone** and **venlafaxine**. Experimental agents include 6-nitroquipazine, alaproclate, litoxetine, indatraline and β-CIT.

Fuller, R.W. (1995) Serotonin uptake inhibitors: uses in clinical therapy and in laboratory research. *Prog. Drug Res.*, **45**, 167-204.
Handley, S.L. (1995) 5-Hydroxytryptamine pathways in anxiety and its treatment. *Pharmacol. Ther.*, **66**, 103-148.
Wong, D.T. *et al.* (1995) Development of antidepressant drugs. Fluoxetine (Prozac) and other selective serotonin uptake inhibitors. *Adv. Exp. Med. Biol.*, **363**, 77-95.
Wong, D.T. *et al.* (1995) Prozac (fluoxetine, Lilly 110140), the first selective serotonin uptake inhibitor and an antidepressant drug: Twenty years since its first publication. *Life Sci.*, **57**, 411-441.

5-hydroxytryptophan ((*S*)-(L)-form = **oxitriptan**) occurs in a number of plants, and in mammals is an immediate in 5-hydroxytryptamine biosynthesis. It can be used to elevate 5-HT levels in the CNS, and has **ANTIDEPRESSANT** and **ANTICONVULSANT/ANTIEPILEPTIC** properties.

hydroxytyramine ➡ **dopamine**.

hydroxyurea [BAN, USAN] (hydroxycarbamide [INN]; carbamoylhydroxylamine; carbamohydroxamic acid; SQ 1089; NSC 32065; Hydrea™ and many other names) is a cytotoxic **ANTICANCER AGENT** which inhibits DNA synthesis by inactivating ribonucleotide reductase. It also acts as an **ANTIOXIDANT & FREE-RADICAL SCAVENGER**. It is used orally to treat chronic myeloid leukaemia and sometimes polycythaemia.

hydroxy[D-Arg^8]vasopressin ➡ **argipressin**.

hydroxy[Val^4,D-Arg^7]vasopressin ➡ **argipressin**.

1α-hydroxyvitamin D_3 ➡ **alfacalcidol**.

25-hydroxyvitamin D_3 ➡ **calcifediol**.

hydroxyzine [BAN, INN] (hydroxyzine pamoate [JAN, USAN]; Atarax™; Ucerax™; Vistaril™) is a piperazine **HISTAMINE H_1-RECEPTOR ANTAGONIST** with **MUSCARINIC CHOLINOCEPTOR**

ANTAGONIST activity. It is a SEDATIVE/TRANQUILLIZER with ANXIOLYTIC activity, and can be used in preoperative medication, as an ANTIEMETIC and for the relief of itching. Hydroxyzine trimethoxybenzoate has been used as an ANTIARRHYTHMIC.

hydroxyzine pamoate ➡ **hydroxyzine.**

hydroxyzine trimethoxybenzoate ➡ **hydroxyzine.**

Hygroton™ ➡ **chlorthalidone.**

hylambates kassinin ➡ **kassinin.**

Hylorel™ ➡ **guanadrel.**

hymechromone ➡ **hymecromone.**

hymecromone [INN, JAN, USAN] (BMU; hymechromone; coumarin 4 and many other names) is a coumarin, isolated from young branches of *Dalbergia volubilis* and from *Eupatorium pauciflorum*. It has been used as a CHOLERETIC, ANTISPASMODIC and SUNSCREEN AGENT.

hyoscine [BAN] (scopolamine hydrobromide [USAN]; hyoscine hydrobromide; scopoline tropate; Kwells™; Scopoderm™) is a tertiary amine belladonna alkaloid, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST. It can be used therapeutically as an (anticholinergic) ANTISPASMODIC, particularly as a SMOOTH MUSCLE RELAXANT within the gastrointestinal and urinogenital tracts, as a MYDRIATIC (for ophthalmic procedures) and as an antinauseant (ANTIEMETIC), especially for motion sickness and sometimes as a hyoscine base incorporated into transdermal patches.

hyoscine butyl bromide [UK] (butylscopolammonium bromide [USA]; scopolamine butyl bromide; Buscopan™) is the *N*-butyl quaternary form of the belladona alkaloid **hyoscine**, and is a MUSCARINIC CHOLINOCEPTOR ANTAGONIST. It can be used therapeutically in place of hyoscine hydrobromide (in order to reduce access to the CNS) as a visceral ANTISPASMODIC and for dysmenorrhoea.

hyoscine methobromide [BAN] (methscopolamine bromide [USAN]; Pamine™) is an *N*-methyl quaternary form of the belladona alkaloid **hyoscine**, and is a MUSCARINIC CHOLINOCEPTOR ANTAGONIST. It can be used clinically in place of hyoscine hydrobromide (in order to reduce access to the CNS) as a visceral ANTISPASMODIC and to treat dysmenorrhoea.

hyoscyamine [BAN, USAN] (hyoscyamine hydrobromide; hyoscyamine sulfate [USAN]; Cytospaz™; Levsin™) is the (*S*)-form of tropine tropate; the (±)-form is **atropine**. It is an alkaloid from *Atropa, Datura, Duboisia, Hyoscyamus* and *Scopolia* spp., and several other genera in the Solanaceae. It is a non-subtype selective MUSCARINIC CHOLINOCEPTOR ANTAGONIST with many clinical uses. It is the archetypal anticholinergic with ANTISPASMODIC activity, and can be used to treat intestinal and urinary bladder irritability. It dries secretion in the airways, so is used in pre-anaesthetic medication to prevent reflex bradycardia and bronchospasm and to decrease secretions, and can be given as a BRONCHODILATOR, ANTIASTHMATIC and antibronchitic. It can be used as an ANTIPARKINSONIAN AGENT to reduce rigidity; topically in the eye as a long-lasting MYDRIATIC and cycloplegic agent; as an ANTIDOTE to poisoning with PARASYMPATHOMIMETICS (e.g. nerve gases, organophosphorus insecticides) and to actions of ANTICHOLINESTERASES used clinically in postoperative recovery. It is a cause of deliberate and accidental poisoning of humans and livestock.

hyoscyamine hydrobromide ➡ **hyoscyamine.**

hyoscyamine sulfate ➡ **hyoscyamine.**

hypericin (mycoporphyrin; Hypericum red) is a complex polycyclic aromatic compound, which has been isolated from the mealy bug *Nipaecoccus aurilanatus*. It is widespread in *Hypericum* spp., especially *Hypericum perforatum* (St John's wort), which is used as a folk remedy for depression and other nervous disturbances. It has ANTIDEPRESSANT, SEDATIVE and potent ANTIVIRAL (antiretroviral) activity.

Hypericum red ➡ **hypericin.**

hyperglycaemic-glycogenolytic factor ➡ ***glucagon*.**

Hypertensin™ ➡ **angiotensinamide.**

Hypnomidate™ ➡ **etomidate.**

HYPNOTICS are agents that induce sleep. They are used mainly to treat short-term insomnia, for instance in shift-work, to cope with jet-lag or in sleep disturbances due to emotional problems or in serious illness. The best-known and most-used hypnotics in current use are the benzodiazepines – and this class of drug is also used, at a lower dose, as ANXIOLYTICS. Examples from the class that are of relatively long-lasting action and may cause drowsiness the next day include **diazepam, flunitrazepam, flurazepam** and **nitrazepam**. Examples with a shorter duration include **loprazolam, lormetazepam** and **temazepam**. All can cause drug dependence on continued usage. Examples of hypnotics that are now much less used include **chloral hydrate, chlormethiazole** and **triclofos**. The barbiturates (e.g. **amylobarbitone**) are now very little used, as they are prone to cause serious dependence and are dangerous in overdose.

Ashton, H. (1989) Risks of dependence on benzodiazepine drugs: a major problem of long term treatment. *Br. Med. J.*, **298**, 103-104.

Gillin, J.C., *et al.* (1990) Drug therapy: The diagnosis and management of insomnia. *N. Engl. J. Med.*, **322**, 239-248.

Greenblatt, D.J. (1992) Pharmacology of benzodiazepine hypnotics. *J. Clin. Psychiatry, Suppl.* **53**, 7-13.

Lader, M. (1992) Rebound insomnia and newer hypnotics. *Psychopharmacology (Berl)*, **108**, 248-255.

Hypnovel™ ➡ **midazolam.**

hypocholate ➡ **cholic acid.**

hypogallic acid ➡ **dihydroxybenzoic acid.**

HYPOGLYCAEMIC AGENTS are often called antihyperglycaemic or antidiabetic agents, and are used principally in the treatment of diabetes mellitus. They can be divided into oral hypoglycaemics, which are mainly used to treat Type 2 diabetes (non-insulin-dependent diabetes mellitus; NIDDM; maturity-onset diabetes), and injectable hypoglycaemics (all insulin analogues), which are used mainly to treat Type 1 diabetes (insulin-dependent diabetes mellitus; IDDM; juvenile-onset diabetes). These agents are discussed more fully elsewhere at ANTIDIABETIC AGENTS.

β-hypophamine ➡ **vasopressin.**

HYPOTENSIVE AGENTS are literally, drugs that lower blood pressure, and there are many drugs that have such an action. Some drugs do so on acute (short-term) administration as a deliberate part of their medical use. For instance, nitrates, which are used to treat angina attacks, have an immediate and powerful VASODILATOR action which redistributes blood flow in the body and beneficially reduces the workload of the heart. In a hypertensive crisis the aim is an immediate fall in blood pressure and this can be achieved by the injection of a vasodilator such as **hydralazine**. However, drugs are rarely used as hypotensive agents. Some types may cause an unwanted fall in blood pressure to below normal levels as one of their side-effects, which may limit their usefulness in susceptible patients. This undesirable side-effect usually occurs as postural hypotension. The term ANTIHYPERTENSIVE is, by convention, commonly used in medicine to describe the class of drug that is used to lower abnormally high blood pressure (hypertension) and usually administered on a long-term basis. Such drugs are not necessarily hypotensive in normal individuals.

HYPOTHALAMIC HORMONES (also called factors)

are secreted by the hypothalamus, and are largely involved in controlling release of the pituitary hormones. These hypothalamic factors travel in a specialized system of portal blood vessels the short distance from the brain area, the hypothalamus, to the adjacent anterior pituitary.

Corticotrophin-releasing hormone (CRH; corticotrophin-releasing factor, CRF) controls release of corticotrophin (adrenocorticotrophic hormone, **ACTH**), which in turn controls the release of corticosteroids from the adrenal glands. See **CORTICOTROPHIN-RELEASING FACTOR RECEPTOR AGONISTS; CORTICOTROPHIN-RELEASING FACTOR RECEPTOR ANTAGONISTS.**

Gonadotrophin-releasing hormone (gonadorelin; GnRH; gonadotrophin-releasing factor; luteinizing hormone-releasing hormone, LH-RH) controls release of the gonadotrophins, **FSH** and **LH**, which cause the ripening of the follicle and ovulation (see **LH-RH RECEPTOR AGONISTS**).

Growth hormone-releasing hormone (**GHRH**; **growth hormone-releasing factor**, **GRF**) controls the release of growth hormone. In the diagnosis of growth hormone secretion, **sermorelin**, an analogue of growth hormone-releasing hormone, can be used to test secretion of growth hormone.

Growth hormone release-inhibiting hormone (GHRIH; growth hormone-release inhibiting factor; GHRIF; somatotrophin release inhibitory factor; SRIF and **somatostatin**) all refer to its role as a hypothalamic factor whose release leads to inhibitory modulation of the release of growth hormone (somatotrophin) from the pituitary gland. This peptide is now most commonly referred to as somatostatin, now that it is recognized to have a potentially wide inhibitor function in the body, and is also produced in the gut and the pancreas, as well as some peripheral nerves. Somatostatin is a cyclic peptide of 14 residues, but therapeutically **octreotide** is used because it is less enzymatically degraded. Octreotide is a cyclic analogue of 8 residues, containing a terapeptide sequence known to be essential for activity (see **SOMATOSTATIN RECEPTOR AGONISTS; SOMATOSTATIN RECEPTOR ANTAGONISTS**). It is used to treat tumours secreting vasoactive intestinal polypeptide (VIPomas), carcinoid syndrome and glucagonomas, and has a place in the treatment of acromegaly and Graves' disease.

Protirelin (thyrotrophin-releasing hormone, TRH, thyrotrophin-releasing hormone factor, TRF) is a tripeptide agent that modulates the release of **thyrotrophin** (and **prolactin**) from the pituitary and thence, in turn, thyroid hormone that affects metabolism and a number of other processes in the body. Therapeutically, protirelin is used to assess thyroid disorders and function in patients who suffer from hypopituitarism or hyperthyroidism.

Thorner, M.O. *et al.* (1992) The anterior pituitary, in *Williams Textbook of Endocrinology*. (eds J.D. Wilson *et al.*), W.B. Saunders Co., Philadelphia, pp. 221-310.
Strobl, J.S. *et al.* (1994) Human growth hormone. *Pharmacol. Rev.*, **46**, 1-34.
Rang, H.P. *et al.* (1995) *Pharmacology*, 3rd edn, Churchill Livingstone, Edinburgh, chapter 21, The endocrine system, pp. 417-453.
Ascoli, M. *et al.* (1996) Adenohypophyseal hormones and their hypothalamic releasing factors, in The *Pharmacological Basis of Therapeutics*, 9th edn, (eds J.G. Hardman *et al.*), McGraw-Hill, New York, chapter 55, pp. 1363-1382.

hypothalamic inhibitory factor ➡ **prolactin-release inhibiting factor.**

Hypovase™ ➡ **prazosin.**

Hyskon™ ➡ **dextran.**

Hytakerol™ ➡ **dihydrotachysterol.**

Hytrin™ ➡ **terazosin.**

Hytrin BPH™ ➡ **terazosin.**

I 612 ➡ **ronifibrate.**

I 653 ➡ **desflurane.**

^{131}I ➡ **sodium iodide.**

IAPP ➡ **amylin.**

ibacitabine [INN] is a nucleoside **ANTIVIRAL**, which is used clinically to treat herpes viruses.

ibenzmethyzin hydrochloride ➡ **procarbazine.**

iberiotoxin (α-KTx1.3) is a 37 amino acid peptide from a scorpion (*Buthus tamulus*), and is a **POTASSIUM-CHANNEL BLOCKER** and **NEUROTOXIN/TOXIN**. It blocks high conductance (maxi-K) K^+-channels ($I_{BK(Ca)}$) in smooth muscle, neuroendocrine cells, certain mammalian CNS neurons, skeletal muscle, invertebrate neurons and mutant forms of Shaker K^+-channels. It causes a transient increase in blood pressure in rats on intravenous injection.

IBH 194 ➡ **isonixin.**

IBI-C 83 ➡ **rosaprostol.**

IB-MECA is an adenosine derivative, active as a (P1 purinoceptor) **ADENOSINE RECEPTOR AGONIST** selective at the A_3-subtype. It is used as a tool in adenosine receptor studies. It is reported to show cerebral antiischaemic activity in an animal model; also induces apoptosis in a human leukaemic cell line.

ibogaine (Enabuse™) is an alkaloid from *Tabernanthe iboga*, *Tabernaemontana* spp. and several other spp. in the Apocynaceae. It is a strong **CNS STIMULANT, PSYCHOTROPIC** and hallucinogenic **ANTICONVULSANT** and **ANTIHYPERTENSIVE AGENT**. *T. iboga* is an African folk remedy against fatigue. It has opioid and serotonergic actions. It is under investigation for treatment of withdrawal symptoms from drugs of abuse.

ibogamine is an alkaloid from *Tabernanthe iboga*, *Tabernaemontana* spp. and several other spp. in the Apocynaceae. It shows weak cytotoxic and **ANTIBACTERIAL** activity, as well as shows some **CNS STIMULANT**, (bradycardia) **CARDIAC DEPRESSANT** and **HYPOTENSIVE** activity.

ibomal ➡ **bromoaprobarbital.**

ibopamine [BAN, INN, USAN] (ibopamine hydrochloride) is a catecholamine derivative, a peripheral **DOPAMINE RECEPTOR AGONIST**. It has (inotropic) **CARDIAC STIMULANT** activity and is used in congestive **HEART FAILURE TREATMENT**.

ibopamine hydrochloride ➡ **ibopamine.**

ibotenic acid is a cyclic amino acid that is a constituent of the fly agaric mushroom (*Amanita muscaria* and other *Amanita* spp., and also from *Tricoloma muscarium*). It is a **NEUROTOXIN**, an (NMDA subtype) **GLUTAMATE RECEPTOR AGONIST**, causing neuronal depolarization, excitation and excitotoxic actions. It can be used as a pharmacological tool and as an **INSECTICIDE**.

iboxygaine is an alkaloid from *Tabernanthe iboga*, *Tabernaemontana* spp. and several other spp. in the Apocynaceae. It shows weak cytotoxic and **ANTIBACTERIAL** activity, as well as some **CNS STIMULANT**, (bradycardic) **CARDIAC DEPRESSANT** and **HYPOTENSIVE** activity.

ibudilast [INN, JAN] (KC 404) is a pyrazolopyridine, an

are secreted by the hypothalamus, and are largely involved in controlling release of the pituitary hormones. These hypothalamic factors travel in a specialized system of portal blood vessels the short distance from the brain area, the hypothalamus, to the adjacent anterior pituitary.

Corticotrophin-releasing hormone (CRH; corticotrophin-releasing factor, CRF) controls release of corticotrophin (adrenocorticotrophic hormone, **ACTH**), which in turn controls the release of corticosteroids from the adrenal glands. See **CORTICOTROPHIN-RELEASING FACTOR RECEPTOR AGONISTS; CORTICOTROPHIN-RELEASING FACTOR RECEPTOR ANTAGONISTS.**

Gonadotrophin-releasing hormone (gonadorelin; GnRH; gonadotrophin-releasing factor; luteinizing hormone-releasing hormone, LH-RH) controls release of the gonadotrophins, **FSH** and **LH**, which cause the ripening of the follicle and ovulation (see **LH-RH RECEPTOR AGONISTS**).

Growth hormone-releasing hormone (**GHRH**; **growth hormone-releasing factor**, **GRF**) controls the release of growth hormone. In the diagnosis of growth hormone secretion, **sermorelin**, an analogue of growth hormone-releasing hormone, can be used to test secretion of growth hormone.

Growth hormone release-inhibiting hormone (GHRIH; growth hormone-release inhibiting factor; GHRIF; somatotrophin release inhibitory factor; SRIF and **somatostatin**) all refer to its role as a hypothalamic factor whose release leads to inhibitory modulation of the release of growth hormone (somatotrophin) from the pituitary gland. This peptide is now most commonly referred to as somatostatin, now that it is recognized to have a potentially wide inhibitor function in the body, and is also produced in the gut and the pancreas, as well as some peripheral nerves. Somatostatin is a cyclic peptide of 14 residues, but therapeutically **octreotide** is used because it is less enzymatically degraded. Octreotide is a cyclic analogue of 8 residues, containing a terapeptide sequence known to be essential for activity (see **SOMATOSTATIN RECEPTOR AGONISTS; SOMATOSTATIN RECEPTOR ANTAGONISTS**). It is used to treat tumours secreting vasoactive intestinal polypeptide (VIPomas), carcinoid syndrome and glucagonomas, and has a place in the treatment of acromegaly and Graves' disease.

Protirelin (thyrotrophin-releasing hormone, TRH, thyrotrophin-releasing hormone factor, TRF) is a tripeptide agent that modulates the release of **thyrotrophin** (and **prolactin**) from the pituitary and thence, in turn, thyroid hormone that affects metabolism and a number of other processes in the body. Therapeutically, protirelin is used to assess thyroid disorders and function in patients who suffer from hypopituitarism or hyperthyroidism.

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hypothalamic inhibitory factor ➡ **prolactin-release inhibiting factor.**

Hypovase™ ➡ **prazosin.**

Hyskon™ ➡ **dextran.**

Hytakerol™ ➡ **dihydrotachysterol.**

Hytrin™ ➡ **terazosin.**

Hytrin BPH™ ➡ **terazosin.**

I 612 ➡ **ronifibrate.**

I 653 ➡ **desflurane.**

^{131}I ➡ **sodium iodide.**

IAPP ➡ **amylin.**

ibacitabine [INN] is a nucleoside **ANTIVIRAL**, which is used clinically to treat herpes viruses.

ibenzmethyzin hydrochloride ➡ **procarbazine.**

iberiotoxin (α-KTx1.3) is a 37 amino acid peptide from a scorpion (*Buthus tamulus*), and is a **POTASSIUM-CHANNEL BLOCKER** and **NEUROTOXIN/TOXIN**. It blocks high conductance (maxi-K) K^+-channels ($I_{BK(Ca)}$) in smooth muscle, neuroendocrine cells, certain mammalian CNS neurons, skeletal muscle, invertebrate neurons and mutant forms of Shaker K^+-channels. It causes a transient increase in blood pressure in rats on intravenous injection.

IBH 194 ➡ **isonixin.**

IBI-C 83 ➡ **rosaprostol.**

IB-MECA is an adenosine derivative, active as a (P1 purinoceptor) **ADENOSINE RECEPTOR AGONIST** selective at the A_3-subtype. It is used as a tool in adenosine receptor studies. It is reported to show cerebral antiischaemic activity in an animal model; also induces apoptosis in a human leukaemic cell line.

ibogaine (Enabuse™) is an alkaloid from *Tabernanthe iboga*, *Tabernaemontana* spp. and several other spp. in the Apocynaceae. It is a strong **CNS STIMULANT, PSYCHOTROPIC** and hallucinogenic **ANTICONVULSANT** and **ANTIHYPERTENSIVE AGENT**. *T. iboga* is an African folk remedy against fatigue. It has opioid and serotonergic actions. It is under investigation for treatment of withdrawal symptoms from drugs of abuse.

ibogamine is an alkaloid from *Tabernanthe iboga*, *Tabernaemontana* spp. and several other spp. in the Apocynaceae. It shows weak cytotoxic and **ANTIBACTERIAL** activity, as well as shows some **CNS STIMULANT**, (bradycardia) **CARDIAC DEPRESSANT** and **HYPOTENSIVE** activity.

ibomal ➡ **bromoaprobarbital.**

ibopamine [BAN, INN, USAN] (ibopamine hydrochloride) is a catecholamine derivative, a peripheral **DOPAMINE RECEPTOR AGONIST**. It has (inotropic) **CARDIAC STIMULANT** activity and is used in congestive **HEART FAILURE TREATMENT**.

ibopamine hydrochloride ➡ **ibopamine.**

ibotenic acid is a cyclic amino acid that is a constituent of the fly agaric mushroom (*Amanita muscaria* and other *Amanita* spp., and also from *Tricoloma muscarium*). It is a **NEUROTOXIN**, an (NMDA subtype) **GLUTAMATE RECEPTOR AGONIST**, causing neuronal depolarization, excitation and excitotoxic actions. It can be used as a pharmacological tool and as an **INSECTICIDE**.

iboxygaine is an alkaloid from *Tabernanthe iboga*, *Tabernaemontana* spp. and several other spp. in the Apocynaceae. It shows weak cytotoxic and **ANTIBACTERIAL** activity, as well as some **CNS STIMULANT**, (bradycardic) **CARDIAC DEPRESSANT** and **HYPOTENSIVE** activity.

ibudilast [INN, JAN] (KC 404) is a pyrazolopyridine, an

orally active LEUKOTRIENE RECEPTOR ANTAGONIST, which can be used in ANTIASTHMA prophylaxis.

ibufenac [BAN, INN, JAN, USAN] (RD 11654) is one of the heteroaryl acetic acid series of CYCLOOXYGENASE INHIBITORS, with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

ibuprofen [BAN, INN, JAN, USAN] (Brufen™, Nurofen™ (UK); Rufen™ , Motrin™ (USA) and many other names) is one of the original members of the propionic acid series of CYCLOOXYGENASE INHIBITORS, acting as a NSAID ANALGESIC with ANTIINFLAMMATORY and ANTIPYRETIC activity. As a prescription and OTC drug (sometimes in compound preparations) it is extensively used therapeutically as an analgesic, antiinflammatory and antipyretic under a large number of proprietary names. Various froms and derivatives can be used: the (*S*)-form is dexibuprofen [INN]; the lysine salt is dexibuprofen lysine [USAN]; an aluminium compound is ibuprofen aluminium [USAN]; the pyridinylmethyl ester is ibuprofen piconol [JAN, USAN] (topical agent).

ibuprofen aluminium ➡ **ibuprofen**.

ibuproxam [INN, JAN, USAN] is related to the propionic acid series, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

ibuterol ➡ **terbutaline**.

ibutilide [BAN, INN] (ibutilide fumarate [USAN]; Corvert™) is a phenylmethanesulphonamide, a (class III) ANTIARRHYTHMIC used for rapid conversion of atrial fibrillation.

ibutilide fumarate ➡ **ibutilide**.

icatibant [INN] (icatibant acetate [USAN]; Hoe 140) is a decapeptide with substitutions on the bradykinin sequence (DArg[Hyp^3,Thi^5,DTic^7,Oic^8]BK), a (B_2-subtype) BRADYKININ RECEPTOR ANTAGONIST. It has potential as an ANTIASTHMIC and to treat rhinitis and pancreatitis.

icatibant acetate ➡ **icatibant**.

ichthammol [BAN, JAN, USAN] (ammonium bituminosulphonate and many other names) consists of hydrocarbons, nitrogenous bases, acids and several thiophene derivatives, and is obtained by sulphation and ammoniation of a distillate of mineral deposits. It can be used as a topical DERMATOLOGICAL AGENT, as an antiinfective, ANTIFUNGAL and KERATOLYTIC AGENT, and is used in the treatment of chronic skin diseases, such as eczema and ulcers. It is generally used together with other substituents, e.g. **zinc oxide**, often in the form of a medicated bandage.

ichthyotocin ➡ **argiprestocin**; **isotocin**.

ICI 8731 (ZD 8731) is a quinoline, an orally active ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE properties.

ICI 28257 ➡ **clofibrate**.

ICI 32865 ➡ **ethoglucid**.

ICI 35868 ➡ **propofol**.

ICI 46474 ➡ **tamoxifen**.

ICI 46476 ➡ **clomiphene**.

ICI 50123 ➡ **pentagastrin**.

ICI 58834 ➡ **viloxazine**.

ICI 59118 ➡ **razoxane**.

ICI 79280 ➡ **droloxifene**.

ICI 81008 ➡ **fluprostenol**.

ICI 118630 ➡ **goserelin**.

ICI 176334 ➡ **bicalutamide**.

icosapent [INN] (timnodonic acid) is present in fish oils as an acylglycerol and in animal phospholipids. It is a metabolite of **α-linolenic acid**, and a constituent of various red algae, and is a precursor of PG_3 series of prostaglandins. It acts as a PLATELET AGGREGATION INHIBITOR.

icotidine [USAN] is a pyridinylpyrimidinone, a HISTAMINE H_1-RECEPTOR ANTAGONIST and HISTAMINE H_2-RECEPTOR ANTAGONIST. It has experimental antinociceptive activity.

ICRF 159 ➡ **razoxane**.

ICRF 187 ➡ **razoxane**.

ICS 205-930 ➡ **tropisetron**.

ID 530 ➡ **nimetazepam**.

Idamycic™ ➡ **idarubicin**.

idarubicin [BAN, INN] (idarubicin hydrochloride [USAN]; Idamycic™; Zavedos™) is an (anthracycline group) ANTIBIOTIC with CYTOTOXIC properties. Clinically, it may be used as an oral and parenteral ANTICANCER AGENT, particularly for breast cancer.

idarubicin hydrochloride ➡ **idarubicin**.

idazoxan [BAN, INN] is an imidazole with (selective α_2-subtype) α-ADRENOCEPTOR ANTAGONIST. Activity as an ANTIDEPRESSANT has been claimed, but anxiogenic-like activity is shown in mice.

idebenone [INN, JAN] (CV 2619) is a benzoquinone, an ANTIOXIDANT & FREE-RADICAL SCAVENGER and NEUROPROTECTIVE AGENT. It has been used for enhancement of immune response. It has CNS STIMULANT properties and has been used as a NOOTROPIC AGENT (cognition enhancer).

idoxuridine [BAN, INN, JAN, USAN] (Herpid™; Herplex™; Iduridin™ etc.) is a pyrimidine nucleoside ANTIVIRAL AGENT, which clinically can be used in the treatment of ocular herpetic infections.

idramantone [INN] (5-hydroxyadamantanone) has (IMMUNOSTIMULANT) IMMUNOMODULATOR properties. It is a lymphocyte and antibody stimulant in mice and a T-cell suppressor.

idropranolol [INN] is a β-ADRENOCEPTOR ANTAGONIST. It was never marketed.

Iduridin™ ➡ **ibacitabine**.

ifenprodil [INN, USAN] (ifenprodil tartrate [JAN]) is a benzylpiperidinohydroxyphenylpropanol derivative, an α-ADRENOCEPTOR ANTAGONIST that is a VASODILATOR. It was formerly used in treating peripheral vascular disease. It is also a GLUTAMATE RECEPTOR ANTAGONIST (NMDA) and is an experimental NEUROPROTECTIVE AGENT.

ifenprodil tartrate ➡ **ifenprodil**.

ifetroban [USAN] (BMS 180291) is a complex heterocyclic, a (TP) PROSTANOID RECEPTOR ANTAGONIST, and is an ANTITHROMBOTIC, antiischaemic and antivasospastic agent.

Ifex/Mesnex™ ➡ **mesna**.

IFN-α ➡ **interferon α**.

IFN-β ➡ **interferon β**.

IFN-β2 ➡ **interleukin-6**.

IFN-γ ➡ **interferon γ**.

ifosfamide [BAN, INN, JAN, USAN] (A 4942; MJF 9325; NSC 109724; Asta 4942; Ifex™; Mitoxana™ and many other names) is related to **cyclophosphamide**, and also is an (alkylating) cytotoxic ANTICANCER and IMMUNOSUPPRESSANT AGENT. It works by interfering with cellular DNA and so inhibits cell replication. It is particularly used for testicular cancer, and is routinely used simultaneously with **mesna** (which reduces the urothelial toxicity).

i-inositol ➡ **myo-inositol**.

Ikorel™ ➡ **nicorandil**.

IL-1 ➡ **interleukin-1**.

IL-1 inhibitor ➡ **anakinra**.

IL-1ra ➡ **anakinra**.

IL-2 ➡ **interleukin-2**.

IL-3 ➡ **interleukin-3**.

IL-4 ➡ **interleukin-4**.

IL-5 ➡ **interleukin-5**.
IL-6 ➡ **interleukin-6**.
IL-8 ➡ **interleukin-8**.
ilatreotide [INN] (SDZ CO 611) is a glycated analogue of **somatostatin** and a SOMATOSTATIN RECEPTOR AGONIST. It is an orally active pituitary and gut hormonal secretion inhibitor, with potential for treating gastroenteropancreatic tumours.
Ile^3-argininevasopressin ➡ **argipressin**.
ilmofosine [INN, USAN] (BM 41.440) is a phospholipid derivative similar to **miltefosine**, which has been investigated as an ANTICANCER AGENT. It is also a PROTEIN KINASE INHIBITOR (PKC) and shows ANTILEISHMANIAL activity.
ilomastat [INN] (GM 6001) is a tryptophan methylamide, a matrix (metallo) PROTEASE INHIBITOR, which can be used as an angiogenesis inhibitor. In animal models it is shown to reverse development of autoimmune encephalomyelitis (with implications for treatment of multiple sclerosis).
iloprost [BAN, INN] (Ciloprost™) is an analogue of **prostacyclin**, with similar VASODILATOR activity but increased stability. It is an (EP_1-subtype) PROSTANOID RECEPTOR AGONIST, with peripheral and cerebral vasodilator activity, and is a HYPOTENSIVE AGENT. It can be used as a PLATELET AGGREGATION INHIBITOR. Its therapeutic potential has been explored in peripheral vascular disease, myocardial ischaemia and extracorporeal circulation procedures.
Ilosone™ ➡ **erythromycin**.
Ilube™ ➡ **acetylcysteine**.
imazodan [INN] (imazodan hydrochloride [USAN]) is an imidazolpyridazinone, a (type III) PHOSPHODIESTERASE INHIBITOR, which shows VASODILATOR and CARDIAC STIMULANT actions.
imazodan hydrochloride ➡ **imazodan**.
Imbretil™ ➡ **carbolonium bromide**.
Imbrilon™ ➡ **indomethacin**.
IMD 760 ➡ **azacosterol**.
Imdur™ ➡ **isosorbide mononitrate**.
imetit (VUF 8325) is a substituted imidazolylthiourea which is an (H_3) HISTAMINE RECEPTOR AGONIST. It is used as a pharmacological tool.
imexon [INN] (BM 06002) is a diazabicycloone derivative, with (IMMUNOSTIMULANT) IMMUNOMODULATOR and ANTIVIRAL activity (murine AIDS model); never marketed.
imidapril ➡ **imidaprilat**.
imidaprilat [INN] is an imidazoline, an ACE INHIBITOR, formerly used as an ANTIHYPERTENSIVE. The ester prodrug imidapril [BAN, INN] can be used.
imidazolamine antazoline ➡ **antazoline**.
imidazolecarboxamide ➡ **dacarbazine**.
imidazole salicylate [INN] is one of the salicylate series of NSAID ANALGESICS, with ANTIINFLAMMATORY, ANTIPYRETIC and ANTITHROMBOTIC actions. It is no longer marketed.
imidazolguanidine ➡ **histaguanidine**.
Imigran™ ➡ **sumatriptan**.
Iminase™ ➡ **anistreplase**.
N-iminoethyl-L-ornithine ➡ **L-NIO**.
iminourea hydrochloride ➡ **guanidine**.
imipemide ➡ **imipenem**.
imipenem [BAN, INN, USAN] (imipemide) is a synthetic carbapenem (β-lactam) ANTIBIOTIC. Clinically, it shows broad-spectrum ANTIBACTERIAL activity which includes many aerobic and anaerobic Gram-positive and Gram-negative bacteria. It is administered together with the ENZYME INHIBITOR **cilastatin** (Primaxin™).
imipramine [BAN, INN] (imipramine hydrochloride [USAN]; Tofranil™ and many other names) is one of the tricyclic class of ANTIDEPRESSANTS, and the principal active metabolite of **desimipramine**. It is a noradrenaline UPTAKE INHIBITOR, and is used as an oral antidepressant. It has antimuscarinic and SEDATIVE effects when used therapeutically. It can also be used as the 5-N-oxide = imipraminoxide [INN].
imipramine hydrochloride ➡ **imipramine**.
imipraminoxide ➡ **imipramine**.
Imitrex™ ➡ **sumatriptan**.
immepip is a substituted imidazolylpiperidine and **histamine** analogue, a selective (H_3) HISTAMINE RECEPTOR AGONIST. It is used as a pharmacological tool.
immune interferon ➡ **interferon γ**.
Immuneron™ ➡ **interferon γ**.
IMMUNOMODULATORS are agents that modify the body's immunological responses. Some agents specifically boost the body's immune responses, and can be referred to as immunostimulants. Others have a more complex role, and are best referred to by the more general term of immunomodulators, and will be dealt with first.

Interferons are inducible polypeptide and glycoprotein (15,000–27,600 daltons) mediators synthesized by mammalian cells, but produced by recombinant technology for biomedical use. They have been used as ANTIVIRALS (e.g. including for hepatitis B and C), as ANTICANCER AGENTS (e.g. for AIDS-related Kaposi's sarcoma) and also to treat chronic granulatomatous disease and Relapsing-Remitting Multiple Sclerosis. There are three or more types, α-, β- and γ-interferon: see **interferon α**, **interferon β** and **interferon γ**. They can modify the host response by inducing production of enzymes that inhibit translocation of viral mRNA into viral protein, and thus prevent virus reproduction. They can be administered as immunomodulators by intravenous or intramuscular injection in the treatment of AIDS, cancer and other chemotherapy.

Interleukins are similarly naturally synthesized by mammalian cells, mainly white cells, and are produced by recombinant technology for biomedical use. They have been used as adjuncts in anticancer chemotherapy and radiotherapy, for antiviral therapy, in treating burns and wounds, and for autoimmune diseases. They help in a variety of ways, including activating haemopoietic stem cells to promote proliferation for leukaemia treatment and activating stromal bone marrow cells to produce colony-stimulating factors also in the treatment of leukaemia. See **interleukin-1**, **interleukin-2** (a lymphokine from T-cell lymphocytes with a number of variants; **celmoleukin**, **c cytokine**), **interleukin-3** (multipotential colony-stimulating factor), **interleukin-4**, **interleukin-5**, **interleukin-6** and **interleukin-8**. **Anakinra** is a recombinant human INTERLEUKIN RECEPTOR ANTAGONIST active against IL-1, which was isolated from human monocytes and is now cloned, and can be used for inflammatory bowel disease.

Colony-stimulating factors (CSFs) are glycopeptide factors containing 100-224 amino acid residues and are endogenous factors produced by many cell types and act as immunomodulators that stimulate proliferation and differentiation of progenitor cells in the monocyte/macrophage white blood cell lineage *in vitro*. There are different forms that act as haemtopoietic agents and stimulate different cell lines. Granulocyte-macrophage-colony-stimulating factor (GM-CSF) is a (GM-CSF subtype) CYTOKINE RECEPTOR AGONIST, and stimulates production of monocytes, neutrophil, eosinophils, erythrocytes and platelets. The granulocyte-colony-stimulating factor (G-CSF) is a (G-CSF subtype) cytokine receptor agonist, and

stimulates neutrophil production. Biosynthetic forms are generally used therapeutically (see **filgrastim**).

Turning to immunostimulants, the therapeutic use of nonspecific immunostimulation originated in the last century in the use of mixed bacterial toxins ('Coley toxins') to treat cancer. A large number of types of microbially derived substances have received clinical approval since then (mainly in the USA). They have been tried in the treatment of bladder, gastric and other cancers. However, they are of variable purity and have been unreliable, with variable side-effects. The preparation of inactivated *Corynebacterium parvum* (Coparvax) formerly available in the UK, and used by the intracavitary route for malignant effusions, has now been discontinued. **Adjuvant peptide** (muramyl dipeptide) is identified as the minimum structural constituent of the mycobacterial cell wall component of Freund's complete adjuvant, which is necessary for adjuvant activity. It and many of its analogues have been investigated as adjuvants in the immunization of animals, as immunostimulants (e.g. **almurtide**). Many microbially derived macrophage activators have been clinically licensed (only in some countries) and mainly for cancers. Some fungal products, glycans, enhance macrophage microbiocidal and antitumouricidal activity and induce release of IL-1, TNF and CSFs. A number of vaccines used in conventional therapy can be regarded as immunostimulants. These include agents such as BCG vaccine (bacillus Calmette-Guérin vaccine), antituberculer vaccine and a number of thymus-derived T-cell stimulant preparations (e.g. thymostimulin), which are thymic peptide extracts for treatment of cancer or infection. Other agents include **levamisole hydrochloride** and **inosine pranobex** (an inositol-salt complex, for infection). Some chemically defined structures in earlier stages of development include thymosin α_1 (a peptide T-lymphocyte promoter proposed for cancer and hepatitis), bropirimine (an IFN inducer/natural killer and macrophage activator) and methyl inositol monophosphate (macrophage activator proposed for HIV/infection).

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immunopoietin E is a hexapeptide, a thymopoietin analogue with IMMUNOMODULATOR or immunoregulator activity (see **thymopoietin**).

immunopoietin G is a pentapeptide, a **thymopoietin** analogue which has IMMUNOMODULATOR or immunoregulator activity.

immunopoietin M (IPM-5) is a pentapeptide, a thymopoietin analogue with IMMUNOMODULATOR or immunoregulator activity (see **thymopoietin**).

Immunoprin™ ➡ **azathioprine**.

IMMUNOSUPPRESSANTS are agents that inhibit the body's reaction to infection or foreign bodies. In this capacity, drugs with this property may be used to prevent tissue rejection following donor grafting or transplant surgery (though there is then the risk of unopposed infection). Also, immunosuppressants are used to treat auto-immune diseases (where the immune system is triggered into acting against systems in the body), including disorders such as rheumatoid arthritis or lupus erythematosus, and also to treat collagen disorders. These agents include **cyclosporin**, **rapamycin** and **tacrolimus**, cytotoxic agents such as **azathioprine** and **cyclophosphamide**, and the glucocorticoids. These will be discussed in turn.

Cyclosporin is technically an antibiotic, which was discovered serendipitously during a search for antifungal agents and is unique in having a selective action on lymphocytes. It is a cyclic peptide of 11 residues – some previously unknown. It is particularly important as an immunosuppressant in limiting tissue rejection during and following organ transplant surgery. It can also be used to treat severe active rheumatoid arthritis and some skin conditions, such as severe resistant atopic dermatitis and (under supervision) psoriasis. It has very little effect on the blood-cell producing capacity of the bone marrow, but has liver toxicity. It works through having a relatively selective action on T-lymphocytes, with several actions, one being at the induction stage, stopping proliferation. Its main effect is to inhibit the synthesis of lymphokines, particularly interleukin-2 (IL-2). It may also inhibit expression at IL-2 receptors on T-cells. It prevents release of histamine from mast cells and blocks transcription of genes for IL-3, IL-4 and LT4. At an intracellular level, cyclosporin binds to a cytosolic protein, cylophilin (one of the immunophilins), and this has the reduction of IL-2 as one end-response.

Rapamycin (sirolimus) is also a natural product, from a soil organism, which is unrelated to cyclosporin but has similar actions, though binding to a different immunophilins. Tacrolimus is a recently introduced macrolide antibiotic similar to cyclosporin, but appears to have a higher incidence of neurotoxicity and nephrotoxicity.

Of the cytotoxic agents azathioprine is the main agent used in immunosuppression to control tissue rejection in transplant surgery. It is converted in the body to **mercaptopurine**, which is a purine analogue that inhibits DNA synthesis. It inhibits clonal proliferation in the induction phase of the immune response, so suppresses both cell-mediated and antibody-mediated immune reactions. In addition to use in transplant surgery, azathioprine may also be used to treat myasthenia gravis, rheumatoid arthritis, ulcerative colitis and other autoimmune diseases (administration is oral or by injection). Cyclophosphamide is a cytotoxic agent with powerful immunosuppressant action which, after conversion by P-450, forms a nitrogen mustard intermediate that alkylates DNA and other molecules. **Chlorambucil** is another alkylating agent that works like cyclophosphamide.

The glucocorticoids are immunosuppressants both by virtue of their antiinflammatory properties and their actions against the immune responses. The basis of these is discussed under other headings: see ANTIINFLAMMATORY AGENTS; CORTICOSTEROIDS; GLUCOCORTICOIDS.

A number of other types of drug are under development. These include agents that interfere with leukotriene synthesis (see LIPOXYGENASE INHIBITORS), interleukin-1 antagonists, monoclonal antibodies linked to cytotoxic drugs etc. See also IMMUNOMODULATORS.

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Imodium™ ➡ **loperamide**.

impromidine [BAN, INN] (impromidine hydrochloride [USAN]; SKF 92676) is a imidazolthioguanidine, a HISTAMINE

H_2-RECEPTOR AGONIST, diagnostic agent (gastric secretion indicator) and HISTAMINE H_3-RECEPTOR ANTAGONIST.

impromidine hydrochloride ➡ **impromidine.**

Improvera™ ➡ **estropipate; oestrone.**

Imtack™ ➡ **isosorbide dinitrate.**

Imunovir™ ➡ **inosine pranobex.**

Imuran™ ➡ **azathioprine.**

Inapsine™ ➡ **droperidol.**

indanazoline [INN] is an imidazoline related to **naphazoline**. It is a SYMPATHOMIMETIC with VASOCONSTRICTOR properties, formerly used as a topical nasal DECONGESTANT.

indapamide [BAN, INN, JAN, USAN] (Lozol™; Natrilix™ etc.) is a (thiazide-related) DIURETIC, which can be used in ANTIHYPERTENSIVE therapy.

indecainide [INN] (indecainide hydrochloride [USAN]) is a carboxamide, a CARDIAC DEPRESSANT and (class Ic) ANTIARRHYTHMIC AGENT.

indecainide hydrochloride ➡ **indecainide.**

indeloxazine [INN] (indeloxazine hydrochloride [JAN, USAN] is an indenyloxy morpholine derivative, and is a reported ANTIDEPRESSANT and cerebral activator with antihypoxic and antiischaemic effects

indeloxazine hydrochloride ➡ **indeloxazine.**

indenolol [BAN, INN] (indenolol hydrochloride [JAN]) is a β-ADRENOCEPTOR ANTAGONIST with ANTIARRHYTHMIC properties.

indenolol hydrochloride ➡ **indenolol.**

Inderal™ ➡ **propranolol.**

indigo carmine ➡ **indigotin disulfonate sodium.**

indigotin ➡ **indigotin disulfonate sodium.**

indigotin disulfonate sodium [USAN] (C.I. acid blue 74; C.I. food blue 1; C.I. pigment blue 63; indigo carmine; soluble indigo blue; amacid brilliant blue; carmine blue; indigotin) is a dye used as a diagnostic agent in cytoscopy, as a kidney function indicator, in cosmetics and as a biological stain.

indinavir [BAN, INN, USAN] (sulphate: Crixivan™) is a nucleoside analogue HIV-1 protease inhibitor ANTIVIRAL AGENT. It is used clinically in conjunction with other drugs in ANTI-HIV treatment.

indobufen [INN] is a propionic acid group NSAID ANALGESIC, with ANTIINFLAMMATORY and PLATELET AGGREGATION INHIBITOR activity. It has been used in the treatment of various thrombotic disorders. The (*S*)-form is dextroindobufen, and is undergoing clinical trials.

Indocid™ ➡ **indomethacin.**

indocyanine green [JAN, USAN] (cardio-green; fox green; tricarbocyanine II; wofaverdin) is a dye used as a diagnostic agent for the determination of blood volume, cardiac output and hepatic function.

indocybin ➡ **psilocybine.**

indolapril [INN] (indolapril hydrochloride [USAN]; SCH 31846) is an indolinecarboxylate, an ACE INHIBITOR and ANTIHYPERTENSIVE.

indolapril hydrochloride ➡ **indolapril.**

Indomed™ ➡ **indomethacin.**

indometacin ➡ **indomethacin.**

indomethacin [BAN, USAN] (indometacin [INN, JAN]; Artracin™; Flexin™; Imbrilon™; Indocid™; Indomod™; Indomed™; Mobilan™ and many other names) is an original member of the indole acetic acid series, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It is used to treat rheumatic and muscular pain caused by inflammation and/or ankylosing spondylitis. It can also be used to treat period pain and as an antigout agent in acute attack. In infants it is used to close a patent ductus arteriosus. It is a metabolite of **proglumetacin**.

Indomod™ ➡ **indomethacin.**

indopanolol [INN] is a combined α-ADRENOCEPTOR ANTAGONIST and β-ADRENOCEPTOR ANTAGONIST.

indoprofen [BAN, INN, USAN] (K 4277) is one of the propionic acid series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It was withdrawn from sale worldwide after reports of carcinogenicity. The (*S*)-form is dexindoprofen [INN].

indoramin [BAN, INN, USAN] (indoramin hydrochloride [USAN]; Baratol™; Doralese™) is an indolpiperidinylbenzamide derivative, an (α_1-selective) α-ADRENOCEPTOR ANTAGONIST with ANTIHYPERTENSIVE and SMOOTH MUSCLE RELAXANT properties. It can be used to treat benign prostatic hypertrophy.

indoramin hydrochloride ➡ **indoramin.**

indorenate [INN] (indorenate hydrochloride [USAN]; TR 3369) is an indole derivative, a ($5\text{-}HT_1$-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST, with ANTIHYPERTENSIVE and ANXIOLYTIC properties.

indorenate hydrochloride ➡ **indorenate.**

INF 4668 ➡ **meclofenamic acid.**

Infacol™ ➡ **dimethicone.**

Infumorph™ ➡ **morphine.**

inhibin (Sertoli cell factor; folliculostatin) is a peptide containing 335 amino acid residues. It is a dimer of two different subunits, α and β. It is produced in the Sertoli cells in the testis and in the granulosa cells in the ovary, and is involved in the regulation of FSH secretion in the pituitary gland. It is a potential CONTRACEPTIVE, and also a possible early marker of Down's syndrome.

Innohep™ ➡ **tinzaparin sodium.**

Innovace™ ➡ **enalapril.**

Innozide™ ➡ **enalapril.**

Inobestin™ ➡ **bestatin.**

Inocor™ ➡ **amrinone.**

inosine pranobex [BAN, JAN] (Imunovir™) is a derivative of inosine, and is an ANTIVIRAL AGENT possibly through IMMUNOSTIMULANT activity. Clinically, it is used for oral herpes.

inositol ➡ **myo-inositol.**

1,2,3,5/4,6-inositol ➡ **myo-inositol.**

inositol hexanicotinate ➡ **inositol nicotinate.**

inositol niacinate ➡ **inositol nicotinate.**

inositol nicotinate [BAN, INN] (inositol niacinate [USAN]; inositol hexanicotinate [JAN]; hexanicotinoylinositol; Hexopal™) is a direct-acting peripheral VASODILATOR and also an ANTILIPIDAEMIC AGENT. It can be used in oral treatment of peripheral vascular disease.

INOTROPIC AGENTS are agents influencing the contractility of muscle. The term is commonly used for agents having a positive inotropic effect on cardiac muscle, i.e. drugs used to stimulate the force of the heartbeat (inotropes) rather than the rate of the heartbeat (chronotropes). In practice, agents will often affect both heart force and rate. Cardiac stimulants may be used to stimulate the heart when it is weak as a result of some disease state and in medical emergencies.

CARDIAC GLYCOSIDES have a pronounced effect on the failing heart, increasing the force of contraction, so have been commonly used to increase the force in the treatment of congestive heart failure: e.g. **digoxin**, **digitoxin**.

A number of sympathomimetic β-adrenoceptor agonist drugs can be used directly to stimulate force (and rate), e.g. **adrenaline**, **dobutamine**, **dopexamine** and **isoprenaline**.

Of these, dobutamine is especially valuable for its inotropic action, and has less chronotropic action than the others. Most of these sympathomimetic drugs tend to be reserved for acute emergencies, including cardiogenic shock, septic shock, in heart surgery and in cardiac infarction or cardiac arrest. **Xamoterol** is a partial agonist at β-adrenoceptors, and is used in mild heart failure only (see **β-ADRENOCEPTOR AGONISTS**).

PHOSPHODIESTERASE INHIBITORS acting at a heart-specific subtype of this enzyme (type III phosphodiesterase), prevent the intracellular degradation of cyclic AMP (cAMP) and thereby raise the intracellular concentration of cAMP. This exerts a positive inotropic affect for the same reason as β-adrenoceptor activation, and may be used in the short-term treatment of severe congestive cardiac failure, e.g. **enoximone** and **milrinone**.

INSECTICIDES act to kill insects by a number of mechanisms, of which the principal ones will be discussed here.

Organochlorine insecticides: these include the original simple organochlorine compound **DDT** (chlorophenothane) introduced in the 1940s, and its successor methoxychlor. Later commonly used compounds were the chlorinated cyclodienes, including **dieldrin**, aldrin, heptachlor and chlordane. Other chlorinated hydrocarbon insecticides include **lindane** and the extremely persistent agents mirex and chlordecone. The uses of these in agriculture and industry and the toxicology of these agents are outside the scope of this article. Lindane and dieldrin can be used in medicine as acaricidal or scabicidal agents (see **ACARICIDES**).

A number of organophosphorus **ANTICHOLINESTERASES** have been developed for use as insecticides, and have largely replaced the organochlorine compounds (which are generally very persistent). They are developed from agents originally designed for warfare, and loosely referred to as 'nerve gases' (e.g. **dyflos**, tabun, sarin and soman). Insecticides derived from this series include **TEPP** (ethyl pyrophosphate, an early agent), **parathion**, paraoxon (active metabolite of parathion), **fenthion**, **malathion** and dimpylate (diazinon). Alhough safer for the environment, they require great care in handling. In fact, parathion is the insecticide most often involved in fatal poisoning.

Carbamate anticholinesterases: these are 'reversible' in as much as their duration of action is short as compared to organophosphorus anticholinesterases, and are used extensively. An example is **carbaryl** (carbaril) and several analogues of carbaryl are used as insecticides. However, not all carbamates found in garden formulations are cholinesterase inhibitors; the dithiocarbamates are fungicidal.

Plant-derived insecticides: for example, pyrethrum, which is a crude extract from flowers of the pyrethrum plant *Chrysanthemum cinerariaefolium*. Pyrethrin is a more refined extract containing the six naturally occurring pyrethrins. The greatest activity resides in pyrethrin I. Pyrethrum is regarded as one of the safest insecticides, at least in terms of primary toxicity. It resembles DDT in mode of action, and works at least in part by opening sodium channels in excitable membranes, so causing paralysis. See **SODIUM-CHANNEL ACTIVATORS**.

Rotenone (derris) is obtained from the roots of plants such as *Derris* and *Lonchocarpus*, and was used to paralyse fish before being developed into an insecticide. Human poisoning is rare, and it has been used to treat head lice and other ectoparasites.

Nicotine is one of the most toxic of insecticides in terms of acute poisoning, but in dilute solution or suspension is an effective acute insecticide. See **NICOTINIC CHOLINOCEPTOR AGONISTS**.

Aldridge, W.N. (1983) Toxicology of pyrethroids, in *Pesticide Chemistry: Human Welfare and the Environment*, 3rd edn, (eds J. Miyamoto *et al.*), Pergamon Press Ltd., Oxford, pp. 485-490.

Narahashi, T. (1989) The role of ion channels in insecticide action, in *Insecticide Action: From Molecular to Organism*, (eds T. Narahashi *et al.*), Plenum Press, New York, pp. 55-84.

Vijverberg, H.P.M. *et al.* (1990) Neurotoxicological effects and the mode of action of pyrethroid insecticides. *Crit. Rev. Toxicol.*, **21**, 105-126.

Baron, R.L. (1991) Carbamate insecticides, in *Handbook of Pesticide Toxicology*, 3rd edn, (eds Hayes, W.J.Jr. *et al.*), Academic Press, San Diego, pp. 1125-1190.

insulin is a hormone produced and stored in the β-cells of the Islets of Langerhans of the pancreas. The material used clinically in the treatment of diabetes mellitus is mainly purified bovine or porcine material, some semisynthetically modified; also, recombinant human sequence material is now available (**human insulin**). Insulin consists of twin peptide chains linked by -S-S bridges. Physiologically, it is the main hormone controlling intermediary metabolism. It acts at insulin receptors in most tissues in the body, but particularly liver, muscle and fat. It lowers blood glucose level by increasing uptake, storage and utilization of glucose (and fats and amino acids) after feeding. Conversely, a fall in blood insulin levels increases glucose utilization. The hormones **glucagon** and **amylin** have broadly opposing and balancing action. Labelled ^{125}I and ^{131}I labelled insulin are used as radioactive agents. There are many species structural variants known. Insulin is available for use modified in several ways, but it is destroyed when taken orally and must be injected. **Isophane insulin** is a complex in solution of human insulin with **protamine sulphate** or other protamine salts. **Soluble insulin**, also known as regular or unmodified insulins, is mainly neutral solution of insulin that are short-acting. **Biphasic insulin**, are suspensions of mixed crystals (bovine and porcine insulin, porcine insulin with human protamine sulphate insulin etc.) that are of intermediate action. **Zinc insulin** is a neutral complex of insulin with zinc salts, and has a prolonged action. Forms of insulin used in this way are usually referred to as a **HYPOGLYCAEMIC AGENTS**, though, in fact, acute episodes of hypoglycaemia are undesirable side-effects that need to be avoided. The objective is to stabilize blood glucose within limits, so insulin is also often referred to as an antihyperglycaemic agent.

insulin arginine [INN] is an insulin obtained by two amino acid substitutions (30Bα-L-Thr, 30Bβ-L-Arg). It can be used as an **ANTIDIABETIC AGENT**. See also **human insulin**.

insulin aspart [INN] is a monomeric insulin obtained by protein engineering by single amino acid substitution (28B-L-Asp derivative). It can be used as an **ANTIDIABETIC AGENT**. See also **human insulin**.

insulin defalan [INN] is an insulin modified by the removal of terminal phenylalanine group from amino-acid chain. It has been available in porcine form (1B-des-L-Phe-8A-L-Thr-10A-L-Ile insulin) and bovine form (1B-des-L-Phe insulin).

insulin-like growth factor 1 (human) ➡ **mecasermin**.

insulin lispro [INN] (Humalog™) is a recombinant peptide, and an analogue of human insulin where the amino acids B-Pro^{28} and B-Lys^{29} are reversed in order to reduce hexamer formation from the monomer (physiological form) in solution. Following subcutaneous injection it is repored to have a more rapid onset, time to peak and shorter duration of action than soluble human insulin. It acts as a (parenteral) **HYPOGLYCAEMIC AGENT** and can be used as an **ANTIDIABETIC**. See also **human insulin**.

insuloma polypeptide ➡ **amylin.**
Intal™ ➡ **cromoglycic acid.**
interferon α (leucocyte interferon; interferon alfa [BAN, INN]; IFN-α; formerly called leucocyte interferon or lymphoblastoid interferon) can be derived from leucocytes or lymphoblasts as well as from recombinant DNA technology. It is an **IMMUNOMODULATOR**, and has been used as an **ANTICANCER AGENT** in the treatment of hairy cell leukaemia. There are a number of variants:

Interferon alfa 2a (interferon alfa-2a [USAN]; Roferon A™; Ro 228181) is produced from *E. coli* genetically modified by recombinant DNA technology.

Interferon alfa 2b (interferon alfa-2b [USAN]; Alferon™; Intron A™; Viraferon ™; Sch 30500) is a recombinant (rbe) version, and is extensively used by injection as an anticancer agent to treat hairy cell leukaemia, condylomata acuminata, AIDS-related Kaposi's sarcoma, follicular lymphoma, chronic myelogenous leukaemia, lymph or liver metastases of carcinoid tumour, as an anticancer adjunct in malignant melanoma; also, in the maintenance of remission in multiple myeloma chronic active hepatitis B, chronic hepatitis C.

Interferon alfa n1 (interferon alfa-n1 [USAN]; Wellferon™) is produced from cultured lymphoblasts.

Interferon alfa n2 (Exovir HZ™) is produced from human blood leucocytes.

Interferon alfa n3 (interferon alfa-n3 [USAN]; Alpheron N™) is a mixture of natural interferon and proteins. Interferons derived through recombinant DNA technology are labelled (rbe).

interferon alfa ➡ **interferon α.**
interferon alfa 2a ➡ **interferon α.**
interferon alfa-2a ➡ **interferon α.**
interferon alfa 2b ➡ **interferon α.**
interferon alfa-2b ➡ **interferon α.**
interferon alfa n1 ➡ **interferon α.**
interferon alfa-n1 ➡ **interferon α.**
interferon alfa n2 ➡ **interferon α.**
interferon alfa n3 ➡ **interferon α.**
interferon alfa-n3 ➡ **interferon α.**

interferon β exists in a number of forms. The natural form *interferon beta* [BAN, INN] (interferon-β; IFN-β; fibroblast interferon; fiblaferon) can be isolated from fibroblasts, and may be used by injection as an **IMMUNOMODULATOR** for keratitis and hepatitis B.

The beta 1b form *interferon beta-1b* [USAN] (Betaferon™; Betaseron™) is a recombinant non-glycosylated polypeptide version produced by *E. coli*, and is an immunomodulator used by injection in the treatment of multiple sclerosis.

The *interferon beta-1a* form (Avonex™) is similarly a immunomodulator used by injection in the treatment of multiple sclerosis. Interferons derived through recombinant DNA technology are labelled (rbe).

interferon beta ➡ **interferon β.**
interferon beta-1a ➡ **interferon β.**
interferon beta-1b ➡ **interferon β.**
interferon β2 ➡ **interleukin 6.**

interferon γ (IFN-γ; MAF; immune interferon; interferon gamma [BAN, INN]; formerly called immune interferon; Polyferon™) can be isolated from immunologically stimulated T-lymphocytes (hence its former name), and is an **IMMUNOMODULATOR** that can be used to treat arthritis and shows activity as an **ANTICANCER AGENT.**

Interferon gamma 1a (Immuneron™; Biogamma™) is a version produced from *E. coli* genetically modified by recombinant DNA technology, and is an anticancer agent for cutaneous T-cell lymphoma.

Interferon gamma-1b [USAN] (Actimmune™) is similarly an immunomodulator for chronic granulatomatous disease. It has been tried as an **ANTICANCER AGENT** against basal cell carcinoma and some other indications. Interferons derived through recombinant DNA technology are labelled (rbe).

interferon gamma ➡ **interferon γ.**
interferon gamma 1a ➡ **interferon γ.**
interferon gamma-1b ➡ **interferon γ.**

interferons are inducible polypeptide and glycoprotein (15,000–27,600 daltons) mediators synthesized by mammalian cells, but produced by recombinant technology for biomedical use. They have been used as **ANTIVIRAL AGENTS** (e.g. including hepatitis B and C), as **ANTICANCER AGENTS** (e.g. for AIDS-related Kaposi's sarcoma) and also to treat chronic granulatomatous disease and Relapsing-Remitting Multiple Sclerosis. There are three or more types, α-, β- and γ-interferon. See **interferon α**; **interferon β**; **interferon γ.**

interleukin-1 (catabolin; endogenous pyrogen; haematopoietin 1; leucocyte endogenous mediator; lymphocyte activating factor; ETAF; IL-1; LAF) is a 152 amino acid residue peptide, a (IL-1R1) **CYTOKINE RECEPTOR AGONIST** isolated from neutrophils. It is one of a number of cytokine peptides produced by lymphocytes, monocytes and other cells involved in regulation of the immune response. It has **IMMUNOMODULATOR** activity, and has been suggested for the treatment of burn and wound healing, and also as an adjunct in **ANTICANCER** chemotherapy and radiotherapy. In practice, interleukin-2 has been ultilized much more widely.

interleukin-2 (IL-2; epidermal thermocyte activating factor; T-cell growth factor; TCGF) is a 133 amino acid residue peptide, a (IL-2) **CYTOKINE RECEPTOR AGONIST** produced by and isolated from T-cell lymphocytes (a lymphokine), and is one of a number of cytokine peptides produced by these and other cells involved in regulation of the immune response. It has **IMMUNOMODULATOR** and haemopoietic activity, and promotes the development of lymphokine-activated killer (LAK) cells, which can lyse tumour cells. It is currently used in therapeutics specifically in **ANTICANCER** chemotherapy (especially renal cell carcinoma), and also has been proposed for **ANTIVIRAL** therapy. A number of variants have been produced, including **celmoleukin**, **opreluekin** and **teceleukin.**

interleukin-3 (IL-3; mast cell growth factor; multipotential colony-stimulating factor; MCGF; multi-CSF; haemopoietin 3; BPA) is a 133 amino acid residue peptide, a (IL-3) **CYTOKINE RECEPTOR AGONIST.** It is one of a number of cytokines produced by white cells and other cells involved in regulation of the immune response. It has **IMMUNOMODULATOR** and haemopoietic activity, and acts on the pluripotent haemopoietic stem cells to promote proliferation and differentiation to macrophages, granulocytes and megakaryocytes and mast cells and erythroid cells. It activates eosinophils. In therapeutics it has been tried as an **ANTICANCER AGENT** for leukaemia.

interleukin-4 (IL-4; B-cell growth factor 1; B-cell stimulating factor 1; BSF-1; BCGF-1) is a 129 amino acid residue peptide, a (IL-4) **CYTOKINE RECEPTOR AGONIST.** It is a cytokine peptide, one of a number of cytokine peptides produced by white cells and other cells involved in regulation of the immune response. It has **IMMUNOMODULATOR** and haemopoietic activity, and stimulates proliferation and maturation of B-cells, and also eosinophils and mast cells. It inhibits the production of IL-1 and TNF by macrophages. Therapeutically, it has been tried as an **ANTICANCER AGENT** in

the treatment of leukaemia.

interleukin-5 (IL-5; B-cell growth factor 2; BCGF-II; TRF) is a 112 amino acid residue peptide, a (IL-5) CYTOKINE RECEPTOR AGONIST. It is one of a number of cytokine peptides produced by white cells and other cells involved in regulation of the immune response. It has IMMUNOMODULATOR and haemopoietic activity, and stimulates proliferation and maturition of B-cells and eosinophils. It has been tried in therapeutics in the treatment of autoimmune diseases.

interleukin-6 (IL-6; B-cell differentiation factor 2; B-cell stimulatory factor 2; interferon β2; BSF2; IFN-β2) is a 184 amino acid residue peptide isolated from T-cells, a (IL-6) CYTOKINE RECEPTOR AGONIST. It is one of a number of cytokine peptides produced by white cells and other cells involved in regulation of the immune response. It has IMMUNOMODULATOR and haemopoietic activity, and stimulates proliferation and maturition of B-cells, activates stromal bone marrow cells to produce **colony-stimulating factors**, and acts as a pyrogen. It has been tried in therapeutics as an ANTICANCER AGENT in the treatment of leukaemia.

interleukin-8 (IL-8; emoctakin [INN]; interleukin-8 (human); neutrophil chemotactic factor (human isoform)) is a 72 amino acid residue peptide that contains 4 Cys residues, which form 2 functionally critical disulphide bridges, and is a CYTOKINE RECEPTOR AGONIST. It is one of a number of cytokine peptides produced by white cells and other cells involved in regulation of the immune response. It has IMMUNOMODULATOR activity, is released by phagocytes and a variety of tissue cells on exposure to inflammatory stimuli, and is chemotactic to neutrophils, and activates macrophages.

interleukin-8 (human) ➡ **interleukin-8**.

intermedine ➡ **melanocyte-stimulating hormone**.

Intralgin™ ➡ **benzocaine**.

Intraval Sodium™ ➡ **thiopentone**.

Intron A™ ➡ **interferon α**.

Intropin™ ➡ **dopamine**.

Inversine™ ➡ **mecamylamine**.

Invirase™ ➡ **saquinavir**.

iodofenphos [BAN, BSI] is a public health INSECTICIDE, a mosquito larvicide.

iodogorgoic acid ➡ **diiodotyrosine**.

iodoquinol ➡ **diiodohydroxyquinoline**.

iodothiouracil [BAN, INN] is one of the thionamide (thioureylene) series of ANTITHYROID AGENTS, which act on the thyroid gland to reduce the production of the thyroid hormones. Potentially, it could be used orally to treat hyperthyroidism (Graves' disease) and its detrimental effects (thyrotoxicosis).

3-iodotyrosine ➡ **monoiodotyrosine**.

iomazenil [INN, USAN] (Ro 16-0154) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. Also ^{123}I-and ^{125}I-labelled compounds are used as benzodiazepine receptor imaging tracer for single photon emission computed tomography.

Ionamine™ ➡ **phentermine**.

Iopidine™ ➡ **apraclonidine**.

iotyrosine ➡ **monoiodotyrosine**.

ipecacuanha is an extract of alkaloids from the ipecacuanha plant, containing **emetine** and cephaeline. It is a powerful EMETIC (it can be used in non-corrosive poisoning) and an EXPECTORANT. Clinically, it is used more than ipecacuanha as an AMOEBICIDE.

IPM-5 ➡ **immunopoietin M**.

ipratropium bromide [BAN, INN, JAN, USAN] (Atrovent™) is a quaternary amine, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as a BRONCHODILATOR in bronchitic and ANTIASTHMATIC treatment.

iprindole [BAN, INN, USAN] is a tricyclic-related agent that has been used as an ANTIDEPRESSANT.

iproclozide [BAN, INN] (PC 603) is one of the hydrazine class, a MONOAMINE-OXIDASE INHIBITOR (MAOI) formerly used as an ANTIDEPRESSANT.

iprocrolol [INN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIARRHYTHMIC properties. It was never marketed.

iproniazid [BAN, INN] is one of the hydrazine class, an irreversible MONOAMINE-OXIDASE INHIBITOR (MAOI) active against both A & B form of the enzyme, which was formerly used as an ANTIDEPRESSANT.

ipronidazole [BAN, INN, USAN] is an (imidazole group) ANTIPROTOZOAL used in veterinary practice.

iproplatin [BAN, INN, USAN] (CHIP; JM 9; NSC 256927) is an organic platinum compound, an analogue of **cisplatin**, and an alkylating ANTICANCER AGENT that has been used clinically.

ipsalazide [BAN, INN] (Hipsalazine™) is a compound of **mesalazine** linked to 4-aminobezoylglycine, and acts as a prodrug of mesalazine, one of the aminosalicylate group. It is being evaluated as an ANTIINFLAMMATORY and ANTICOLITIS AGENT for treatment of ulcerative colitis. It is an analogue of **balsalazide**.

ipsapirone [BAN, INN] (ipsapirone hydrochloride [USAN]; Bay q 7821) is one of the azaspirone group and similar to **buspirone**. It is a 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST (a partial agonist at the 5HT1A receptor subtype). It is a novel ANXIOLYTIC under investigation for treatment of anxiety and depression.

ipsapirone hydrochloride ➡ **ipsapirone**.

I RAP ➡ **anakinra**.

irazepine (Ro 7-1986/1) is a [1,4]benzodiazepine, a (non-competitive) BENZODIAZEPINE BINDING-SITE ANTAGONIST.

irbesartan [BAN, INN, USAN] (SR 47436; BMS 18629500; Aprovel™) is a diazaspirononenone, an (AT_1) ANGIOTENSIN RECEPTOR ANTAGONIST, which is used as an ANTIHYPERTENSIVE.

irinotecan [INN] (CPT 11; Camptetin™; Campto™; Topotecin™) is a semisynthetic agent synthesized from **camptothecin**. It is a topoisomerase I inhibitor class of ANTICANCER AGENT used to treat colorectal cancer.

IRL 2500 is a peptoid compound that acts as an (ET_B) ENDOTHELIN RECEPTOR ANTAGONIST. It is used as a pharmacological tool.

iron(III) ammonium citrate ➡ **ferric ammonium citrate**.

iron(2+) citrate ➡ **ferrous citrate**.

iron(II) fumarate ➡ **ferrous fumarate**.

iron(II) gluconate ➡ **ferrous gluconate**.

iron sorbitex [USAN] is a colloidal solution containing Fe (III), sorbitol and citrate stabilized with dextrin. It can be used as an ANTIANAEMIC AGENT in the treatment of iron-deficiency anaemia.

iron(II) sulphate ➡ **ferrous sulphate**.

irradiated ergosterol ➡ **ergocalciferol**.

irtemazole [BAN, INN, USAN] (R 60844) is a benzimidazole, a URICOSURIC AGENT.

isbogrel [INN] (CV 4151) is a pyridine derivative, a THROMBOXANE SYNTHETASE INHIBITOR. It has ANTIANGINAL and ANTITHROMBOTIC properties.

isepamicin [BAN, INN, USAN] (betamicin sulfate [USAN]; gentamicin B) is a semisynthetic (aminoglycoside)

ANTIBIOTIC. Clinically, it can be used in the form of various derivatives and has ANTIBACTERIAL properties.

ISF 2522 ➡ **oxiracetam**.

islet amyloid polypeptide ➡ **amylin**.

islet-associated polypeptide ➡ **amylin**.

Ismelin™ ➡ **guanethidine**.

Ismotic™ ➡ **isosorbide mononitrate**.

isoaminile [BAN, INN] is a benzeneacetonitrile derivative, with ANTISPASMODIC and ANTITUSSIVE properties.

isobromindione [INN] (G/18) is an indanedione and a URICOSURIC AGENT.

isobucaine is an ester series LOCAL ANAESTHETIC, which has been used by topical application for local pain relief.

isocainide ➡ **lorcainide**.

isocarbacyclin is a synthetic prostaglandin analogue, a PROSTANOID RECEPTOR AGONIST. It is a PLATELET AGGREGATION INHIBITOR and a VASODILATOR.

isocarboxazid [BAN, INN] (Ro 5-0831; U 10387; Marplan™) is a hydrazide, an irreversible MONOAMINE-OXIDASE INHIBITOR (MAOI active against both A and B forms of the enzyme), which is used as an ANTIDEPRESSANT.

isoconazole [BAN, INN, USAN] (isoconazole nitrate [JAN]; Travogyn™) is an (imidazole group) ANTIFUNGAL AGENT. Clinically, it can be used topically, especially for candidiasis.

isoconazole nitrate ➡ **isoconazole**.

isocromil [INN] is a chromone, an ANTIALLERGIC AGENT and MEDIATOR RELEASE INHIBITOR similar to CROMOGLYCIC ACID. Potentially, it can be used for prophylaxis of allergic conditions, including for treatment of passive cutaneous anaphylaxis and as an ANTIASTHMATIC.

isoenzyme protein moiety reduced) ➡ **alglucerase**.

isoetarine ➡ **isotharine**.

isoetharine [BAN] (isoetarine [INN]; isoetharine hydrochloride [USAN]; isoetharine mesylate; Bronkometer™) is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype, which therapeutically can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.

isoetharine hydrochloride ➡ **isoetharine**.

isoetharine mesylate ➡ **isoetharine**.

isoetretin (Ro 13-7652) is a retinoid, a DERMATOLOGICAL AGENT that effects epithelial proliferation and has been used topically to relieve severe psoriasis and other skin conditions.

isogenistin ➡ **genistein**.

isoflurane [BAN, INN, USAN] (Forane™) is a halogenated ether and isomer of **enfluorane**, and is used as an inhalation GENERAL ANAESTHETIC.

Isoket™ ➡ **isosorbide dinitrate**.

isomazole [INN] (isomazole hydrochloride [USAN]) is an imidazopyridine, a (type V) PHOSPHODIESTERASE INHIBITOR with CARDIAC STIMULANT actions.

isomazole hydrochloride ➡ **isomazole**.

isomethadone [BAN, INN] (Win 1783; BW 47-442) is one of the methadone series and an OPIOID RECEPTOR AGONIST. It is an OPIOID ANALGESIC and ANTITUSSIVE.

isometheptene [BAN, INN] (isometheptene mucate [USAN]) is an indirect-acting SYMPATHOMIMETIC and ANTISPASMODIC, which can be used as a VASOCONSTRICTOR in ANTIMIGRAINE TREATMENT.

isometheptene mucate ➡ **isometheptene**.

Isomide™ ➡ **disopyramide**.

isoniazid [BAN, INN, USAN] (Nydrazid™) is the hydrazide of isonicotinic acid, and has ANTIBACTERIAL properties. It is used as an ANTITUBERCULAR AGENT in conjunction with other drugs.

isonitrosoacetone (monoisonitrosoacetone; MNA) is an oxime CHOLINESTERASE REACTIVATOR. It can be used parenterally as an ANTIDOTE adjunct to **atropine** in treating human or animal (organophosphate group) pesticide poisoning.

isonixin [INN] (IBH 194) is an oxopyridinecarboxamide derivative, with ANALGESIC, ANTIINFLAMMATORY and URICOSURIC activity.

isopentyl nitrite ➡ **amyl nitrite**.

isophane insulin ➡ **insulin**.

Isopto Atropine™ ➡ **atropine**.

isoprenaline [BAN, INN] (isopropylnorepinephrine; isoproterenol hydrochloride [USAN]; Isuprel™ etc.; isoproterenol sulfate [USAN]; Aludrin™; Medihaler-Iso™) is a β-ADRENOCEPTOR AGONIST which therapeutically can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment. The (*R*)-form is levisoprenaline [INN].

isopropamide iodide [BAN, INN] is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as a visceral ANTISPASMODIC and as an adjunct in treating peptic ulcers.

isopropylnorepinephrine ➡ **isoprenaline**.

isopropylphenazone ➡ **propyphenazone**.

isoproterenol hydrochloride ➡ **isoprenaline**.

isoproterenol sulfate ➡ **isoprenaline**.

Isopto Carbachol™ ➡ **carbachol**.

Isopto Carpine™ ➡ **pilocarpine**.

Isopto Homatropine™ ➡ **homatropine hydrobromide**.

Isordil™ ➡ **isosorbide dinitrate**.

isosorbide dinitrate [BAN, INN, USAN] (Cedocard™; Imtack™; Isoket™; Isordil™; Sorbitrate™ and many other names) is an organic nitrate, a **nitric oxide** (NO) donor, and is a NITRERGIC STIMULANT. It is used as a VASODILATOR and ANTIANGINAL AGENT for symptomatic relief during an acute attack, and also in HEART FAILURE TREATMENT.

isosorbide mononitrate [BAN, INN, USAN] (Elantan™; Imdur™; Ismotic™;. Isotrate™ and many other names) is the active metabolite of ISOSORBIDE DINITRATE, an organic nitrate and **nitric oxide** (NO) donor. It is a NITRERGIC STIMULANT and is used as a VASODILATOR and ANTIANGINAL AGENT for symptomatic relief during an acute attack, and also in HEART FAILURE TREATMENT.

isosulfan Blue ➡ **sulphan blue**.

isotocin ([Ser^4,Ile^8]oxytocin; ichthyotocin) is isolated from various fish, and is an analogue of **oxytocin**, an agonist at oxytocin receptors ((OT) VASOPRESSIN RECEPTOR AGONIST). It has OXYTOCIC activity and is less potent than oxytocin. See also **argiprestocin**.

Isotrate™ ➡ **isosorbide mononitrate**.

isotretinoin [BAN, INN, USAN] (Ro 4-3780; Isotrex™; Roaccutane™; Accutane™) is a retinoid reported to inhibit sebaceous gland function and keritanization. It is used as a DERMATOLOGICAL AGENT both topically and orally to treat recalcitrant cyctic acne. It also has some unlicenced use as an ANTICANCER AGENT, especially as an adjunct in treating basal cell carcimoma.

Isotrex™ ➡ **isotretinoin**.

Isovex™ ➡ **ethaverine**.

isoxaprolol [INN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIARRHYTHMIC and ANTIHYPERTENSIVE properties.

isoxicam [BAN, INN, USAN] (W 8495) is one of the oxicam series, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

isoxsuprine [BAN, INN] (isoxsuprine hydrochloride [USAN]; Vasotran™) is a β-ADRENOCEPTOR AGONIST. Therapeutically, it can be used as a VASODILATOR in, for example, peripheral

vascular disease and cerebrovascular insufficiency.
isoxsuprine hydrochloride ➡ **isoxsuprine**.
isradipine [BAN, INN, USAN] (DynaCirc™; Prescal™) is a dihydropyridine derivative, a **CALCIUM-CHANNEL BLOCKER** with coronary and peripheral **VASODILATOR** actions, and also antiatherosclerotic properties. It can be used as an **ANTIHYPERTENSIVE**.
Istin™ ➡ **amlodipine**.
Isuprel™ ➡ **isoprenaline**.
ITA 104 ➡ **plafibride**.
itazigrel [INN, USAN] (U 53059) is a thiazole, a **PLATELET AGGREGATION INHIBITOR** used as an **ANTITHROMBOTIC**.
itraconazole [BAN, INN, USAN] (Sporanox™) is a broad-spectrum (imidazole group) **ANTIFUNGAL**. Clinically, it can be used orally to treat resistant forms of candidiasis.
Ivеegam™ ➡ **globulin, immune**.
ivermectin [BAN, INN, USAN] (Mectizan™) is a (macrolide) **ANTIBIOTIC** used in a range of derivatives. It can be used clinically as an oral **ANTHELMINTIC** to treat various infections.

J, K

JB 11 ➡ **trimetrexate**.
JB 8181 ➡ **desipramine**.
JD 96 ➡ **vinylbitone**.
JM 8 ➡ **carboplatin**.
JM 9 ➡ **iproplatin**.
josamycin [INN, JAN, USAN] is a (macrolide) **ANTIBIOTIC** with **ANTIBACTERIAL** properties. It is active against Gram-positive bacteria, particularly rickettsia.
K 31 ➡ **nicomol**.
K 251-6 ➡ **daidzein**.
K 1039 ➡ **doxorubicin**.
K 2541 ➡ **genistein**.
K 4277 ➡ **indoprofen**.
K 4710 ➡ **ketobemidone**.
K 9321 ➡ **acipimox**.
K 10033 ➡ **febuprol**.
K 21060 E ➡ **droloxifene**.
KABI 1774 ➡ **quadrosilan**.
Kabikinase™ ➡ **streptokinase**.
kainic acid [INN] (α-kaininic acid; digenic acid) is a cyclic analogue of **glutamic acid**, a constituent of red algae *Digenea simplex* and *Centroceras clavulatum*. It is a **GLUTAMATE RECEPTOR AGONIST**, acting at the AMPA/kainate subtype, and is a **NEUROTOXIN** used as a pharmacological tool, particularly to model neuroexcitatory/neurodegenerate disorders. It was formerly used as an **ANTHELMINTIC**.
α-kaininic acid ➡ **kainic acid**.
kaliotoxin (α-KTx3.1) is a peptide with a single chain of 38 amino-acid residues and 3 intramolecular disulphide bridges. It is isolated from the venom of the scorpion *Androctonus mauretanicus mauretanicus*, and is a **POTASSIUM-CHANNEL BLOCKER** active on neuronal potassium channels ($I_{BK(Ca)}$).
kallidin (lysyl-bradykinin; Lys-BK; KD) is a decapeptide *N*-terminally extended analogue of **bradykinin**, which is produced under similar inflammatory conditions. These local hormones produce the cardinal symptoms of inflammatory response, i.e. **VASODILATION**, increased capillary permeability, pain (sensory nerve C-fibre stimulation) and the accumulation of leucocytes. It is rapidly inactivated by peptidases, and the effects are too short-lived for clinical application. It acts as a **BRADYKININ RECEPTOR AGONIST** (active at the B_2-receptor subtype), and these receptors account for most actions.
kallidinogenase [BAN, INN, JAN] (kallikrein; kininogenin; Padutin™) is an **ENZYME** isolated from blood plasma, glandular tissues and urine. It occurs abundantly in the pancreas, parotid and submaxillary glands and the intestinal wall. It is a (serine) **PROTEASE** which releases kinins (**kallidin** and **bradykinin**) from plasma proteins (kininogens). The released kinins are **VASODILATORS**. It has been used in the treatment of peripheral vascular disorders and male infertility.
kallikrein ➡ **kallidinogenase**.
kallikrein-trypsin inactivator ➡ **aprotinin**.

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kallikrein ➡ **kallidinogenase**.
kallikrein-trypsin inactivator ➡ **aprotinin**.

kanendomycin ➡ **bekanamycin**.

kanamycin [BAN, INN] (kanamycin A; Kannasyn™) is an (aminoglycoside) ANTIBIOTIC. Clinically, it has broad-spectrum ANTIBACTERIAL properties and can be used systemically.

kanamycin A ➡ **kanamycin**.

Kannasyn™ ➡ **kanamycin**.

KAS ➡ **kassinin**.

kassinin (KAS) is a naturally occurring 12 amino acid residue *C*-terminally amidated peptide, a tachykinin from the skin of the frog *Kassina senegalensis*. It acts as a TACHYKININ RECEPTOR AGONIST (showing greater activity at NK_3/NK_2 than at NK_1 receptors). It stimulates extravascular smooth muscle, is a powerful VASODILATOR and transient HYPOTENSIVE. It is used as a pharmacological tool. There is also an analogue, hylambates kassinin ([Glu^2,Pro^5]-kassinin), from the skin of the frog *Hylambates maculatus*, with similar properties and also used as a pharmacological tool.

[Glu^2,Pro^5]-kassinin ➡ **kassinin**.

katacalcin (human-calcitonin precursor peptide; PDN 21) is a 21 residue linear peptide isolated from human blood. It is thought to be related to the THYROID HORMONE, **calcitonin**, and is a CALCIUM METABOLISM MODIFIER.

KB 95 ➡ **benzpiperylone**.

KB 509 ➡ **flutoprazepam**.

KC 404 ➡ **ibudilast**.

KC 2547 ➡ **metaclazepam**.

KC 5103 ➡ **tifluadom**.

KD ➡ **kallidin**.

kebuzone [INN] (ketophenylbutazone [JAN]; KPB; γ-oxophenylbutazone) is related to the pyrazolone series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

Kefadim™ ➡ **ceftazidime**.

Keflex™ ➡ **cephalexin**.

Keflin™ ➡ **cephalothin**.

Kefzol™ ➡ **cephazolin**.

kelatorphan is a substituted alanine derivative, a NEUTRAL ENDOPEPTIDASE INHIBITOR ('enkephalinase' inhibitor), with ANALGESIC activity.

Kelocyanor™ ➡ **dicobalt edetate**.

Kemadrin™ ➡ **procyclidine**.

Kemicetine™ ➡ **chloramphenicol**.

Kenalog™ ➡ **triamcinolone**.

kenazepine is a [2,3]benzodiazepine, a BENZODIAZEPINE BINDING-SITE ANTAGONIST.

Kendall's compound E ➡ **cortisone**.

Kendall's compound F ➡ **hydrocortisone**.

Kendall's desoxy compound B ➡ **deoxycortone**.

KERATOLYTIC AGENTS (desquamating agents) are drugs to clear the skin of thickened, horny patches (hyperkeratoses) and scaly areas, as occur in some forms of eczema, ichthyosis and psoriasis, and in the treatment of acne. The standard, classic, keratolytic is **salicylic acid**, as well as **benzoic acid**, **ichthammol**, **podophyllotoxin** (for warts), **resorcinol** and coal tar. See DERMATOLOGICAL AGENTS.

Kerlone™ ➡ **betaxolol**.

Ketalar™ ➡ **ketamine**.

ketamine [BAN] (ketamine hydrochloride [JAN, USAN]; CI 581; CL 369; CM 52372-2; Ketalar™; Ketaset™; Vetalar™ and many other names) is a cyclohexanone, a rapid-acting dissociative GENERAL ANAESTHETIC and ANALGESIC, with atypical actions, including a propensity to act as a PSYCHOTROPHIC AGENT (causes hallucinations, psychoses and other anaesthetic emergence reactions). It is also used as an immobilizing agent in veterinary practice, and is a drug of abuse.

ketamine hydrochloride ➡ **ketamine**.

ketanserin [BAN, INN, USAN] (Sufrexal™) is a piperidinylquinazoline derivative with both ($5\text{-}HT_{2A}$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST and (α_1) α-ADRENOCEPTOR ANTAGONIST. It can be used, though only in certain countries, as an ANTIHYPERTENSIVE.

Ketaset™ ➡ **ketamine**.

ketazocine [INN, USAN] (ketocyclazocine; Win 34276) is a benzomorphan series, mixed OPIOID RECEPTOR AGONIST and OPIOID RECEPTOR ANTAGONIST, with OPIOID ANALGESIC activity.

ketazolam [BAN, INN, USAN] (U 28774) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It has been used orally in the treatment of anxiety disorders.

ketobemidone [BAN, INN] (Ciba 7115; Hoechst 10720; K 4710; Win 1539) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST, with OPIOID ANALGESIC properties.

ketocaine ➡ **ketocainol**.

ketocainol [INN, USAN] (ketocaine [INN]; Astra 2358) is an ester series LOCAL ANAESTHETIC, which has been used by topical application for local pain relief.

ketoconazole [BAN, INN, JAN, USAN] (Nizoral™) is an (imidazole group) ANTIFUNGAL, which can be used orally to treat serious mycosis.

ketocyclazocine ➡ **ketazocine**.

ketophenylbutazone ➡ **kebuzone**.

ketoprofen [BAN, INN, JAN, USAN] (Alrheumat™; Ketovail™; Larafen™; Orudis™) is one of the propionic acid series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It can be used orally, by injection or topical application to treat rheumatic and muscular pain caused by inflammation, pain after orthopaedic surgery, acute gout and period pain. The (*S*)-form is dexketoprofen [INN].

6-ketoprostaglandin E_1 ➡ **6-oxoprostaglandin E_1**.

ketorolac [BAN, INN] is a heteroaryl acid, NSAID ANALGESIC, ANTIINFLAMMATORY and PLATELET AGGREGATION INHIBITOR. It is also used in the form of **ketorolac trometamol**.

ketorolac trometamol [BAN] (ketorolac tromethamine [USAN]; Acular™; Toradol™) is a derivative of **ketorolac**, and is an NSAID ANALGESIC, ANTIINFLAMMATORY and PLATELET AGGREGATION INHIBITOr. It can be used topically.

ketorolac tromethamine ➡ **ketorolac trometamol**.

ketotifen [BAN, INN] (ketotifen fumarate [JAN, USAN]; Zaditen™) is a piperidinylidenebenzocycloheptathiophenone, an oral HISTAMINE H_1-RECEPTOR ANTAGONIST with pronounced SEDATIVE actions, which is atypical in that it has ANTIALLERGIC/ANTIINFLAMMATORY properties dependent on its inhibition of release of inflammatory mediators. It can be used in ANTIASTHMATIC treatment and for allergic rhinitis and other allergic disorders.

ketotifen fumarate ➡ **ketotifen**.

Ketovail™ ➡ **ketoprofen**.

Ketovite™ ➡ **myo-inositol**.

khellin [INN] is a chromone (benzopyrone), a constituent of the fruit of *Ammi visnaga* (Umbelliferae). It displays a range of pharmacological activity, including ANTHELMINTIC, antianaphylactic, ANTIASTHMATIC, antiarteriosclerotic and ANTIDIABETIC properties. It also shows ANTITUSSIVE, ANTIULCEROGENIC, BRONCHODILATOR, ANTISPASMODIC and VASODILATOR properties. As a photochemotherapeutic agent it can be used as a photosensitizer in the treatment of vitiligo.

Kinevac™ ➡ **sincalide**.

King Kong peptide ➡ δ-conotoxins TxVIA.
Kinidin™ ➡ **quinidine**.
kininogenin ➡ **kallidinogenase**.
Klaricid™ ➡ **clarithromycin**.
Kliofem™ ➡ **norethisterone**.
Kogenate™ ➡ **factor VIII; octocog alfa**.
Kolanticon™ ➡ **dimethicone; magnesium hydroxide**.
Kombé strophanthin ➡ **strophanthin-K**.
KPB ➡ **kebuzone**.
α-KTx1.1 ➡ **charybdotoxin**.
α-KTx1.3 ➡ **iberiotoxin**.
α-KTx3.1 ➡ **kaliotoxin**.
kuwanon H is isolated from mulberry, and is a nonpeptide (BB_2) BOMBESIN RECEPTOR ANTAGONIST. It is used as a pharmacological tool.
KW 110 ➡ **aceglutamide aluminium**.
KW 125 ➡ **doxorubicin**.
KW 2307 ➡ **vinorelbine**.
KW 4679 ➡ **olopatadine**.
Kwells™ ➡ **hyoscine**.
Kytril™ ➡ **granisetron**.

L

3123L ➡ **puromycin**.
L-8 ➡ **lypressin**.
L 1718 ➡ **osalmid**.
L 2103 ➡ **hexapropymate**.
L 33355 ➡ **mestranol**.
L 33379 ➡ **flurandrenolone**.
L 37231 ➡ **vincristine**.
L 154803 ➡ **lovastatin**.
L 159913 is a sulfonylbenzamide, a non-peptide orally active (AT_1) ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE activity.
L 363586 ➡ **seglitide**.
L 364 718 ➡ **devazepide**.
L 365260 is a benzodiazepine, a (CCK_B-subtype) CHOLECYSTOKININ RECEPTOR ANTAGONIST. It lacks anxiolytic activity. It is an analogue of **YM 022**, and is used as a pharmacological tool.
L 643341 ➡ **famotidine**.
L 670452 ➡ **alendronic acid**.
L 700462 ➡ **tirofiban**.
L 740093 is a benzodiazepine and analogue of **YM 022**. It is a selective (CCK_B/gastrin subtype) CHOLECYSTOKININ RECEPTOR ANTAGONIST, and is used as a pharmacological tool.
LAAM ➡ **levacetylmethadol**.
labetalol [BAN, INN] (Trandate™) is a combined α-ADRENOCEPTOR ANTAGONIST and (subtype-non-selective) β-ADRENOCEPTOR ANTAGONIST, which is relatively water-soluble. Chemically, it has two asymetric centres, and so exists as a mixture of two diastereoisomeric pairs. Each of the isomers has relative pharmacological properties that differ. The (1′*R*,1″*R*)-form is **dilevalol**: it makes up 25% of the labetalol form. It can be used therapeutically as an ANTIHYPERTENSIVE AGENT.
labile factor ➡ **factor V**.
Labosept™ ➡ **dequalinium chloride**.
LAC 43 ➡ **bupivacaine**.
lachesine chloride [BAN] is a quaternary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which was formerly used as a topical MYDRIATIC and cycloplegic agent.
lacidipine [BAN, INN] is a dihydropyridine CALCIUM-CHANNEL BLOCKER. It can be used as an ANTIHYPERTENSIVE.
β-LACTAMASE INHIBITORS are agents that inhibit the enzyme β-lactamase (penicillinase) which neutralizes the antibacterial activity of many β-lactam ANTIBIOTICS, including penicillin antibiotics. The main inhibitor used is **clavulanic acid**, which is an antibiotic from *Streptomyces* spp., with a β-lactam structure similar to the penicillin group nucleus except that the fused thiazolidine ring of the latter is substituted by an oxazolidine ring. It has only weak ANTIBACTERIAL activity, but is a β-lactamase inhibitor acting against enzymes produced by Gram-positive and Gram-negative bacteria. Clinically, it can be used co-administered with β-lactamase susceptible penicillins and cephalosporins, enhancing their antibacterial actions. The most extensively

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L 33379 ➡ **flurandrenolone**.
L 37231 ➡ **vincristine**.
L 154803 ➡ **lovastatin**.
L 159913 is a sulfonylbenzamide, a non-peptide orally active (AT_1) ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE activity.
L 363586 ➡ **seglitide**.
L 364 718 ➡ **devazepide**.
L 365260 is a benzodiazepine, a (CCK_B-subtype) CHOLECYSTOKININ RECEPTOR ANTAGONIST. It lacks anxiolytic activity. It is an analogue of **YM 022**, and is used as a pharmacological tool.
L 643341 ➡ **famotidine**.
L 670452 ➡ **alendronic acid**.
L 700462 ➡ **tirofiban**.
L 740093 is a benzodiazepine and analogue of **YM 022**. It is a selective (CCK_B/gastrin subtype) CHOLECYSTOKININ RECEPTOR ANTAGONIST, and is used as a pharmacological tool.
LAAM ➡ **levacetylmethadol**.
labetalol [BAN, INN] (Trandate™) is a combined α-ADRENOCEPTOR ANTAGONIST and (subtype-non-selective) β-ADRENOCEPTOR ANTAGONIST, which is relatively water-soluble. Chemically, it has two asymetric centres, and so exists as a mixture of two diastereoisomeric pairs. Each of the isomers has relative pharmacological properties that differ. The (1′*R*,1″*R*)-form is **dilevalol**: it makes up 25% of the labetalol form. It can be used therapeutically as an ANTIHYPERTENSIVE AGENT.
labile factor ➡ **factor V**.
Labosept™ ➡ **dequalinium chloride**.
LAC 43 ➡ **bupivacaine**.
lachesine chloride [BAN] is a quaternary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which was formerly used as a topical MYDRIATIC and cycloplegic agent.
lacidipine [BAN, INN] is a dihydropyridine CALCIUM-CHANNEL BLOCKER. It can be used as an ANTIHYPERTENSIVE.
β-LACTAMASE INHIBITORS are agents that inhibit the enzyme β-lactamase (penicillinase) which neutralizes the antibacterial activity of many β-lactam ANTIBIOTICS, including penicillin antibiotics. The main inhibitor used is **clavulanic acid**, which is an antibiotic from *Streptomyces* spp., with a β-lactam structure similar to the penicillin group nucleus except that the fused thiazolidine ring of the latter is substituted by an oxazolidine ring. It has only weak ANTIBACTERIAL activity, but is a β-lactamase inhibitor acting against enzymes produced by Gram-positive and Gram-negative bacteria. Clinically, it can be used co-administered with β-lactamase susceptible penicillins and cephalosporins, enhancing their antibacterial actions. The most extensively

used preparation is **co-amoxiclav** (Augmentin™), which is a combination of **amoxycillin** and clavulanic acid (as potassium salt).

Moellering, R.C. (1993) Meeting the challenges of β-lactamases. *J. Antimicrob. Chemother. Suppl. A*, **31**, 1-8.
Davies, J. (1994) Inactivation of antibiotics and the dissemination of resistance genes. *Science*, **264**, 375-382.

lactic acid [JAN, USAN] (E 270; Lacticare™; Lactinol™ and many other names) is distributed widely in nature. It can be used as a DERMATOLOGICAL AGENT, an ANTISEPTIC and as a moisturizer. It is also used in foodstuffs (as a preservative, flavouring, acidulant), brewing, cheese-making and confectionery.

Lacticare™ ➡ **lactic acid**.

lactilol [BAN, INN] is a disaccharide that is not absorbed from the intestines and can be used in therapeutics for its (osmotic) LAXATIVE properties. It is also used as an artificial sweetener in foodstuffs.

Lactinol™ ➡ **lactic acid**.

lactoflavine ➡ **riboflavine**.

lactogen ➡ **prolactin**.

lactoylcholine is a trimethylethanaminium compound that acts as a NICOTINIC CHOLINOCEPTOR AGONIST.

lactulose [BAN, INN, JAN, USAN] is a semisynthetic disaccharide that is not absorbed from the intestines and can be used in therapeutics for its (osmotic) LAXATIVE properties.

LAF ➡ **interleukin-1**.

Laki-Lorand factor ➡ **factor XIII**.

Lamictal™ ➡ **lamotrigine**.

lamifiban [INN, USAN] (Ro 44-9883) is a piperidinyl derivative, a platelet fibrinogen receptor antagonist, acting as a PLATELET AGGREGATION INHIBITOR, used as an ANTITHROMBOTIC.

Lamisil™ ➡ **terbinafine**.

lamivudine [BAN, INN, USAN] (3TC; Epivir™) is a nucleoside analogue HIV-1 protease inhibitor ANTIVIRAL, which is used clinically in conjunction with other drugs in ANTI-HIV treatment. Also, it is active against hepatitis B virus.

lamotrigine [BAN, INN, USAN] (BW 430C; Lamictal™) is a phenyltriazine compound, a novel agent that seems to work like **phenytoin**, acting as a use-dependent SODIUM-CHANNEL BLOCKER that modulates opening in neurons and attenuating high-frequency action potential firing. It appears to selectively inhibit release of excitatory amino acids, though it is not clear how. It has ANTICONVULSANT properties and is being evaluated as an ANTIEPILEPTIC (for partial seizures and secondarily generalized tonic-clonic seizures).

lamtidine [BAN, INN] (AH 22216) is a piperidinyltriazolediamine, a HISTAMINE H_2-RECEPTOR ANTAGONIST. It is a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC AGENT.

Lanoxin™ ➡ **digoxin**.

lanreotide [BAN, INN] (lanreotide acetate [USAN]; BIM 23014C; DC 13116) is a synthetic analogue of **somatostatin**, and a SOMATOSTATIN RECEPTOR AGONIST. It can be used as a tumour inhibitor in anticancer therapy, as well as for acromegaly. Also, it inhibits myocyte replication in experimental allograft arteriosclerosis (chronic rejection) studies.

lanreotide acetate ➡ **lanreotide**.

lansoprazole (Zoton™) is a substituted benzimidazole, a GASTRIC PROTON PUMP INHIBITOR, a (H^+/K^+) ATPASE INHIBITOR. It can be used as an ANTIULCEROGENIC in the treatment of gastric ulcers and other gastric acid-related gastrointestinal disorders. It can be used in combination with **amoxicillin** for eradication of gastric *Helicobacter pylori* infection.

Larafen™ ➡ **ketoprofen**.

Larapam™ ➡ **piroxicam**.

Lariam™ ➡ **mefloquine**.

Larodopa™ ➡ **levodopa**.

LAS 3876 ➡ **almagate**.

LAS 30451 ➡ **pancopride**.

lasalocid [BAN, INN, USAN] is a (polyether-type) ANTIBIOTIC with ANTIBACTERIAL and ANTIPROTOZOAL activity. It can be used in veterinary practice as an ANTICOCCIDIAL.

Lasix™ ➡ **frusemide**.

latamoxef [BAN, INN, JAN] (moxalactam disodium [USAN]) is a semisynthetic (cephalosporin group) ANTIBIOTIC, which can be used as an ANTIBACTERIAL.

latanoprost [BAN, INN] (Xalatan™) is a synthetic prostaglandin analogue of $PGF_{2\alpha}$ and a PROSTANOID RECEPTOR AGONIST. It is a novel ANTIGLAUCOMA TREATMENT, used topically in open-angle glaucoma and ocular hypertension in patients unresponsive to other drugs.

laudexium methylsulphate [BAN] is a bisquaternary ammonium heterocyclic complex, and is a NICOTINIC CHOLINOCEPTOR ANTAGONIST and (competitive) NEUROMUSCULAR BLOCKING AGENT, which can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia.

'Laughing gas' ➡ **nitrous oxide**.

lavoltidine [BAN, INN] (lavoltidine succinate [USAN]; AH 23844) is a piperidinyltriazole, a HISTAMINE H_2-RECEPTOR ANTAGONIST, with GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC properties.

lavoltidine succinate ➡ **lavoltidine**.

lawsone (naphthalinic acid; henna; C.I. Natural Orange 6) is a naphthoquinone isolated from *Lawsonia* spp., henna and seeds of *Lomatia ferruginea*. It has activity as an ANTISPASMODIC, ANTIFUNGAL, ANTIBACTERIAL, ANTIINFLAMMATORY, ANALGESIC, ANTIPYRETIC and ANTICANCER AGENT. It is used as a hair dye and in sunscreen preparations.

LAXATIVES (purgatives or cathartics) are agents that promote defecation and so relieve constipation. There are several types. *Faecal softeners*, which soften the faeces for easier evacuation, e.g. liquid paraffin. *Bulking agents*, which increase the overall volume of the faeces in the rectum and thus stimulate bowel movement. They are mostly fibres, such as bran, ispaghula husk, methylcellulose and sterculia. *Stimulant laxatives*, which act on the gastrointestinal muscles to increase motility; many old-fashioned remedies are stimulants of this kind and contain a mixture of active substances, e.g. cascara, castor oil, figs elixir and **senna**. But there are modern variants with less stimulant action, augmented by other properties, e.g. **bisacodyl**, **danthron**, **docusate sodium** and **sodium picosulphate**. *Osmotic laxatives* are mainly non-absorbed inorganic salts which work by retaining water in the intestine, so increasing overall liquidity, e.g. **magnesium hydroxide** and **magnesium sulphate** (note that magnesium salts are also used as ANTACIDS), and also the non-absorbed sugar **lactulose**.

Bateman, D.N. *et al.* (1988) A policy for laxatives. *Br. Med. J.*, **297**, 1420.
Clayden, G.S. (1989) Constipation in children. *Br. Med. J.*, **299**, 1116.

LC 44 ➡ **flupenthixol**.

LE 29060 ➡ **vinblastine**.

Ledercort™ ➡ **triamcinolone**.

Lederfen™ ➡ **fenbufen**.

Ledermycin™ ➡ **demeclocycline**.

lefetamine [INN] is one of the methadone series, an OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC with ANTITUSSIVE and SKELETAL MUSCLE RELAXANT activity.

lenampicillin [INN] (lenampicillin hydrochloride [JAN]) is a (penicillin) ANTIBIOTIC, which can be used clinically as an ANTIBACTERIAL to treat certain infections.

lenampicillin hydrochloride ➡ **lenampicillin**.

lenograstim (recombinant human granulocyte-colony stimulating factor, rHuG-CSF; G-CSF; Granocyte™) is a glycosylated recombinant version of **HuG-CSF**, an endogenous granulocyte macrophage **colony-stimulating factor**. It is a (G-CSF subtype) CYTOKINE RECEPTOR AGONIST, and acts as a haemopoietic agent and IMMUNOMODULATOR. It stimulates production of granulocytes, and is used for reduction in the duration of neutropenia and associated complications following bone-marrow transplantation for non-myeloid malignancy, or after treatment with cytotoxic chemotherapy associated with a significant incidence of febrile neutropenia; and for mobilization of peripheral blood progenitor cells for harvesting and subsequent autologous infusion. It is given by infusion or subcutaneous injection.

Lentaron™ ➡ **formestane**.

Lentizol™ ➡ **amitryptyline**.

Leo 275 ➡ **estramustine**.

Leo 640 ➡ **lofepramine**.

Leo 1031 ➡ **prednimustine**.

Leo 40067 ➡ **treosulfan**.

lepargylic acid ➡ **azelaic acid**.

lepirudin [BAN, INN] (Hirudo medicinalis isoform HVI) is a 65 residue peptide originally isolated from the salivary glands of the medicinal leech (*Hirudo medicinalis*; see **hirudin**), but in this form it is now made by recombinant DNA techniques. It acts as an ENZYME INHIBITOR, an ANTITHROMBIN active as a (parenteral) ANTICOAGULANT. It can be used in thromboembolytic disorders.

lergotrile [INN, USAN] (lergotrile mesylate [USAN]) is an ergoline (or ergot alkaloid derivative) with DOPAMINE RECEPTOR AGONIST activity, and was proposed as an ANTIPARKINSONIAN AGENT and as a PROLACTIN RELEASE INHIBITOR for treating hyperprolactinaemia and other pituitary oversecretion states.

lergotrile mesylate ➡ **lergotrile**.

Lescol™ ➡ **fluvastatin**.

Lethidrone™ ➡ **nalorphine**.

letosteine [INN] is a thio compound, a MUCOLYTIC AGENT.

letrozole [BAN, INN, USAN] (CGS 20267; Femara™) is a non-steroid, with selective AROMATASE INHIBITOR (oestrogen synthetase inhibitor) activity, and is used as an ANTICANCER AGENT for oral treatment of breast cancer (mainly where **tamoxifen** has failed).

ε-leucine ➡ **aminocaproic acid**.

leucine enkephalin ➡ **enkephalins**.

leucinocaine [INN] is an ester series LOCAL ANAESTHETIC. It has been used by topical application for local pain relief.

Leucomax™ ➡ **molgramostim**.

leucocyte endogenous mediator ➡ **interleukin-1**.

leucocyte interferon ➡ **interferon α**.

Leucovorin™ ➡ **folinic acid**.

leucovorin calcium ➡ **calcium folinate**.

leukaemomycin C ➡ **daunorubicin**.

Leukeran™ ➡ **chlorambucil**.

Leukine™ ➡ **sargramostim**.

leukotriene B_4 (LTB_4) is an eicosanoid and metabolite of **arachidonic acid**, a LEUKOTRIENE RECEPTOR AGONIST, most active at the BLT (LTB_4) receptor subtype. It is a powerful chemotactic substance for macrophages and neutrophils, involved in tissue response to inflammation. On neutrophils, it causes up-regulation of membrane adhesion molecules, secretion of granular enzymes, and production of reactive toxic oxygen species. Acting on macrophages it stimulates proliferation and release of cytokines. It can be found in inflammatory exudates and tissues in conditions such as rheumatoid arthritis, ulcerative colitis and psoriasis. It differs in overall pharmacology from that of the group cysteinyl-containing leukotrienes (LTC_4, LTD_4,LTE_4, LTF_4 etc.).

leukotriene C_3 (LTC_3) is an eicosanoid and metabolite of **arachidonic acid**, and is a LEUKOTRIENE RECEPTOR AGONIST. It is one of the group cysteinyl-containing leukotrienes.

8,9-leukotriene C_3 (8,9-LTC_3) is an eicosanoid and metabolite of **arachidonic acid**. It is a LEUKOTRIENE RECEPTOR AGONIST, one of the group of cysteinyl-containing leukotrienes.

leukotriene C_4 (LTC_4) is an eicosanoid and metabolite of **arachidonic acid**, and is a LEUKOTRIENE RECEPTOR AGONIST. It can be isolated from mouse mastocytoma cells and human polymorphonuclear leukocytes. It is formed *in vivo* from LTA_4 with the introduction of a peptidic cycteine moity by glutathione-*S*-transferase, and is the first of a metabolic chain of the cysteinyl-containing (or sulphidopeptide) leukotrienes. It is a constituent of 'slow reacting substance of anaphylaxis' (SRS-A, together with LTD_4 and LTE_4). It is a potent bronchoconstrictor and an important mediator in asthma and various forms of hypersensitivity.

leukotriene C_5 (LTC_5) is an eicosanoid and metabolite of **arachidonic acid**, and is a LEUKOTRIENE RECEPTOR AGONIST. It is one of the cysteinyl-containing leukotrienes.

leukotriene D_4 (LTD_4) is an eicosanoid and metabolite of **arachidonic acid**, and is a LEUKOTRIENE RECEPTOR AGONIST. It can be isolated from cat basophilic leukaemic cells and from human lung. It is one of the cysteinyl-containing leukotrienes, and is formed *in vivo* from LTC_4, and is a constituent of 'slow reacting substance of anaphylaxis' (SRS-A, together with LTC_4 and LTE_4). It is a potent bronchoconstrictor and an important mediator in asthma and various forms of hypersensitivity, including allergic rhinitis.

leukotriene E_3 (LTE_3) is an eicosanoid and metabolite of **arachidonic acid**, and is a LEUKOTRIENE RECEPTOR AGONIST. It is one of the cysteinyl-containing leukotrienes, and is formed *in vivo* from LTC_3.

leukotriene E_4 (LTE_4) is an eicosanoid and metabolite of **arachidonic acid**, and is a LEUKOTRIENE RECEPTOR AGONIST. It is one of the cysteinyl-containing leukotrienes, and is formed *in vivo* from LTD_4, and is a constituent of 'slow reacting substance of anaphylaxis' (SRS-A, together with LTC_4 and LTD_4). It is a potent bronchoconstrictor and an important spasmogen and mediator in asthma and other forms of airways disease.

leukotriene E_5 (LTE_5) is an eicosanoid and metabolite of **arachidonic acid**, and is a LEUKOTRIENE RECEPTOR AGONIST. It is one of the cysteinyl-containing leukotrienes, and is formed *in vivo* from LTD_5.

leukotriene F_4 (LTF_4) is an eicosanoid and metabolite of **arachidonic acid**, and is a LEUKOTRIENE RECEPTOR AGONIST. It is one of the cysteinyl-containing leukotrienes, and is formed *in vivo* from LTE_4. It induces contractions in the guinea-pig isolated ileum (less potent than LTE_4).

LEUKOTRIENE RECEPTOR AGONISTS act at receptors recognizing leukotrienes and analogues. The lipoxygenase system forms the **leukotrienes**, which are members of the eicosanoid family of phospholipid mediators. Their name derives from the fact that leukotrienes are found in leucocytes and contain a triene system of double bonds. The other members of the eicosanoid family are the **prostanoids** (**thromboxanes** and the **prostaglandins**), and these are formed by the cyclooxygenase system: see CYCLOOXYGENASE INHIBITORS. All the eicosanoids are derived mainly from arachidonic acid. These mediators are synthesized on demand, and in some cases their half-lives are short. The

lipoxygenases are a group of soluble enzymes, the main member of the group is 5-lipoxygenase, the first enzyme in the sequence of leukotriene synthesis: see **LIPOXYGENASE INHIBITORS**. On cell activation the enzyme translocates to the cell membrane where it becomes associated with FLAP (five-lipoxygenase activating protein), which is necessary for leukotriene synthesis. The next step, through a reactive intermediate, 5-HPETE, is the synthesis of **leukotriene A_4** (LTA_4). Then LTA_4 acts as a precursor for two separate pathways. Thus LTA_4 may be converted, either (via a hydrolase) to **leukotriene B_4** (LTB_4), or alternatively, (via a glutathione-*S*-transferase) to the family of so-called cysteinyl-containing leukotrienes (also known as sulphidopeptide leukotrienes or peptidoleukotrienes) – LTC_4, LTD_4, LTE_4 and LTF_4. (Historically, it is of interest that 'slow reacting substance of anaphylaxis' (SRS-A) – a factor known since 1940 to be released from sensitized lung in anaphylaxis – turns out, after some cases of mistaken identity to be a mix of LTC_4, LTD_4 and LTE_4.) Neutrophils produce LTF_4, whereas eosinophils, mast cells, basophils and macrophages produce cysteinyl-leukotrienes.

LTB_4 acts on specific receptors called BLT receptors (formerly called LTB_4 receptors, i.e. leukotriene receptors where B_4 is the preferred ligand), and which couple through the $InsP_3$/DAG pathway. BLT receptors are powerfully chemotactic for macrophages and neutrophils (on the latter causing upregulation of membrane adhesion molecules and production of toxic oxygen products), and on macrophages and lymphocytes stimulating proliferation and cytokine release. The cysteinyl-leukotrienes act preferentially at receptors referred to as $CysLT_1$ and $CysLT_2$ (formerly called LTD_4 and LTC_4, respectively). Actions include contraction of human bronchiolar smooth muscle with an increase in mucus secretion. Inhaled by human volunteers, they have effects similar to histamine (i.e. reduction in specific airways conductance and peak expiratory flow rate), though more prolonged. On blood vessels they cause a fall in blood pressure but a constriction of small coronary vessels. Injected intradermally they cause wheal and flare (again like histamine, and approximately equipotent). Given topically in the nose, they increase permeability and blood flow.

In summary, the leukotrienes have a profile that well suits a primary role in several types of inflammatory response. Furthermore, LTB_4 can be found in inflammatory exudates and tissues, in conditions such as rheumatoid arthritis and ulcerative colitis, and dermatological conditions such as psoriasis. Also, leukotrienes are present in the sputum and lung lavage of bronchitics. Trials of receptor antagonist have turned current belief in favour of the role of the cysteinyl-containing leukotrienes rather than LTB_4 in asthma and similar respiratory disease states. Also, a role for efferent effects on sensory nerve fibres in these actions is now being proposed. It should be noted that another lipoxygenase pathway is of interest. The 15-lipoxygenase system, through 15-HETE, and subsequent action of 5-lipoxygenase, forms the mediators **lipoxin A** and **lipoxin B**. The role of these in inflammatory responses is less well understood, but there are experimental agents that inhibit this system (e.g. **BW B70C**).

For the reasons given above, agents that interfere with leukotriene synthesis or actions, are of great interest in relation to limiting inflammatory reactions. The sites amenable to pharmacological manipulation include: (1) the 'upstream' inhibition of arachidonic acid production from phospholipids (which is a rate-limiting step: see **PHOSPHOLIPASE INHIBITORS**); (2) the inactivation of five-lipoxygenase activating protein (FLAP), and thus of the production of any of the leukotrienes; (3) inhibition of 5-lipoxygenase and hence the production of 5-HPETE and subsequent LTA_4 – the precursor of all other leukotrienes – either LTB_4, or the cysteinyl-containing leukotrienes (LTC_4, LTD_4, LTE_4 and LTF_4): see **LIPOXYGENASE INHIBITORS**; lastly, (4) the actions of the leukotrienes at BLT receptors or $CysLT_1$ and $CysLT_2$ receptors may be antagonized.

Recently, rather more information about the recognition properties of leukotriene receptors themselves has become available, though at the time of writing only LTD_4 has an identified clone. The receptors are almost certainly of the G-protein-coupled type and appear to activate the $InsP_3$/DAG system. There is limited information about the receptors from agonists, as compared to antagonists, but they appear to group on the basis of whether they are LTB_4, or cysteinyl-containing leukotriene preferring. At the three receptors the order of potency is as follows: BLT (LTB_4) receptors; $LTB_4 > 12R$-HETE; and LTC_4, LTD_4 are inactive. *Cys*LT_1 (LTD_4) receptors; $LTC_4 = LTD_4 \geq LTE_4$. *Cys*LT_2 (LTC_4) receptors; $LTC_4 \geq TD_4 > E_4$.

Coleman, R.A. *et al.* (1995) Prostanoid and leukotriene receptors: a progress report from the IUPHAR working parties on classification and nomenclature. *Adv. Prostaglandin. Thromboxane. Leukot. Res.*, **23**. 283-285.

Jackson, W.T. *et al.* (1996) Development of novel anti-inflammatory agents: a pharmacologic perspective on leukotrienes and their receptors. *Prog. Drug Res.*, **46**. 115-168.

Rovati, G.E. *et al.* (1997) More on the classification of cysteinyl leukotriene receptors. *Trends Pharmacol. Sci.*, **18**. 148-149.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**. 1-98.

LEUKOTRIENE RECEPTOR ANTAGONISTS act at two types of receptor, and appear to group on the basis of whether they are LTB_4, or cysteinyl-containing leukotriene preferring: see **LEUKOTRIENE RECEPTOR AGONISTS**.

At the BLT (LTB_4) receptors the following antagonists are active: SB 209247, SC 53228, CP 105696, ONO 4057, CGS 25019C, RP 69698, LY 293111, LY 255283, SC 41930, RP 69698 and RG 14893.

At *Cys*LT1 (LTD_4) receptors the following antagonists are active: ICI 1204219, ICI 198615, MK 476, SR 2649, SKF 104353, LY 170680, WY 48252, ONO 1078, sulukast, verlukast and pobilukast. At *Cys*LT_2 (LTC_4) receptors, no antagonists show high affinity.

A number of antagonists are, or have been, at some stage of early investigation or clinical trial. These include: **ablukast**, **cinalukast**, **tomelukast** and BAY x 7195 (a *Cys*LT_1 antagonist, by inhalation in the treatment of asthma). **Iralukast**, a *Cys*LT_1 antagonist, for inhalation, is on trial in the treatment of asthma. **Pobilukast**, a *Cys*LT_1 antagonist, was on trial by oral administration, but discontinued. **Montelukast**, a *Cys*LT_1 antagonist for oral administration, has recently been marketed. **Pranlukast**, an antagonist for oral administration, is on trial in phase III: this agent antagonizes antigen-induced microvascular permeability in the trachea, main bronchi and pulmonary airways. **Zafirlukast**, a *Cys*LT_1 antagonist for oral administration, is in trial in phase III. Use of the antagonists has, in turn, refined the original ideas about the role of leukotrienes in pathophysiology. For instance, the current belief is more in favour of a role of the cysteinyl-containing leukotrienes rather than LTB_4 being involved in asthma and similar respiratory disease states.

Gardiner, P.J. *et al.* (1994) Leukotriene receptors and their selective antagonists. *Adv. Prostaglandin. Thromboxane. Leukot. Res.*, **22**. 49-61.

Chung, K.F. (1995) Leukotriene receptor antagonists and biosynthesis inhibitors: potential breakthrough in asthma therapy. *Eur. Respir. J.*, **8**. 1203-1213.

Ford-Hutchinson, A.W. (1995) Leukotriene antagonists and inhibitors: clinical

applications. *Adv. Prostaglandin. Thromboxane. Leukot. Res.*, **23**, 69-74.
Olivieri, D. *et al.* (1995) The role of leukotriene receptor antagonists in asthma therapy. *Monaldi. Arch. Chest Dis.*, **50**, 170-172.
Holgate, S.T. *et al.* (1996) Leukotriene antagonists and synthesis inhibitors: new directions in asthma therapy. *J. Allergy Clin. Immunol.*, **98**, 1-13.

leupeptin is a peptide antibiotic product isolated from *Streptomyces* spp. that has ENZYME INHIBITOR properties similar to **antipain**. It acts as a (serine) PROTEASE INHIBITOR against plasmin and trypsin-like enzymes, and as a (thiol) protease inhibitor against **papain**, cathepsin A & B.

leuprolide acetate ➡ **leuprorelin**.

Leupron™ ➡ **leuprorelin**.

leuprorelin [BAN, INN] (leuprolide acetate [USAN]; Abbott 43818; TAP 144; Leupron™; Prostap™) is a synthetic peptide analogue of **gonadorelin (gonadotrophin-releasing hormone)**, and a potent LH-RH RECEPTOR AGONIST with similar properties. Given chronically by injection it reduces secretion of gonadotrophin from the pituitary, resulting in reduced secretion of sex hormones by the ovaries or testes. It is used to treat endometriosis, and as an ANTICANCER AGENT to treat cancer of the prostate gland. For further details see gonadotrophin-releasing hormone.

leurocristine ➡ **vincristine**.

Leustat™ ➡ **cladribine**.

Leustatin™ ➡ **cladribine**.

levacetylmethadol [INN] (levomethadyl acetate [USAN]; levo-alpha-acetylmethadol; LAAM; Orlaam™) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC. It is an acetyl derivative of **dimepheptanol**. It is used in replacement therapy for the treatment of narcotic addiction (USA).

levallorphan [BAN, INN] (levallorphan tartrate [USAN]; Ro 1-7700) is a close analogue of **levorphanol**, and is an OPIOID RECEPTOR ANTAGONIST with some residual OPIOID RECEPTOR AGONIST activity. It can be used to reverse the effects of OPIOID ANALGESICS (but may exacerbate respiratory depression).

levallorphan tartrate ➡ **levallorphan**.

levamfetamine ➡ **levamphetamine**.

levamfetamine succinate ➡ **levamphetamine**.

levamisole hydrochloride ➡ **dexamisole**.

levamphetamine [BAN] (levamfetamine [INN]; levamfetamine succinate [USAN]) is the (*R*)-form of **amphetamine**. It is an (indirect) SYMPATHOMIMETIC with both peripheral and CNS stimulating actions, generally less active than amphetamine. It was formerly used as an oral APPETITE SUPPRESSANT.

Levatol™ ➡ **penbutolol**.

levcromakalim [BAN, INN, USAN] (BRL 38227) is the (3*S*,4*R*)-form, the most pharmacologically active isomer, of **cromakalim**.

levdobutamine [INN] is a β-ADRENOCEPTOR AGONIST selective for the β_1-subtype, the active (*S*)-isomer of **dobutamine**, showing activity as a positive INOTROPIC AGENT.

levetimide ➡ **dexetimide**.

levisoprenaline [INN] is a β-ADRENOCEPTOR AGONIST. Chemically, it is the (*R*)-form of **isoprenaline**, and therapeutically it can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.

levo-alpha-acetylmethadol ➡ **levacetylmethadol**.

levobetaxolol ➡ **betaxolol**.

levobunolol [BAN, INN] (levobunolol hydrochloride [USAN]; Betagen™) is a naphthalenone analogue, a non-subtype-selective β-ADRENOCEPTOR ANTAGONIST. It is the (-)-form that is the most active at the receptor; but the (±)-form is also used as bunolol hydrochloride [USAN]. Therapeutically, it can be used in ANTIHYPERTENSIVE treatment.

levobunolol hydrochloride ➡ **levobunolol**.

levocabastine [BAN, INN] (levocabastine hydrochloride [USAN]; R 50547; Livostin™) is a substituted piperidinecarboxylic acid, a HISTAMINE H_1-RECEPTOR ANTAGONIST. It is used topically for the symptomatic relief of allergic conjunctivitis and rhinitis.

levocabastine hydrochloride ➡ **levocabastine**.

levocarnitine ➡ **carnitine**.

levodopa [BAN, INN, JAN, USAN] (L-form of 3,4-dihydroxyphenylalanine; DOPA; Dopar™; Larodopa™ and many other names) occurs in a number of plants and *Bacillus* spp., and in the central and peripheral nervous system of mammals and lower phylla. It is the immediate precursor of the neurotransmitter **dopamine**. It is used as an ANTIPARKINSONIAN AGENT in reducing the slowness of movement and rigidity associated with parkinsonism, but is not as successful in controlling the tremor. It is usually administered with a peripheral DOPA-DECARBOXYLASE INHIBITOR to increase CNS levels after oral administration (e.g. co-beneldopa, co-careldopa).

Levo-Dromoran™ ➡ **levorphanol**.

levofenfluramine [INN] is the (*R*)-form of **fenfluramine hydrochloride**. It is an (indirect-acting) SYMPATHOMIMETIC amine.

levofloxacin ➡ **ofloxacin**.

levoleucovorin calcium ➡ **calcium levofolinate**.

levomenthol ➡ **menthol**.

levomepromazine ➡ **methotrimeprazine**.

levomethadone ➡ **methadone**.

levomethadyl ➡ **dimepheptanol**.

levomethadyl acetate ➡ **dimepheptanol**; **levacetylmethadol**.

levomethorphan [BAN, INN] is the methyl ether of **levorphanol**, and is an OPIOID RECEPTOR AGONIST, OPIOID ANALGESIC and ANTITUSSIVE.

levomoprolol [INN] is the active (*S*)-isomer of **moprolol**, and is a β-ADRENOCEPTOR ANTAGONIST.

levomoramide ➡ **moramide**.

levonantradol [BAN, INN] (levonantradol hydrochloride [USAN]; CP 50556-1; NSC 331615) is the pharmacologically active isomer, the (1′*R*,6*S*,6a*R*,9*R*,10a*R*)-form, of **nantradol**. It is a CANNABINOID RECEPTOR AGONIST.

levonantradol hydrochloride ➡ **levonantradol**.

levonordefrin [USAN] (corbadrine [INN]; α-methylnoradrenaline) is a catecholamine SYMPATHOMIMETIC with α-ADRENOCEPTOR AGONIST actions. It can be used as a VASOCONSTRICTOR in dentistry.

levonorgestrel [BAN, INN, USAN] (D-norgestrel and many other names) is a synthetic steroid, a PROGESTOGEN that is extensively used as an oral CONTRACEPTIVE. It is a component of progesterone-only pills, and of numerous compound preparations combined with an OESTROGEN. It is also used (in combination with oestrogens) in HRT and as an emergency postcoital contraceptive agent.

Levophed™ ➡ **adrenaline**.

Levoprome™ ➡ **methotrimeprazine**.

levopropicillin ➡ **propicillin**.

levopropylcillin potassium ➡ **propicillin**.

levopropoxyphene [BAN, INN] (levopropoxyphene napsylate [USAN]; Lilly 29866) is one of the methadone series, the (2*R*,3*S*)-(-)-form of propoxyphene. It is an OPIOID RECEPTOR AGONIST, but has very slight OPIOID ANALGESIC activity. It can be used in ANTITUSSIVE preparations.

levopropoxyphene napsylate ➡

levopropoxyphene.
levoprotiline ➡ **oxaprotiline**.
levormeloxifene ➡ **centchroman**.
levorphanol [BAN, INN] (levorphanol tartrate [USAN]; Ro 1-5431; Levo-Dromoran™) is the (-)-form of **hydroxy-*N*-methylmorphinan**, and is an **OPIOID RECEPTOR AGONIST** and **OPIOID ANALGESIC**. It is used orally or by injection to treat moderate to severe pain.
levorphanol tartrate ➡ **levorphanol**.
Levothroid™ ➡ **thyroxine**.
levothyroxine sodium ➡ **thyroxine**.
levoxadrol ➡ **dioxadrol**.
levoxadrol hydrochloride ➡ **dioxadrol**.
Levoxyl™ ➡ **thyroxine**.
Levsin™ ➡ **hyoscyamine**.
Lewisite (Agent L) is an arsenical war agent, a potent toxic vesicant and **SENSORY IRRITANT**, which reacts with the sulfhydryl groups of proteins through its arsenic group. British Anti-Lewisite (**dimercaprol**), a **CHELATING AGENT**, was developed as an antidote to the toxic effect of Lewisite.
lexipafant [INN, USAN] (BB 882) is an imidazopyridinyl-phenylsulphonyl derivative, a **PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST**, which ameliorates progression of experimental acute pancreatitis.
lexithromycin ➡ **erythromycin**.
Lexotan™ ➡ **bromazepam**.
LF 178 ➡ **fenofibrate**.
LH ➡ **luteinizing hormone**.
LH-RH ➡ **gonadotrophin-releasing hormone**.
LHRH ➡ **gonadotrophin-releasing hormone**.
LH-RH RECEPTOR AGONISTS act at sites that recognize the hypothalamic hormone, gonadotrophin-releasing hormone (GnRH; **gonadorelin**, luteinizing hormone-releasing hormone; LH-RH or LH-FSH-RH). This is a linear decapeptide, derived from a 92-residue precursor, one of the hypothalamic factors that travel in a specialized system of portal blood vessels, the short distance from the brain area of the hypothalamus, to the adjacent anterior pituitary. Its main physiological action on the pituitary gland is to release the gonadotrophins, which are comprised of **follicle-stimulating hormone** (FSH) and **luteinizing hormone** (LH). The structural requirements for activation of the receptors for LH-RH have been determined by synthesizing analogues of the 10 amino acid residues in the linear sequence of mature GnRH. The natural peptide has blocked termini, the *N*-terminal end by pyroGlu, and the *C*-terminal is amidated. The sequences are different in the available LH-RH sequences derived from some other species, e.g. chicken, salmon or lamprey. Thousands of such variants of LH-RH have been made, and most of the therapeutically useful agonist analogues retain the residues 1–9 or 1–10 of the original decapeptide, but make substitutions; largely by a hydrophobic D-amino acid in position 6, with modifications to the *N*-terminal structure. A major therapeutic application for these analogues is in the treatment of infertility, to promote the pituitary release of gonadotrophins. For this purpose, to mimic the physiological action, administration must be intermittent and for short periods only. For instance, gonadorelin is given by pulsatile injection or infusion, whereas **nafarelin** can be given intranasally. Alternatively, for other purposes, gonadorelin and other LH-RH receptor agonist analogues can be used by continued administration when stimulation is followed by down-regulation of gonadotrophin-releasing hormone receptors, so reducing the release of gonadotrophins (follicle-stimulating hormone and luteinizing hormone), which in turn leads to inhibition of androgen and oestrogen production. This latter use may be in the treatment of breast and prostate cancer, endometriosis, anaemia due to uterine fibroids and before intrauterine surgery. Lastly, the agents my be used as diagnostic agents (to assess pituitary function). See also **HYPOTHALAMIC HORMONES**; **OVULATION-INDUCING AGENTS**; **PITUITARY HORMONES**.

Agents used therapeutically in the UK or USA include synthetic GnRH (in this context called gonadorelin) and the synthetic analogues **buserelin**, **goserelin**, **histrelin**, **leuprorelin**, **nafarelin** and **triptorelin**. Examples of other agents include **deslorelin**, **fertirelin**, **ganirelix** and **lutrelin**.

Jaffe, R.B. *et al.* (1990) Neuromodulatory regulation of gonadotrophin-releasing hormone pulsatile discharge in women. *Am. J. Obstet. Gynecol. Suppl.*, **163**, 1727-1731.
Conn, P.M. *et al.* (1991) Gonadotrophin-releasing hormone and its analogues. *N. Engl. J. Med.*, **324**, 93-103.
Klijn, J.G. (1992) LH-RH agonists in the treatment of metastatic breast cancer: ten years' experience. *Recent. Results. Cancer Res.*, **124**, 75-90.

LH-RH RECEPTOR ANTAGONISTS act at sites that recognize gonadotrophin-releasing hormone; see **LH-RH RECEPTOR AGONISTS**. In principle, they can be used as a **LUTEOLYTIC AGENTS** to inhibit ovulation. A projected use is for the treatment of sex hormone-related diseases, especially as part of **ANTICANCER** hormone-therapy of sex-hormone-dependent tumours. **Cetrorelix** is a pseudopeptide with an alaninamide *C*-terminus, an analogue of **ganirelix**. It is a long-acting agent. **Detirelix** is a pseudopeptide with an alaninamide *C*-terminus, with some structural similarities to ramorelix, ganirelix and cetrorelix. **Ramorelix**, a pseudopeptide, is an analogue of ganirelix.
LH-RF ➡ **gonadotrophin-releasing hormone**.
liarozole [BAN, INN] (liarozole hydrochloride [USAN]; liarozole fumarate [USAN]) is a non-steroid, a benzimidazole, with **ANTIANDROGEN** activity, and is an **AROMATASE INHIBITOR** and inhibits retinoic acid metabolism. It has been investigated as an **ANTICANCER AGENT** for prostatic cancer.
liarozole fumarate ➡ **liarozole**.
liarozole hydrochloride ➡ **liarozole**.
libenzapril [INN, USAN] is an **ACE INHIBITOR**, formerly used as an **ANTIHYPERTENSIVE**.
Librium™ ➡ **chlordiazepoxide**.
lidamidine [INN] (lidamidine hydrochloride [USAN]) is an iminomethylurea, an (α_2) **α-ADRENOCEPTOR AGONIST** with **ANTIDIARRHOEAL** and antiperistaltic activity.
lidamidine hydrochloride ➡ **lidamidine**.
lidocaine ➡ **lignocaine**.
lidocaine hydrochloride ➡ **lignocaine**.
lifarizine [BAN, INN, USAN] (RS 87476) is a piperazine derivative, with both **SODIUM-CHANNEL BLOCKER** and **CALCIUM-CHANNEL BLOCKER** activities. It is a **VASODILATOR**.
lignocaine [BAN] (lidocaine [INN]; lidocaine hydrochloride [USAN]; Xylocaine™; Xylocard™ and many other names) is an amide-type **LOCAL ANAESTHETIC**, with fast onset and intermediate duration of action. It is widely used topically for surface anaesthesis and by injection for infiltration, dental, regional and epidural pain relief and motor block. It can be used in combination with **adrenaline** in preparations for injection to prolong its action, and with **ANTISEPTICS** and **CORTICOSTEROIDS** in topical preparations. It also is a ($K_{(ATP)}$ and $K_{(Vol)}$) **POTASSIUM-CHANNEL BLOCKER** that increases insulin secretion by the islets cells of the pancreas, and is a voltage-gated **SODIUM-CHANNEL BLOCKER** it is also a (class 1b) **ANTIARRHYTHMIC AGENT**, normally reserved for acute intravenous use.

Lilly 29866 ➡ **levopropoxyphene**.
Lilly 30109 ➡ **noracymethadol**.
Lilly 53858 ➡ **fenoprofen**.
Lilly 69323 ➡ **fenoprofen**.
Lilly 133314 ➡ **trioxifene**.
limaprost [INN] is a synthetic prostaglandin analogue, a PROSTANOID RECEPTOR AGONIST. It is a VASODILATOR and PLATELET AGGREGATION INHIBITOR, and can be used orally in the treatment of peripheral vascular disease.
LIN 1418 ➡ **sultopride**.
Lincocin™ ➡ **lincomycin**.
lincomycin [BAN, INN] (Lincocin™) is an ANTIBIOTIC produced by *Streptomyces lincolnensis* and other *S.* spp. Clinically, it shows broad-spectrum ANTIBACTERIAL activity.
lindane [BAN, BSI, INN, ISO, USAN] (gamma benzene hexachloride [BAN]; gamma-BHC; Quellada™) is an INSECTICIDE, SCABICIDAL and PEDICULICIDAL AGENT. It can be used topically to treat parasitic infestation by mites and lice.
linetastine [INN] (TMK 688) is a piperidinylethylpentadienyl derivative, a (5-) LIPOXYGENASE INHIBITOR, an ANTIINFLAMMATORY with inhibitory effects in mouse skin tumour model.
Lingraine™ ➡ **ergotamine**.
γ-linolenic acid ➡ **gamolenic acid**.
linopirdine [USAN] (linopirine; DuP 996) is an indolone derivative, a NEUROTRANSMITTER-RELEASE-MODIFYING AGENT, enhancing release of acetylcholine and other mediators. It is a CNS STIMULANT and under consideration as an orally active NOOTROPIC AGENT (cognition enhancer) for use in the treatment of Alzheimer's disease.
linopirine ➡ **linopirdine**.
linsidomine [INN] the active metabolite of **molsidomine**, acting as a NITRERGIC STIMULANT. It has coronary VASODILATOR and ANTIANGINAL properties.
lintitript [INN] (SR 27897) is a thiazolylindole derivative, a (CCK_A-subtype) CHOLECYSTOKININ RECEPTOR ANTAGONIST. It is used as a pharmacological tool.
Lioresal™ ➡ **baclofen**.
liothyronine [BAN, INN, USAN] (liothyronine sodium [BAN, USAN]; triiodothyronine ; T3; Cytomel™; Tertroxin™ and many other names) is a monoiodophenyldiiodotyrosine derivative, the (*S*)-(L)-form, is one of the two main natural endocrine THYROID HORMONES (together with **thyroxine**) released into the bloodstream by the thyroid gland. It has a more rapid response than thyroxine, and is used orally or by injection particularly in acute hypothyroid states. It can also be used in replacement therapy, and to treat certain pituitary states. The labelled ^{125}I and ^{131}I compounds are used as radioactive diagnostic agents for assessment of thyroid function, and treatment of thyroid cancers. The (*R*)-(D)-form of triiodothyronine, **detrothyronine**, has different actions (see entry). The racemic, (±)-form, of triiodothyronine is rathyronine [INN] (Ro 2-5959), and was never marketed.
liothyronine sodium ➡ **liothyronine**.
Lipantil™ ➡ **fenofibrate**.
β-lipotropic hormone ➡ **lipotropin**.
lipotropin (β-lipotropic hormone; LPH) is a linear peptide with 90 amino acid residues. β-lipotropin itself contains the sequences of γ-lipotropin (a less potent lipotropic hormone), β-melanotropin (β-MSH), [Met^5]enkephalin and β-endorphin. It is an anterior PITUITARY HORMONE derived from propiomelanocortin, and has endocrine functions. β-lipotropin stimulates the release of fatty acids from adipose tissue. There is a high degree of sequence homology in the *C*-terminal 56 residues of the lipotropin hormones of several species (bovine, ovine, porcine and human), whereas marked sequence differences exist in the *N*-terminal portions and possibly even polymorphism within a species (human).
β-lipotropin ➡ **lipotropin**.
γ-lipotropin ➡ **lipotropin**.
LIPOXYGENASE INHIBITORS act on lipoxygenases, which are a group of soluble enzymes involved in the formation of the family of leukotrienes, which are important inflammatory mediators. Inhibition of one or other of the lipoxygenase enzymes has considerable potential in the treatment of inflammatory disorders.

The leukotrienes are members of the eicosanoid family of phospholipid mediators. Their name derives from the fact that leukotrienes are found in leucocytes and contain a triene system of double bonds. The other members of the eicosanoid family are the prostanoids (thromboxanes and the prostaglandins), and these are formed by the cyclooxygenase system: see CYCLOOXYGENASE INHIBITORS. All the eicosanoids are derived mainly from arachidonic acid (5,8,11,14-eicosatetraenoic acid). These mediators are synthesized on demand, and in some cases their half-lives are short.

The lipoxygenases are a group of soluble enzymes located in the cytosol, and are found in the lung, platelets, mast cells and white blood cells. The main enzyme of the group is 5-lipoxygenase – the first enzyme in the sequence of leukotrienes. On cell activation the enzyme translocates to the cell membrane where it becomes associated with FLAP (five-lipoxygenase activating protein), which is necessary for leukotriene synthesis. The next step in this pathway is the synthesis of **leukotriene A_4** (LTA_4), which is through a reactive intermediate termed 5-HPETE (5-hydroperoxyeicosatetraenoic acid). Then LTA_4 acts as a precursor for two separate pathways. Thus LTA_4 may be converted, either (via a hydrolase) to **leukotriene B_4** (LTB_4), or (via a glutathione-*S*-transferase) to the family of so-called cysteinyl-containing leukotrienes (also known as sulphidopeptide leukotrienes or peptidoleukotrienes) – LTC_4, LTD_4, LTE_4 and LTF_4. Neutrophils produce LTF_4, whereas eosinophils, mast cells, basophils and macrophages produce cysteinyl-leukotrienes. LTB_4 acts on specific receptors called BLT receptors (formerly called LTB_4 receptors, i.e. leukotriene receptors where B_4 is the preferred ligand), delineated with selective agonists and antagonists, and coupling through the $InsP_3$/DAG pathway. LTB_4 acting via BLT receptors is powerfully chemotactic for macrophages and neutrophils (on the latter causing up-regulation of membrane adhesion molecules and production of toxic oxygen products), and on macrophages and lymphocytes, stimulating proliferation and cytokine release. The cysteinyl-leukotrienes act preferentially at receptors referred to as $CysLT_1$ and $CysLT_2$ (formerly called LTD_4 and LTC_4 respectively). Actions include: contraction of human bronchiolar smooth muscle with an increase in mucus secretion. Inhaled by human volunteers, they have effects similar to histamine (i.e. reduction in specific airways conductance, and peak expiratory flow rate), though more prolonged. On blood vessels they cause a fall in blood pressure, but a constriction of small coronary vessels. Injected intradermally they cause wheal and flare (again like histamine, and approximately equipotent). Given topically in the nose, they increase permeability and increase blood flow. In summary, the leukotrienes have a profile that well suits a primary role in several types of inflammatory response. Furthermore, LTB_4 can be found in inflammatory exudates

and tissues in conditions such as rheumatoid arthritis, ulcerative colitis, and dermatological conditions such as psoriasis. Furthermore, leukotrienes are also present in the sputum and lung lavage of bronchitics.

For these reasons, agents that interfere with leukotriene synthesis or actions are of great interest in relation to limiting inflammatory reactions. The sites amenable to pharmacological manipulation include: (1) the 'upstream' inhibition of production of arachidonic acid from phospholipids (which is a rate-limiting step: see PHOSPHOLIPASE INHIBITORS); (2) the inactivation of FLAP, and thus of the production of any of the leukotriene; (3) inhibition of 5-lipoxygenase, and hence the production of 5-HPETE and subsequent LTA_4 – the precursor of all other leukotrienes – either LTB_4, or the family of cysteinyl-containing leukotrienes (LTC_4, LTD_4, LTE_4 and LTF_4); and (4) the actions of the leukotrienes at BLT receptors or at *Cys*LT_1 and *Cys*LT_2 receptors. See also LEUKOTRIENE RECEPTOR ANTAGONISTS.

In relation to lipoxygenase inhibitors, it should be noted that another lipoxygenase pathway is of interest. The 15-lipoxygenase system forms, through 15-HETE and subsequent action of 5-lipoxygenase, mediators called **lipoxin A** and **lipoxin B**. The role of these in inflammatory responses is less well understood, but there are experimental agents that inhibit this system (e.g. **BW B70C**). There are a number of inhibitor agents in development. Some are mixed 5-lipoxygenase and 15-lipoxygenase inhibitors, mixed lipoxygenase inhibitors and cyclooxygenase inhibitors, and mixed lipoxygenase inhibitors and leukotriene receptor antagonists. A number of 5-lipoxygenase inhibitors have emerged. **Zileuton**, a benzothienylethylhydroxyurea, is filed in the USA for clinical development. In clinical trials it has shown improved pulmonary function, and decreased symptoms and frequency of use of β_2-adrenoceptor agonist use, in mild-to-moderate asthmatic subjects. It has also been investigated for treatment of irritable bowel disease. **Bunaprolast** has potential as an ANTIASTHMATIC AGENT. **Docebenone** is an orally active agent that has been investigated as an ANTIINFLAMMATORY AGENT and antiasthmatic for treatment of allergic disorders. It shows protective effect in an animal model of pancreatitis. **Enofelast** is a potential antiasthmatic agent. **Linetastine** (TMK 688) is an antiinflammatory agent and shows inhibitory effects in mouse skin tumour model. **Lonapalene** (RS 43179) has antipsoriatic properties. **Nafazatrom (Bay g 6575)** is thought to enhance synthesis of prostacyclin and thus is a PLATELET AGGREGATION INHIBITOR. It has been used as an ANTITHROMBOTIC AGENT in the treatment of vascular disorders. It has also been used a an antimetastatic in anticancer chemotherapy. **Ontazolast** (BIRM 270) is a potential antiasthmatic.

Taylor, I.K. (1995) Cysteinyl leukotrienes in asthma: current state of therapeutic evaluation. *Thorax*, **50**, 1005-1010.

Bell, R.L. *et al.* (1995) Optimization of the potency and duration of action of N-hydroxyurea 5-lipoxygenase inhibitors. *J. Pharmacol. Exp. Ther.*, **272**, 724-731.

Chung, K.F. (1995) Leukotriene receptor antagonists and biosynthesis inhibitors: potential breakthrough in asthma therapy. *Eur. Respir. J.*, **8**, 1203-1213.

Pauwels, R.A. *et al.* (1995) Leukotrienes as therapeutic target in asthma. *Allergy*, **50**, 615-622.

LIR 1660 ➡ **veralipride**.

lisadimate [INN, USAN] (aminobenzoate; glyceryl PABA) is a SUNSCREEN AGENT effective against UVB light.

lisinopril [BAN, INN, JAN, USAN] (Carace™; Prinivil™; Zestril™) is a pseudopeptide ACE INHIBITOR. Clinically, it can be used as an ANTIHYPERTENSIVE and in HEART FAILURE TREATMENT.

lisuride ➡ **lysuride**.

Litarex™ ➡ **lithium citrate**.

lithium acetate (Quilonum™) is effective as an ANTIMANIC AGENT when used orally on a chronic basis to control or prevent the hyperactive manic episodes in manic-depressive illness. It may also reduce the frequency and severity of depressive episodes.

lithium carbonate [JAN, USAN] (NSC 16895; Camcolit™; Eskalith™; Lithonate™; Priadel™ and many other names) is effective as an ANTIMANIC AGENT when used orally on a chronic basis to control or prevent the hyperactive manic episodes in manic-depressive illness. It may also reduce the frequency and severity of depressive episodes.

lithium citrate [USAN] (Litarex™; Priadel™) is effective as an ANTIMANIC AGENT when used orally on a chronic basis to control or prevent the hyperactive manic episodes in manic-depressive illness. It may also reduce the frequency and severity of depressive episodes.

Lithonate™ ➡ **lithium carbonate**.

Lithostat™ ➡ **acetohydroxamic acid**.

Livial™ ➡ **tibolone**.

lividomycin [INN] (Lividomycin A) is an (aminoglycoside) ANTIBIOTIC with ANTIBACTERIAL properties against Gram-positive and Gram-negative bacteria.

Lividomycin A ➡ **lividomycin**.

Livostin™ ➡ **levocabastine**.

lixazinone [INN] (lixazinone sulfate [USAN]; RS 82856) is a complex heterocyclic, a (type III) PHOSPHODIESTERASE INHIBITOR with ANTITHROMBOTIC and CARDIAC STIMULANT activity.

lixazinone sulfate ➡ **lixazinone**.

LJ 206 ➡ **carbocisteine**.

LL 31 ➡ **trimecaine**.

LL 1558 ➡ **tiadenol**.

LMTH ➡ **prolactin**.

LN 107 ➡ **broparestrol**.

LN 2974 ➡ **tazifylline**.

L-NAME (L-N^G-nitro-L-arginine methyl ester; N^G-nitro-L-arginine methyl ester; nitroarginine methyl ester) is a NITRIC OXIDE SYNTHASE INHIBITOR, extensively used as a pharmacological tool.

L-NI ➡ **7-nitroindazole**.

L-NIO (*N*-iminoethyl-L-ornithine) is a NITRIC OXIDE SYNTHASE INHIBITOR which is used as a pharmacological tool.

L-NMMA (N^G-monomethyl-L-arginine; L-N^G-monomethyl-L-arginine) is a NITRIC OXIDE SYNTHASE INHIBITOR, extensively used as a pharmacological tool.

L-NNA (L-N^G-aminoarginine) is a NITRIC OXIDE SYNTHASE INHIBITOR, extensively used as a pharmacological tool.

L-NOAG (L-N^G-nitroarginine) is a NITRIC OXIDE SYNTHASE INHIBITOR, extensively used as a pharmacological tool.

LO 44 ➡ **bezafibrate**.

lobeline [INN] is a tertiary amine alkaloid from *Lobelia inflata* and several other *Lobelia* spp., and also isolated from seeds of *Campanula*. It is a NICOTINIC RECEPTOR AGONIST, and shows CNS STIMULANT, RESPIRATORY STIMULANT, EXPECTORANT, ANTIASTHMATIC and DIURETIC properties. It has been used in antismoking preparations and for its respiratory stimulant properties

lobenzarit [INN] (lobenzarit sodium [USAN]; CCA) is a substituted phenylaminedicarboxylic acid, an IMMUNOMODULATOR/ANTIINFLAMMATORY AGENT. It shows hepatoprotective activity via induction of glutathione reductase.

lobenzarit sodium ➡ **lobenzarit**.

LOCAL ANAESTHETICS can be used to reduce sensation (especially pain) in a specific local area of the body, without loss of consciousness. (In contrast, general anaesthetics

decrease sensation only because of a loss of consciousness). Local anaesthetics work by reversibly blocking the transmission of impulses in nerves, largely by acting as SODIUM-CHANNEL BLOCKERS. They probably work in their cationic forms, and their activity is strongly pH-dependent, being increased at alkaline pH – which is a disadvantage where wounds are acidic. The rate of onset of their action depends on the degree of myelination of nerves, so unmyelinated sensory C-fibres are first affected. They can be administered by a number of routes, always close to their site of action. By local injection or infiltration, they can be used for dental surgery and minor surgery (such as sutures). A more extensive loss of sensation through nerve block (e.g. injected near to the nerve supplying a limb), or through spinal anaesthesia (e.g. epidural injection in childbirth, or intrathecal block for extensive procedures), which causes loss of sensation in whole areas of the body, allows major surgery (though with some – quickly reversible – paralysis). When injected into a vascular region, co-injection of adrenaline as a vasoconstrictor limits the rate at which they are washed away. When applied topically, certain local anaesthetics are well absorbed from mucous membranes and abraded skin, and can be used to treat discomfort at many sites. Examples of local anaesthetics include: **amethocaine**, **benzocaine**, **bupivacaine**, **cinchocaine**, **cocaine**, **lignocaine**, **prilocaine**, **procaine**. Chemically, these are amphiphilic molecules, with a hydrophobic aromatic group and a basic amine group.

Courtney, K.R. *et al.* (1987) Structural elements which determine local anaesthetic activity. in, *Local Anaesthetics*, (eds G.R Strichartz), *Handb. Exp. Pharmacol.*, **81**, Springer-Verlag, Berlin, pp. 53-94.

Covino, B.G. (1987) Toxic and systemic effects of local anaesthetic agents. in, *Local Anaesthetics*, ed. Strichartz, G.R., *Handb. Exp. Pharmacol.*, **81**, 187-212.

Loceryl™ ➡ **amorolfine**.

Locoid™ ➡ **hydrocortisone**.

β-L-ODAP ➡ **dencichin**.

Lodine™ ➡ **etodolac**.

Iodoxamide [BAN, INN] (Iodoxamide trometamine [USAN]; Alomide™) is a *bis*(oxaloylamino)benzonitrile derivative, a mast cell stabilizer ANTIALLERGIC AGENT. It can be used for prophylaxis of allergic conditions, and topically for the treatment of conjunctivitis.

Iodoxamide trometamine ➡ **Iodoxamide**.

Iofentanil [BAN, INN] (Iofentanil oxalate [USAN]; R 34995) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC properties.

Iofentanil oxalate ➡ **Iofentanil**.

Iofepramine [BAN, INN, JAN] (Iopramine hydrochloride; DB 2182; Leo 640) is one of the tricyclic class of monoamine UPTAKE INHIBITORS. It has been used as an ANTIDEPRESSANT.

Iofexidine [BAN, INN] is an imidazoline with properties similar to **clonidine**. It is an (α_2) α-ADRENOCEPTOR AGONIST that can be used as an ANTIHYPERTENSIVE. It can also be used to alleviate opioid withdrawal symptoms. The (*R*)-form is a more active isomer.

Iomefloxacin [BAN, INN, USAN] (Iomefloxacin hydrochloride [JAN, USAN]; Iomefloxacin mesylate [USAN]; Maxaquin™) is a fluoroquinone ANTIBACTERIAL, which is used for bronchitis and urinary tract infections.

Iomefloxacin hydrochloride ➡ **Iomefloxacin**.

Iomefloxacin mesylate ➡ **Iomefloxacin**.

Lomexin™ ➡ **fenticonazole**.

Lomotil™ ➡ **atropine sulphate**; **diphenoxylate**.

Iomustine [BAN, INN, USAN] (CCNU™; CEENU™) is a lipid-soluble nitrosourea that is an alkylating cytotoxic agent. It can be used as an ANTICANCER AGENT, particularly for Hodgkin's disease and certain solid tumours.

Ionapalene [INN, USAN] (RS 43179) is a naphthalenediol derivative, a selective LIPOXYGENASE INHIBITOR, which has antipsoriatic properties.

Ionazolac [INN] is one of the pyrazolone series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

Ionidamine [BAN, INN] (diclondazolic acid; DICA; AF 1890) is an ANTICANCER AGENT thought to work by inhibiting mitochondrial function in tumour cells. It also acts as an antispermatogenic agent, and has been investigated as an antitrypanocidal agent.

Lonoten™ ➡ **minoxidil**.

Ioperamide [BAN, INN, JAN] (Ioperamide hydrochloride [USAN]; Arret™; Diareze™; Diocalm Ultra™; Imodium™ and many other names) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST. It is used as an oral ANTIDIARRHOEAL and antiperistaltic agent for acute attacks. The *N*-oxide, loperamide oxide [BAN, INN], is a prodrug of loperamide.

Ioperamide hydrochloride ➡ **Ioperamide**.

Ioperamide oxide ➡ **Ioperamide**.

Lopid™ ➡ **gemfibrozil**.

Iopramine hydrochloride ➡ **Iofepramine**.

Ioprazolam [BAN, INN] (Ioprazolam mesylate; HR 158; RU 31158; Dormonact™ and many other names) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It has been used orally in the treatment of insomnia, when it has a relatively short duration of action.

Ioprazolam mesylate ➡ **Ioprazolam**.

Lopressor™ ➡ **metoprolol**.

Lopurin™ ➡ **allopurinol**.

Loratadine [BAN, INN, USAN] (Sch 29851; Claritin™; Clarityn™ and many other names) is a piperidylidene compound, one of the newer HISTAMINE H_1-RECEPTOR ANTAGONISTS with reduced sedative action. It is used orally in the treatment of allergic rhinitis and urticaria.

Lorazepam [BAN, INN, JAN, USAN] (lorazepam pivalate; Ativan™ and many other names) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It has been used orally or by injection to treat anxiety, as a relatively long-acting agent for insomnia, as an ANTIEPILEPTIC in status epilepticus and as a sedative in preoperative medication. It is the 3-hydroxy derivative of **delorazepam**.

Lorazepam pivalate ➡ **lorazepam**.

Lorcainide [BAN, INN] (lorcainide hydrochloride [USAN]; isocainide) is an acetamide derivative active as a (class 1c) ANTIARRHYTHMIC AGENT.

Lorcainide hydrochloride ➡ **lorcainide**.

Loreclezole [BAN, INN, USAN] (R 72063) is a triazole, a novel ($GABA_A$) GABA RECEPTOR AGONIST, possibly acting at the modulatory site in a similar way to the benzodiazepines, though at a different site. It is an ANTICONVULSANT and ANTIEPILEPTIC currently under investigation.

Lorglumide [INN] (CR 1409) is a dipentylaminooxo-pentanoic acid derivative, is a selective (CCK_A) CHOLECYSTOKININ-RECEPTOR ANTAGONIST with only low affinity for the CCK_B subtype. It has an inhibitory effect on pancreatic carcinogenesis in rats, and is used as a pharmacological tool.

Lormetazepam [BAN, INN, USAN] (Ro 5-5516; Wy 4082; ZK 65997) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE

BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity It has been used orally in the treatment of insomnia, and also in preoperative medication.

Iornoxicam [BAN, INN, USAN] (Ro 13-9297) is one of the oxicam series of CYCLOOXYGENASE INHIBITORS and has NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

Loron™ ➡ **clodronic acid**.

Iosartan [INN] (losartan potassium [USAN]; DuP 753; Avastar™; Cozaar™) is a biphenylyltetrazole derivative that is an (AT_1-subtype) ANGIOTENSIN RECEPTOR ANTAGONIST; the first nonpeptide example to enter general clinical practice. It can be used as an oral ANTIHYPERTENSIVE AGENT.

Iosartan potassium ➡ **losartan**.

Losec™ ➡ **omeprazole**.

Lotensin™ ➡ **benazepril**.

Iotrifen [INN] is a triazoloisoquinoline, a veterinary ABORTIFACIENT.

Iovastatin [INN, USAN] (L 154803; MB 530B; MSD 803; antibiotic L 154803; antibiotic MB 530B; antibiotic MSD 803; Mevacor™) is a metabolite of *Aspergillus terreus* and *Monascus ruber*. It is an inhibitor of cholesterol biosynthesis, a potent HMG-COA INHIBITOR and is extensively used as an ANTIHYPERLIPIDAEMIC AGENT.

Ioviride [BAN] is a non-nucleoside REVERSE TRANSCRIPTASE INHIBITOR, an ANTIVIRAL AGENT, which is being explored as an ANTI-HIV AGENT in AIDS management.

Loxapac™ ➡ **loxapine**.

Ioxapine [BAN, INN, USAN] (loxapine succinate [USAN]; CL 62362; S 805; SUM 3170; CL 71563; Loxapac™ and many other names) is a dibenzoxazepine, a novel ANTIPSYCHOTIC. It is used orally to treat acute and chronic psychoses.

Ioxapine succinate ➡ **loxapine**.

Ioxiglumide [INN] (oxiglumide; CR 1505) is an analogue of **lorglumide** and is a (CCK_A-subtype) CHOLECYSTOKININ RECEPTOR ANTAGONIST. It inhibits growth of human pancreatic cells (KP-1 N) *in vitro*, and has ANXIOLYTIC properties. The pharmacologically active isomer, the (*R*)-form, is dexloxiglumide [INN].

Ioxistatin ➡ **aloxistatin**.

Loxonin™ ➡ **loxoprofen**.

Ioxoprofen [INN] (loxoprofen sodium [JAN]; CS 600; Loxonin™) is a very early member of the propionic acid series. It is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It is marketed in Japan.

Ioxoprofen sodium ➡ **loxoprofen**.

Lozol™ ➡ **indapamide**.

LPH ➡ **lipotropin**.

LRF ➡ **gonadotrophin-releasing hormone**.

LS 2616 ➡ **roquinimex**.

LS 2667 ➡ **tauromustine**.

LSD ➡ **lysergide**.

LSD-25 ➡ **lysergide**.

LT 86 ➡ **flurandrenolone**.

LTB_4 ➡ **leukotriene B_4**.

LTC_3 ➡ **leukotriene C_3**.

8,9-LTC_3 ➡ **8,9-leukotriene C_3**.

LTC_4 ➡ **leukotriene C_4**.

LTC_5 ➡ **leukotriene C_5**.

LTD_4 ➡ **leukotriene D_4**.

LTE_3 ➡ **leukotriene E_3**.

LTE_4 ➡ **leukotriene E_4**.

LTE_5 ➡ **leukotriene E_5**.

LTF_4 ➡ **leukotriene F_4**.

LTH ➡ **prolactin**.

Lu 5-110 ➡ **flupenthixol**.

Lu 7-105 ➡ **flupenthixol**.

Lu 10-171 ➡ **citalopram**.

Lu 23-174 ➡ **sertindole**.

Iucanthone [BAN, INN] (lucanthone hydrochloride [USAN]) is an agent formerly used in ANTISCHISTOSOMAL treatment.

Iucanthone hydrochloride ➡ **lucanthone**.

Ludiomil™ ➡ **maprotiline**.

Lufyllin™ ➡ **diprophylline**.

Luminal™ ➡ **phenobarbitone**.

Iupitidine [INN] (lupitidine hydrochloride [USAN]; SKF 93479) is a pyrimidinone derivative, a HISTAMINE H_2-RECEPTOR ANTAGONIST, GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC AGENT. It has experimental antinociceptive activity.

Iupitidine hydrochloride ➡ **lupitidine**.

Iuprostiol [BAN, INN] (EMD 34946) is a synthetic thiaprostanoid and analogue of **dinoprost**. It is a PROSTANOID RECEPTOR AGONIST, a veterinary LUTEOLYTIC AGENT.

Iurosetron [BAN, INN, USAN] (lurosetron mesylate [USAN]; GR 87442 N) is a substituted pyridoindolone, a ($5\text{-}HT_3$-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It has potential as an antinauseant or ANTIEMETIC.

Iurosetron mesylate ➡ **lurosetron**.

Lustral™ ➡ **sertraline**.

luteinizing hormone (LH; lutropin) is a gonadotrophic PITUITARY HORMONE, a glycoprotein (MW *c.* 30,000) consisting of two subunits designated α and β. It contains about 20% carbohydrate residues. Ovine LH-α is a polypeptide chain of 96 amino-acid residues, having two carbohydrate moieties. It is secreted by the anterior pituitary gland, together with a related FOLLICLE-STIMULATING HORMONE (FSH). In the male, LH stimulates testicular Leydig cells to secrete androgens (including testosterone). In the female it stimulates ovulation of the ovarian follicle and formation of the corpus luteum, which secretes PROGESTOGENS (mainly progesterone). It is normally used as HUMAN MENOPAUSAL GONADOTROPHIN preparations together with FSH: see **menotrophin**. Similar biological activity is found in HUMAN CHORIONIC GONADOTROPIN; see CHORIONIC GONADOTROPIN.

luteinizing hormone-releasing factor ➡ **gonadotrophin-releasing hormone**.

luteinizing hormone-releasing factor (pig) ➡ **buserelin**.

luteinizing hormone-releasing hormone ➡ **gonadotrophin-releasing hormone**.

luteohormone ➡ **progesterone**.

LUTEOLYTIC AGENTS may be defined for these purposes as any agents that inhibit some aspect of the implantation of the ovum in the corpus luteum. Under this wide definition, such agents might work, mechanistically, at any site from the corpus luteum itself, up to alteration of central processes leading to ovulation.

To prevent ovulation, use can be made of agents that prevent the action on the pituitary gland of the hypothalamic hormone. One approach is to use LH-RH RECEPTOR AGONIST treatment on a chronic basis, when after an initial stimulation phase, continued administration is followed by down-regulation of gonadotrophin-releasing hormone receptors, so reducing the release of gonadotrophins (follicle-stimulating hormone and luteinizing hormone), which in turn leads to inhibition of androgen and oestrogen production. (It should be noted that

the opposite holds with short-term administration, often by pulsatile injection, when these agents are used in the treatment of infertility.) In principle, therefore, in chronic use these agonists can be regarded as luteolytic agents. In practice, they are more used to suppress sex steroid production in the treatment of breast and prostate cancer, endometriosis etc. Agents used therapeutically in the UK or USA include synthetic GnRH (in this context called **gonadorelin**) and the synthetic analogues **buserelin**, **goserelin**, **histrelin**, **leuprorelin**, **nafarelin** and **triptorelin**. Other agents that have been developed include **deslorelin**, **fertirelin**, **ganirelix** and **lutrelin**.

Rather than given chronic treatment with LH-RH receptor agonists, use may be made of LH-RH RECEPTOR ANTAGONISTS. By blocking the sites that recognize the gonadotrophin-releasing hormone (GnRH). In principle they can act as luteolytic agents by inhibiting ovulation. **Cetrorelix**, **detirelix**, **ganirelix** and **ramorelix** are peptides or pseudopeptides with some structural similarities.

CONTRACEPTIVES come in various forms, and these are discussed under other headings. Most contain both an OESTROGEN and a PROGESTOGEN. The oestrogen inhibits the release of **follicle-stimulating hormone** (**FSH**) and prevents egg development; the progesterone inhibits release of **luteinizing hormone** (**LH**), which prevents ovulation and makes the cervix mucus unsuitable for sperm. Together, they alter the endometrium of the uterus, and prevent any fertilized eggs from implanting.

Prostanoids have powerful direct actions at many tissues within the reproductive tract (and indirect actions at pituitary level) and may be used as direct ABORTIFACIENTS. A number have been used to procure therapeutic abortion, but commonly either the prostaglandin **gemeprost** or **dinoprostone** (given by the extra-amniotic route) are used in conjunction with the progestogen hormone antagonist **mifepristone** (given orally). Other prostanoids that have been used for their actions on the female reproductive tract, experimentally or in veterinary practice, include **cloprostenol**, **delprostenate**, **fenprostalene**, **fluprostenol**, **luprostiol** and **prostalene**. See PROSTANOID RECEPTOR AGONISTS.

luteomammotropic hormone ➡ **prolactin**.

luteotrophic hormone ➡ **prolactin**.

luteotropin ➡ **prolactin**.

lutrelin [INN] (lutrelin acetate [USAN]; WY-40972) is a derivative of LH-RH (pig), and is a LH-RH RECEPTOR AGONIST with similar properties: see **gonadotrophin-releasing hormone**.

lutrelin acetate ➡ **lutrelin**.

Lutrepulse™ ➡ **gonadotrophin-releasing hormone**.

lutropin ➡ **luteinizing hormone**.

luzindole (N-acetyl-2-benzyltryptamine; N 0774) is a MELATONIN RECEPTOR ANTAGONIST (with moderate selectivity for Mel_{1B} over the Mel_{1A} subtype). It shows ANTIDEPRESSANT-like activity in animal model.

LVP ➡ **lypressin**.

LX 100-129 ➡ **clozapine**.

LY 53857 is an ergoline derivative, a selective ($5\text{-}HT_{2B}$-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It is used as a pharmacological tool.

LY 61017 ➡ **felbinac**.

LY 110140 ➡ **fluoxetine**.

LY 127623 ➡ **metkefamide**.

LY 137998 ➡ **human pituitary growth hormone**.

LY 139037 ➡ **nizatidine**.

LY 150720 ➡ **picenadol**.

LY 156758 ➡ **raloxifene**.

LY 170053 ➡ **olanzapine**.

LY 186641 ➡ **sulofenur**.

LY 186655 ➡ **tibenelast**.

LY 253352 ➡ **tamsulosin**.

LY 277359 ➡ **zatosetron**.

LY 281067 ➡ **sergolexole**.

LY 288513 is a pyrazolidinecarboxamide derivative, a (CCK_B-subtype) CHOLECYSTOKININ RECEPTOR ANTAGONIST. It shows experimental ANXIOLYTIC and ANTIPSYCHOTIC activity, and has advanced to early clinical trials stage.

Lyclear™ ➡ **permethrin**.

Lydex™ ➡ **fluocinolone acetonide**.

lymecycline [BAN, INN] is a semisynthetic (tetracycline) ANTIBIOTIC. It can be used clinically as a broad-spectrum semisynthetic oral ANTIBACTERIAL to treat various infections.

lymphoblastoid interferon ➡ **interferon α**.

lymphocyte activating factor ➡ **interleukin-1**.

lymphotoxin ➡ **tumour necrosis factor**.

lynestrenol ➡ **lynoestrenol**.

lynoestrenol [BAN] (lynestrenol [INN, USAN]; NSC 37725) is a synthetic steroid, a PROGESTOGEN, and has been used as a progesterone-only oral CONTRACEPTIVE, a combined contraceptive (with OESTROGEN), and for the treament of menstrual disorders.

lypressin [BAN, INN, USAN] (lysine vasopressin; LVP; lysine-8-vasopressin; L-8; antidiuretic hormone; ADH; Diapid™; Pitressin™; Syntopressin™) is the form of the cyclic nonapeptide hormone **vasopressin** that can be obtained from the posterior lobe of porcine posterior pituitary (neurohypophysis). Therapeutically, lypressin (ADH) is a (V subtype) VASOPRESSIN RECEPTOR AGONIST. It has ANTIDIURETIC activity and is used in pituitary-originated diabetes insipidus treatment. It is a powerful VASOCONSTRICTOR and can be used as a HAEMOSTATIC AGENT to treat bleeding from varices of the oesophagus. Hundreds of analogues have been synthesized, with some more active than the parent compound.

Lys-BK ➡ **kallidin**.

lysergic acid diethylamide ➡ **lysergide**.

lysergide [BAN, INN] (lysergic acid diethylamide; DAM 57; LSD; LSD-25; 'Acid') is a semisynthetic ergoline or ergot alkloid, thought to act as a (partial) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST or 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST ($5\text{-}HT_{1c}$, $5\text{-}HT_{2A}$ and others). It has SYMPATHOMIMETIC actions. It is a drug of abuse, and was formerly used in psychotherapy as PSYCHOTROPIC AGENT.

lysine vasopressin ➡ **lypressin**; **vasopressin**.

8-L-lysine vasopressin ➡ **vasopressin**.

Lysodren™ ➡ **mitotane**.

lysuride [BAN] (lisuride [INN]; Revanil™) is an ergoline amine derivative, a DOPAMINE RECEPTOR ANTAGONIST with some activity as a 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It can be used as an ANTIPARKINSONIAN AGENT and in ANTIMIGRAINE prophylaxis.

lysyl-bradykinin ➡ **kallidin**.

lyxoascorbic acid ➡ **ascorbic acid**.

M

M 99 ➡ **etorphine**.
M 183 ➡ **acetorphine**.
M 218 ➡ **alletorphine**.
M 551 ➡ **pheneturide**.
M 5202 ➡ **homprenorphine**.
M 39831 ➡ **temozolomide**.
M 73101 ➡ **emorfazone**.
MA 144A1 ➡ **aclarubicin**.
Maalox™ ➡ **aluminium hydroxide; magnesium hydroxide**.
mabuterol [INN] (mabuterol hydrochloride [JAN]) is a (selective for the β_2-subtype) **β-ADRENOCEPTOR AGONIST**, which therapeutically can be used as a **BRONCHODILATOR** in ANTIASTHMATIC treatment.
mabuterol hydrochloride ➡ **mabuterol**.
Maclean™ ➡ **calcium carbonate; magnesium carbonate; magnesium hydroxide**.
Macrobid™ ➡ **itrofurantoin**.
Macrodantin™ ➡ **nitrofurantoin**.
maculotoxin ➡ **tetrodotoxin**.
Madopa™ ➡ **benserazide**.
MAF ➡ **interferon γ**.
mafenide [BAN, INN, USAN] (mafenide acetate [JAN, USAN]; Sulfamylon™) is a **SULPHONAMIDE**, and can be used as an ANTIBACTERIAL, particularly in the treatment of burns.
mafenide acetate ➡ **mafenide**.
mafosfamide [INN] is a derivative of **cyclophosphamide**, and is an alkylating cytotoxic that has been used as an **ANTICANCER AGENT** for acute and chronic myeloid leukaemias.
magaldrate [BAN, INN, USAN] (aluminium magnesium hydroxide sulphate; AY 5710; Dynese™) is a synthetic combination of **aluminium hydroxide** and **magnesium hydroxide** with sulphuric acid. It is used as a non-systemic **antacid**, used orally for the relief of hyperacidity, dyspepsia and indigestion, and as an adjunct in the treatment of peptic ulcers. It is claimed to have some cytoprotective activity.
Magnapen™ ➡ **ampicillin; flucloxacillin (co-fluampicil)**.
Magnatol™ ➡ **alexitol**.
magnesia; hydrated magnesium oxide ➡ **magnesium hydroxide**.
magnesium aluminosilicate ➡ **almasilate**.
magnesium carbonate [BAN, JAN, USAN] (carbonic acid, magnesium salt) is used as a mild, long-acting, non-systemic **ANTACID** which also has **LAXATIVE** properties. It is used orally for the relief of hyperacidity, dyspepsia and indigestion, and as an adjunct in the treatment of peptic ulcers. It is also used as an abrasive agent in toothpastes. It is a component of many compound preparations, e.g. Algicon™, Aludrox™, Andrews™, Bisodol™, Dijex™, Maclean™ and Rennie™.
magnesium clofibrate ➡ **clofibrate**.
magnesium hydroxide [USAN] (magnesia; hydrated magnesium oxide; Milk of Magnesia™) is used as a mild, long-acting, non-systemic **ANTACID** which also has some **LAXATIVE** properties. It is used orally for the relief of hyperacidity, dyspepsia and indigestion, and as an adjunct in the treatment of peptic ulcers. It is a component of many compound antacid preparations, eg Algicon™, Aludrox™, Asilone™, Dijex™, Gastrocote™, Gaviscon™, Kolanticon™, Maalox™ and Maclean™.
magnesium sulphate (Epsom salts) is an (osmotic) **LAXATIVE** that works by preventing the reabsorption of water within the gut and can be used to facilitate rapid bowel evacuation. Occasionally, it can also be used as a magnesium supplement and to treat boils and carbuncles when it is applied topically as a paste with glycerol.
magnesium trisilicate [USAN] is used as a mild, long-acting, non-systemic **ANTACID**, which is used orally for the relief of hyperacidity, dyspepsia and indigestion, and as an adjunct in the treatment of peptic ulcers. It is a component of many compound antacid preparations, e.g. Gastrocote™, Gaviscon™ and Pyrogastrone™.
malathion [BAN, BSI, ISO] (Drebac™; Prioderm™; Quellada™ and many other names) is a (organophosphate group) **ANTICHOLINESTERASE** which acts as a wide-ranging **INSECTICIDE**. Clinically, it can be used topically as a **PEDICULICIDAL** or **SCABICIDAL**.
Maloprim™ ➡ **dapsone; pyrimethamine**.
mammotropin ➡ **prolactin**.
Mandadil™ ➡ **chlorcyclizine; hydocortisone acetate**.
Mandol™ ➡ **cephamandole**.
Mandrax™ ➡ **diphenhydramine; methaqualone**.
Manerix™ ➡ **moclobemide**.
manita ➡ **mannitol**.
mannitol (cordycepic acid; manita; E 421) is a hexahydric alcohol used mainly as an intravenous (osmotic) **DIURETIC** to treat oedema, particularly cerebral oedema, and in **ANTIGLAUCOMA TREATMENT** for acute attacks. It is a diagnostic agent for renal function determination. It is a permitted bulk sweetener for foods.
mannitol hexanitrate [INN] (nitromannitol; nitromannite; Nitromaxitate™) is an organic nitrate, with properties similar to **glyceryl trinitrate**, and is a coronary **VASODILATOR** that has been used as an **ANTIANGINAL** for treatment and prophylaxis.
mannitol nitrogen mustard ➡ **mannomustine**.
mannomustine [BAN, INN] (mannitol nitrogen mustard; NSC 9698) is an analogue of **mustine**, and is an alkylating **ANTICANCER AGENT** that directly damages DNA so interfering with cell replication. It has been used intravenously to treat tumours.
Maolate™ ➡ **chlorphenesin carbamate**.
maprotiline [BAN, INN, USAN] (maprotiline hydrochloride [USAN]; Ba 34276; Ludiomil™) is one of the tricyclic class of noradrenaline **UPTAKE INHIBITORS**. It is used as an oral **ANTIDEPRESSANT**.
maprotiline hydrochloride ➡ **maprotiline**.
Marcaine™ ➡ **bupivacaine**.
Marevan™ ➡ **warfarin sodium**.
margatoxin (α-MgTx2.2) is a 39 amino acid peptide from a scorpion (*Centruroides margaritatus*), and is structurally related to other scorpion toxins, such as **charybdotoxin**, **iberiotoxin** and **noxiustoxin**. It is a **POTASSIUM-CHANNEL BLOCKER** and **NEUROTOXIN**, active on voltage-activated potassium channels. It acts on Kv of human T-lymphocytes and shows **IMMUNOSUPPRESSANT** properties.
marijuana ➡ **Δ^8-tetrahydrocannabinol; Δ^9-tetrahydrocannabinol; dronabinolinol**.
marimastat [BAN, USAN] (BB 2516) is a peptide mimetic

comprised of a peptide backbone with a hydroxamate terminal group which binds to the zinc atom of the enzyme active site. It is a matrix (metallo) PROTEASE INHIBITOR. It has entered trials as an adjunct in ANTICANCER treatment, where because it inhibits matrix metalloproteinases, it restricts tumour growth and spread.

Marinol™ ➡ **dronabinol.**

Marplan™ ➡ **isocarboxazid.**

masoprocol [INN, USAN] (CHX 100; Actinex™) is used as a DERMATOLOGICAL AGENT for the treatment of actinic (solar) keratoses.

mast cell growth factor ➡ **interleukin-3.**

mastoparan is a strongly cationic amphipathic 14 amino acid peptide from wasp venom (*Vespa basalis*), and is a G-protein activator (G_o). It is a TOXIN that stimulates vesicle secretion, causes histamine release and has mast cell degranulating activity.

Matrex™ ➡ **methotrexate.**

Matulane™ ➡ **procarbazine.**

Maxair™ ➡ **pirbuterol.**

Maxaquin™ ➡ **lomefloxacin.**

Maxepa™ ➡ **omega-3 marine triglycerides.**

Maxiflor™ ➡ **flumethasone.**

Maxipim™ ➡ **cefepime.**

Maxolon™ ➡ **metoclopramide.**

Mazanot™ ➡ **mazindol.**

mazindol [BAN, INN, USAN] (AN 448; Mazanot™; Sanorex™ and many other names) is pharmacologically an **amphetamine**-like agent, though chemically it is an unrelated isoindole. It is a noradrenaline UPTAKE INHIBITOR with indirect-acting SYMPATHOMIMETIC properties and CNS STIMULANT activity. It can be used as an APPETITE SUPPRESSANT, to treat narcolepsy and urinary incontinence. It has abuse potential.

MB 530B ➡ **lovastatin.**

MB 33153 ➡ **oxoprostol.**

MBLA ➡ **melinamide.**

MC 903 ➡ **calcipotriol.**

MCGF ➡ **interleukin-3.**

MCI 2016 ➡ **bifemelane.**

MCI 9042 ➡ **sarpogrelate.**

McN 2559 ➡ **tolmetin.**

McN 2783-21-98 ➡ **zomepirac.**

MCN 4853 ➡ **topiramate.**

McN-JR 3345 ➡ **pipamperone.**

McN JR 6238 ➡ **pimozide.**

McN JR 13558-11 ➡ **fetoxylate.**

McN JR 15403-11 ➡ **difenoxin.**

MCNU ➡ **ranimustine.**

MDA ➡ **tenamfetamine.**

MD 780515 ➡ **cimoxatone.**

MDL 458 ➡ **deflazacort.**

MDL 646 ➡ **mexiprostil.**

MDL 16455 ➡ **fexofenadine.**

MDL 18962 ➡ **plomestane.**

MDL 71754 ➡ **vigabatrin.**

MDL 72222 ➡ **bemesetron.**

MDL 73147EF ➡ **dolasetron.**

MDMA (3,4-methylenedioxymethylamphetamine; EA 1475; 'XTC'; 'Ecstasy'; 'E') has amphetamine-like actions, and induces release of, and is a (re-) UPTAKE INHIBITOR of 5-hydroxytryptamine. Also, it is a MONOAMINE-OXIDASE INHIBITOR (MAOI, type A), slowing catabolism of 5-HT. It is a PSYCHOTROPIC AGENT and drug of abuse.

MDP ➡ **adjuvant peptide.**

mebanazine [BAN, INN] is one of the hydrazine class, and is a MONOAMINE-OXIDASE INHIBITOR (MAOI) formerly used as an ANTIDEPRESSANT.

Mebaral™ ➡ **methylphenobarbitone.**

mebendazole [BAN, INN, USAN] (Equivurm Plus™; Telmin™; Vermox™) is a broad-spectrum ANTHELMINTIC. Clinically, it can be used orally for most of the common worm infections in humans; it is also used extensively in veterinary practice.

mebeverine [BAN, INN] (mebeverine hydrochloride [USAN]; Colofac™) is a methoxyphenyl-methylethylaminobutylbenzoate, a directly acting SMOOTH MUSCLE RELAXANT which can be used as an ANTISPASMODIC to treat intestinal spasm and irritable bowel syndrome.

mebeverine hydrochloride ➡ **mebeverine.**

mebezonium iodide [INN] is a bisquaternary ammonium compound, a NEUROMUSCULAR BLOCKING AGENT and SKELETAL MUSCLE RELAXANT, which can be used for veterinary euthanasia.

mebhydrolin [BAN, INN] (mebhydrolin napadisylate [JAN]) is a pyridoindole, a HISTAMINE H_1-RECEPTOR ANTAGONIST with MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity and SEDATIVE effects. It has been used to treat hypersensitivity reactions, including urticaria and rhinitis.

mebhydrolin napadisylate ➡ **mebhydrolin.**

mebolazine [INN] is a steroid with ANABOLIC properties.

mebrophenhydramine ➡ **embramine.**

mebutamate [BAN, INN, USAN] is a carbamate similar to **meprobamate**. It is a SEDATIVE that was formerly used as part of ANTIHYPERTENSIVE treatment.

mebutizide [INN] is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy and to treat oedema.

mecamylamine [BAN, INN] (mecamylamine hydrochloride [USAN]; Inversine™) is a methylaminoisocamphane derivative, a secondary amine that is active orally. It is a GANGLION BLOCKING AGENT that acts as a (channel blocker) NICOTINIC CHOLINOCEPTOR ANTAGONIST. It can be used as an ANTIHYPERTENSIVE.

mecamylamine hydrochloride ➡ **mecamylamine.**

mecasermin [BAN, INN] (insulin-like growth factor 1 (human); human somatomedin C; FK 780) is a peptide with 70 amino acid residues and 3 disulphide bridges, and is related to insulin. It is one of the somatomedins, growth factors involved in mediating the effects of **growth hormone** in the body. It is available in a DNA technology recombinant form. It has been used as an alternative to growth hormone for dwarfism. Also, it is a diagnostic agent for acromegaly.

mechlorethamine ➡ **mustine.**

mechlorethamine hydrochloride ➡ **mustine.**

mecillinam [BAN, INN] (amdinocillin [USAN]) is a semisynthetic (penicillin) ANTIBIOTIC (chemically not a true penicillin as the side chain is not acylamino). It can be used clinically as an ANTIBACTERIAL to treat certain infections.

Meclan™ ➡ **meclocycline.**

meclizine ➡ **meclozine.**

meclizine hydrochloride ➡ **meclozine.**

meclocycline [BAN, INN, USAN] (meclocycline sulfosalicylate [USAN]; Meclan™) is a semisynthetic (tetracycline) ANTIBIOTIC. It can be used clinically as a broad-spectrum semisynthetic topical ANTIBACTERIAL AGENT to treat a variety of infections.

meclocycline sulfosalicylate ➡ **meclocycline.**

meclofenamate sodium ➡ **meclofenamic acid.**

meclofenamic acid [BAN, INN, USAN] (meclofenamate sodium [USAN]; CI 583; INF 4668; Meclomen™ and many other names) is an early member of the fenemate series, a

CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. The ethoxymethyl ester is terofenamate [INN].

meclofenoxate [BAN, INN] (meclofenoxate hydrochloride [JAN]; ANP 235) is a CNS STIMULANT that is claimed to aid tissue oxygen utilization and has been given to the elderly after strokes and head injury. It is a plant growth regulator.

meclofenoxate hydrochloride ➡ **meclofenoxate**.

Meclomen™ ➡ **meclofenamic acid**.

meclozine [BAN, INN] (meclizine [USAN]; meclizine hydrochloride [USAN]; Sea-Legs™ and many other names) is one of the piperazine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS with MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity and SEDATIVE effects. It is used particularly for its antinauseant and ANTIEMETIC activity, including for the treatment of motion sickness and vertigo.

mecobalamin [BAN, INN, JAN, USAN] (methylcobalamin) is a VITAMIN, a form of vitamin B_{12} found in the body. It has been used for peripheral nervous system disorders.

Mectizan™ ➡ **ivermectin**.

mecysteine ➡ **methyl cysteine**.

medazepam [BAN, INN, JAN] (medazepam hydrochloride [USAN]) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity, and has been used orally in the treatment of anxiety.

medazepam hydrochloride ➡ **medazepam**.

medetomidine [BAN, INN] (medetomidine hydrochloride [USAN]) is an imidazole derivative, a (selective α_2) α-ADRENOCEPTOR AGONIST. It can be used as a veterinary TRANQUILLIZER, SEDATIVE and ANALGESIC. The (*R*)-form of medetomidine, the pharmacologically active isomer, is dexmedetomidine.

medetomidine hydrochloride ➡ **medetomidine**.

medifoxamine [INN] is a monoamine UPTAKE INHIBITOR, which has been used as an ANTIDEPRESSANT.

Mediclear™ ➡ **benzoyl peroxide**.

medigoxin [BAN] (metildigoxin [INN, JAN]) is a methyl ether of **digoxin**. It is a CARDIAC GLYCOSIDE and CARDIAC STIMULANT.

Medihaler-Iso™ ➡ **isoprenaline**.

Medijel™ ➡ **aminacrine**.

medphalan ➡ **melphalan**.

medrogestone [BAN, INN, USAN] (AY 62022; NSC 123018; R 13615) is a synthetic steroid, a PROGESTOGEN, and has been used in HRT. It has also been used in ANTICANCER treatment of prostate and breast cancer.

medroglutaric acid ➡ **meglutol**.

medroxalol [BAN, INN, USAN] (medroxalol hydrochloride [USAN]) is a combined α-ADRENOCEPTOR ANTAGONIST and β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically as an ANTIHYPERTENSIVE.

medroxalol hydrochloride ➡ **medroxalol**.

medroxyprogesterone [BAN, INN] (medroxyprogesterone acetate [BAN, INN, USAN]; NSC 26386; Cycrin™; Depo-Provera™; Farlutal™; Provera™) is a synthetic steroid and analogue of **progesterone**. It is a PROGESTOGEN that is given by oily deep intramuscular injection for abnormal bleeding and fibroids, as an ANTICANCER AGENT for endometrial and renal cancer, and also by injection and orally as a CONTRACEPTIVE.

medroxyprogesterone acetate ➡ **medroxyprogesterone**.

medrysone [INN, USAN] (NSC 63278; HMS and many other names) is a CORTICOSTEROID, a GLUCOCORTICOID, with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically to treat inflammatory eye diseases.

mefenamic acid [BAN, INN, JAN, USAN] (Ponstan™; Ponstel™ and many other names) is an early member of the fenemate series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It is used primarily to treat mild to moderate pain and inflammation in rheumatoid arthritis, osteoarthritis and other musculoskeletal disorders, including juvenile arthritis. It is also used to treat dysmenorrhoea.

mefenidramium metilsulfate [INN] is an ethanolamine derivative, a HISTAMINE H_1-RECEPTOR ANTAGONIST, ANTITUSSIVE and ANTIEMETIC.

mefenorex hydrochloride [USAN] is an **amphetamine** analogue, a SYMPATHOMIMETIC which can be used as an APPETITE SUPPRESSANT. It shows serotonergic activity.

mefentanyl is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST which is an OPIOID ANALGESIC. It has been synthesized as a 'designer drug'; subject to abuse.

mefloquine [BAN, INN, USAN] (mefloquine hydrochloride [USAN]; Lariam™) is a 4-quinolinemethanol derivative, which clinically can be used as an ANTIMALARIAL AGENT.

mefloquine hydrochloride ➡ **mefloquine**.

Mefoxin™ ➡ **cefoxitin**.

mefruside [BAN, INN, JAN, USAN] (Baycaron™) has (thiazide-like) DIURETIC properties (though it lacks a thiazide ring system) and can be used in ANTIHYPERTENSIVE therapy and to treat oedema.

Megace™ ➡ **megestrol**.

megestrol [BAN, INN] (megestrol acetate [JAN, USAN]; BDH 1298; NSC 71423; Megace™) is a synthetic steroid, a PROGESTOGEN. It is used primarily as an oral ANTICANCER AGENT in oestrogen-dependent cancer (e.g. breast cancer or cancer of the endometrium of the uterus).

megestrol acetate ➡ **megestrol**.

meglumine [BAN, INN, JAN, USAN] is an organic base for the preparation of salts of organic acds used in the preparation of contrast media.

meglumine antimonate is a pentavalent antimony compound which can be used as an ANTILEISHMANIAL AGENT.

meglutol [INN, USAN] (dicrotalic acid; medroglutaric acid; CB 337; HMG) occurs free in *Crotalaria dura* and *Crotalaria globifera*. It is a biosynthesis precursor of isoprenoids, and is found in some cases of malonic aciduria. It has been used as an oral ANTIHYPERLIPIDAEMIC.

melanocyte-stimulating hormone (intermedine [INN]; melanotropin) consists of α- and β-forms of melanotropin. It is a PITUITARY HORMONE, the active principle from pituitary gland (pars intermedia). It causes dispersal of melanin granules in the skin. See **α-melanocyte-stimulating hormone** and **β-melanocyte-stimulating hormone**.

α-melanocyte-stimulating hormone (α-melanotropin; α-MSH) is a *13 residue peptide*, a PITUITARY HORMONE from neurohypophysis of pigs, cattle, horses and monkeys. A small number of species variants have been investigated. The endocrine effect in fish and amphibia is to darken the skin. The function in humans is not known.

β-melanocyte-stimulating hormone (β-melanotropin; β-MSH) is an *18 residue peptide* PITUITARY HORMONE isolated from neurohypophysis of pigs, cattle, horses and monkeys. A number of species variants are recognized (porcine, bovine, equine, monkey, human). The endocrine effect in fish and amphibia is to darken the skin. The function in humans is not known.

melanocyte-stimulating-hormone-release inhibiting factor ➡ **melanostatin**.

melanostatin (melanotropin release-inhibiting factor; prolylleucylglycinamide; melanocyte-stimulating-hormone-release inhibiting factor; MIF; MRIH) is a tripeptide HYPOTHALAMIC HORMONE which acts in the pituitary of various mammals, where it controls the release of **melanocyte-stimulating hormone** (melanotropin; see **α-melanocyte stimulating hormone**, **β-melanocyte stimulating hormone**). Its role in humans is not established, though it has been tried in the treatment of depression.

melanotropin ➡ **melanocyte-stimulating hormone**.

α-melanotropin ➡ **α-melanocyte stimulating hormone**.

β-melanotropin ➡ **β-melanocyte stimulating hormone**.

melanotropin release-inhibiting factor ➡ **melanostatin**.

melarsonyl potassium [BAN, INN] is an organic arsenical, an ANTIPROTOZOAL formerly used in antitrypanosomal treatment.

melatonin (*N*-acetyl-5-methoxytryptamine) is a hormone isolated from bovine pineal glands, where it is a product of tryptophan metabolism. Synthesis and secretion of melatonin is subject to photoperiodic control. As a hormone, it has potent effects on the control of seasonal reproduction in mammals, and may influence circadian rhythms in humans. It also has tumour-inhibiting properties, and a role in the immune system (under investigation). It is a MELATONIN RECEPTOR AGONIST (acting at Mel_{1A} & Mel_{1B} subtypes).

MELATONIN RECEPTOR AGONISTS act at sites recognizing the hormone melatonin (*N*-acetyl-5-methoxytryptamine) was first identified about 30 years ago as a secretory product of the pineal gland. In mammals, the daily rhythm of pineal melatonin synthesis is controlled by neural inputs, and is thought to be an internal *zeitgeber* (time-giver) for the circadian clock. The CNS is thought to be a primary target organ involved in mediating the influence of melatonin on a variety of physiological and behavioural processes, including biological rhythms, neuroendocrine function, activity patterns and sleep. It now appears that melatonin is also produced in the retina and affects various aspects of retinal physiology. There is increasing evidence for more than one site of action.

The development of novel melatonin receptor agonists and antagonists, high-affinity radioligands, quantitative bioassays and the recent cloning of melatonin receptors are all contributing information about melatonin receptors. The radioligand 2-[^{125}I]iodomelatonin binds to the suprachiasmatic nucleus, the site of the biological clock. Melatonin receptors in the mediobasal hypothalamus may be involved in the control of reproduction by melatonin. Receptors of the inner plexiform layer of the retina may be involved in retinal physiology.

An acute action of melatonin of much interest is a sedative activity not mediated by an interaction with benzodiazepine or cannabinoid receptors. There is hope of developing a new type of hypnotic agent from this approach. A rather different aspect, potentially of great importance, is the use of melatonin analogues for re-establishing the circadian sleep rhythm when this is disturbed; e.g. jet-lag, in the elderly and in disease (e.g. Alzheimer's disease).

Subtypes of melatonin receptor have been described. Though the nomenclature is in flux, there are two or three distinct melatonin receptors. The mt1 receptor (previously MEL_{1A}, ML_{1A}, Mel_{1a}) receptor have been cloned in mammals, as has the MT_2 receptor (previously Mel_{1B}, ML_{1B}, Mel_{1b}), and are products of different genes. Both MEL_{1A} and MEL_{1B} are seven-transmembrane segment G-protein-coupled receptors that couple negatively to adenylyl cyclase. There is a fair degree of sequence homology within these receptors (60% identical in human forms), but they are very different to other G-protein receptors, and may constitute a new receptor class. These receptors have only slightly different affinity orders for some analogues of melatonin. Further putative sites have been proposed ($MT_3 = MEL_2$). Agonist ligands include **melatonin**, **NAS** (*N*-acetyl-5-hydroxytryptamine, which is possibly an endogenous ligand), 2-iodomelatonin and 6-chloromelatonin. NAS is thought to be relatively selective for MT_3 receptors The agonist ligands **S 20098** and GR 196429 are subtype non-selective.

It seems very likely that there are important advances to be made in the application of melatonin agonists to the modification of sleep states and circadian rhythms. See also MELATONIN RECEPTOR ANTAGONISTS.

Sugden, D. (1994) Melatonin: binding site characteristics and biochemical and cellular responses. *Neurochem. Int.*, **24**, 147-157.

Dubocovich, M.L. (1995) Melatonin receptors: Are there multiple subtypes. *Trends Pharmacol. Sci.*, **16**, 50-56.

Hagan, R.M. *et al.* (1995) Melatonin comes of age. *Trends Pharmacol. Sci.* **16**, 81-83.

Reppert, S.M. *et al.* (1996) Melatonin receptors step into the light: cloning and classification of subtypes. *Trends Pharmacol. Sci.*, **17**, 100-102.

MELATONIN RECEPTOR ANTAGONISTS act at sites recognizing **melatonin**, and fall into two main groups, with distinct subtypes. The general properties (and nomenclature) are outlined in MELATONIN RECEPTOR AGONISTS. The tryptamine analogue **luzindole**, also 4P-CADOT and 4P-PDOT (tetraline derivatives) are antagonists at MT_2. At MT_3 receptors, **prazosin** shows some selectivity. The antagonists are not yet sufficiently developed to test possible therapeutic applications. Several classes of chemical agent are under development.

Garratt, P.J. *et al.* (1995) Mapping the melatonin receptor. 3. Design and synthesis of melatonin agonists and antagonists derived from 2-phenyltryptamines. *J. Med. Chem.*, **38**, 1132-1139.

Sugden, D. *et al.* (1995) Structural requirements at the melatonin receptor. *J. Pharmacol.*, **114**, 618-623.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

melinamide [INN, JAN] (AC 223; MBLA) is an octadecadienamide derivative, an acylcoenzyme A: cholesterol acyltransferase inhibitor, which can be used as an antihypercholesterolaemic agent.

melitracen [INN] (melitracen hydrochloride [JAN, USAN]; N 7001; U 24973A) is a tricyclic-related agent that has been used as an ANTIDEPRESSANT.

melitracen hydrochloride ➡ **melitracen**.

Melleril™ ➡ **thioridazine**.

'Mellow Drug of America' ➡ ***tenamfetamine***.

meloxicam [BAN, INN] (UH AC 62; Mobic™ and many other names) is a member of the oxicam series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It is used orally to treat pain and inflammation in rheumatoid arthritis, and for short-term exacerbation of osteoarthritis.

melperone [BAN, INN] is one of the butyrophenone group with general properties similar to **haloperidol**, and was formerly used as an ANTIPSYCHOTIC.

melphalan [BAN, INN, JAN, USAN] (alanine nitrogen mustard; phenylalanine lost; phenylalanine-mustard; L-PAM; L-sarcolysin; Alkeran™) is a *bis*chloroethylamine, an alkylating ANTICANCER AGENT. It is used orally or intravenously to treat myeloma and occasionally solid tumours and lymphomas. The (*R*)-(D)-form, which is less active, is called medphalan;

the racemic form is sarcolysin or merphalan.

memantine [INN] (dimethyladamantanamine; DMAA) is a derivative of **amantidine**, and is a (non-competitive NMDA) GLUTAMATE RECEPTOR ANTAGONIST. It has dopaminergic activity and has been used as an ANTIPARKINSONIAN AGENT, and is a possible NEUROPROTECTIVE AGENT.

memotine [INN] (memotine hydrochloride [USAN]) is an isoquinoline ANTIVIRAL, tested for influenza prophylaxis.

memotine hydrochloride ➡ **memotine**.

menadiol [BAN] (vitamin K_4) is a synthetic VITAMIN, a naphthoquinone analogue of vitamin K, which can be used therapeutically as a HAEMOSTATIC prothrombogenic agent, when it is mainly used in the form of its water-soluble salts, e.g. **acetomenaphthone**, menadiol potassium sulphate, menadiol sodium diphosphate, **menadiol sodium phosphate**, **menadiol sodium sulfate** and **potassium menaphthosulphate**. It also has ANTIOXIDANT properties and enhances activity of antineoplastic agents *in vitro*.

menadiol *bis*(dihydrogen phosphate) ➡ **menadiol sodium phosphate**.

menadiol diacetate ➡ **acetomenaphthone**.

medadiol disulphate ➡ **menadiol sodium sulfate**.

menadiol potassium sulphate ➡ **potassium menaphthosulfate**.

menadiol sodium diphosphate ➡ **menadiol sodium phosphate**.

menadiol sodium phosphate [BAN] (menadiol sodium diphosphate; menadiol *bis*(dihydrogen phosphate); menadiol tetra-Na salt; vitamin K_4 sodium; Synkavit™) is a synthetic VITAMIN, a water-soluble analogue of vitamin K, which can be used therapeutically as a HAEMOSTATIC prothrombogenic agent.

menadiol sodium sulfate [INN] (medadiol disulphate) is a synthetic VITAMIN, a water-soluble analogue of vitamin K, which can be used therapeutically as a HAEMOSTATIC prothrombogenic agent.

menadiol tetra-Na salt ➡ **menadiol sodium phosphate**.

menatetrenone [INN, JAN] is a naphthoquinone vitamin K substance, one of the antihaemorrhagic VITAMIN group necessary for normal blood coagulation. Also, it inhibits bone resorption via PGE_2 synthesis inhibition and other mechanisms.

menbutone [BAN, INN] (SC 1749) is a phthalenebutanoic acid derivative, which has been used as a CHOLERETIC AGENT.

menfegol [INN] (menphegol [JAN]) is a polymeric compound of methylphenyl ethers of macrogols, and is a nonionic surfactant used as a spermicide CONTRACEPTIVE.

menogaril [INN, USAN] (NSC 269148; U 52047; TUT 7; 7-omen; 7-con-omen) is an anthracene derivative reported to have actions similar to **doxorubicin**. It is under evaluation as an ANTICANCER AGENT.

Menorest™ ➡ **oestradiol**.

menotrophin [BAN] (menotropins [INN, USAN]; menotropinim; human menopausal gonadotrophin; Humegon™; Normegon™; Pergonal™) are preparations extracted from the urine of post-menopausal women. They contain both **luteinizing hormone** (LH) and **follicle-stimulating hormone** (FSH) (also PITUITARY HORMONES) in proportions dependent on the particular preparation (activity ratio (1:1) for menotrophin). They are given by injection and have various uses, including as an infertility treatment for women with proven hypopituitarism, or who do not respond to **clomiphene citrate**, and also in superovulation treatment in assisted conception (IVF).

menotropinim ➡ **menotrophin**.

menotropins ➡ **menotrophin**.

menphegol ➡ **menfegol**.

menthacamphor ➡ **menthol**.

***p*-menthadienone** ➡ **carvone**.

***p*-menthan-3-ol** ➡ **menthol**.

menthol (*p*-menthan-3-ol; hexahydrothymol) is found in many essential oils, in large amounts in peppermint oil (*Mentha piperita*) and also in other *Mentha* spp., *Artemisia* spp. and others. It is produced semisynthetically on an industrial scale. It is used in confectionery, perfumery, menthol cigarettes, inhalers etc. It is used in topical preparations as a mild local anaesthetic or COUNTER-IRRITANT (rubefacient or topical analgesic) for symptomatic relief of underlying pain, and as an antipruritic agent. It is used orally as a CARMINATIVE and anticolic agent. Of its isomers, a preferred form is levomenthol [BAN, INN] ((-)-menthol; menthacamphor; peppermint camphor).

(-)-menthol ➡ **menthol**.

Menzol™ ➡ **norethisterone**.

mepacrine [BAN, INN] (quinacrine hydrochloride [USAN]) can be used as an ANTIMALARIAL and ANTHELMINTIC. It also acts as a POTASSIUM-CHANNEL BLOCKER ($I_{SK(Ca)}$).

mepartricin [BAN, INN, USAN] (Mepartricin A) is a (polyene group) ANTIBIOTIC mixture with ANTIFUNGAL and ANTIPROTOZOAL activity. Clinically, it can be used topically, principally for candidiasis.

Mepartricin A ➡ **mepartricin**.

mepenzolate bromide [BAN, INN, JAN] (Cantil™) is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as an ANTISPASMODIC and as an adjunct in treating peptic ulcer.

meperidine hydrochloride ➡ **pethidine**.

mephenesin [BAN, INN] is a tolyl ether, one of a series of similar agents, and is a SEDATIVE/TRANQUILLIZER which can be used as a (CNS-acting) SKELETAL MUSCLE RELAXANT in management of muscular spasm states.

mephenoxalone [INN] is an oxazolidinone derivative, with actions similar to **mephanesin**. It is a SEDATIVE/TRANQUILLIZER which can be used as a centrally acting SKELETAL MUSCLE RELAXANT in management of muscular spasm states.

mephentermine [BAN, INN] (mephentermine sulfate [USAN]; Aramine™; Wyamine™) is an (indirect-acting) SYMPATHOMIMETIC with VASOCONSTRICTOR properties. It can be used as a hypertensive to maintain blood pressure in HYPOTENSIVE states.

mephentermine sulfate ➡ **mephentermine**.

mephenytoin ➡ **methoin**.

mephobarbital ➡ **methylphenobarbitone**.

mepindolol [BAN, INN] is a β-ADRENOCEPTOR ANTAGONIST. Chemically, it is the 2-methyl analogue of **pindolol**, and can be used in ANTIHYPERTENSIVE treatment.

mepirizole ➡ **epirizole**.

Mepirzapin™ ➡ **mirtazapine**.

mepitiostane [INN, JAN] (S 10364) is a steroid with ANABOLIC and ANTIOESTROGEN activity. It has been used as an oral ANTICANCER AGENT for breast cancer.

mepivacaine [BAN, INN] (mepivacaine hydrochloride [USAN]; Carbocaine™; Polocaine™; Scandonest™) is an ester series LOCAL ANAESTHETIC with a rapid onset and intermediate duration of action. It is used by injection for infiltration, dental, regional and epidural pain relief and motor block.

mepivacaine hydrochloride ➡ **mepivacaine**.

mepixanox [INN] is a CNS STIMULANT and RESPIRATORY

STIMULANT.

meprednisone ➡ **methylprednisolone**.

meprednisone hydrogen succinate ➡ **methylprednisolone**.

meprobamate [BAN, INN] (Equanil™; Miltown™) is a carbamate with SEDATIVE/TRANQUILLIZER action. It can be used as an ANXIOLYTIC and also as a centrally-acting SKELETAL MUSCLE RELAXANT. It has abuse potential.

meprochol [BAN] is a MUSCARINIC CHOLINOCEPTOR AGONIST with potent PARASYMPATHOMIMETIC actions.

meprodine is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC. It can be used in the form of diastereoisomers: alphameprodine [BAN, INN], or betameprodine [BAN, INN].

Mepron™ ➡ **atovaquone**.

meproscillarin [BAN, INN] (methylproscillaridin) is the semisynthetic methyl ester derivative of proscillaridin, an (inoptropic) CARDIAC STIMULANT similar to **digoxin**.

meprylcaine [INN] (meprylcaine hydrochloride [USAN]) is an ester series LOCAL ANAESTHETIC which has been used in dentistry.

meprylcaine hydrochloride ➡ **meprylcaine**.

meptazinol [BAN, INN] (meptazinol hydrochloride [USAN]; Wy 22811; Meptid™) is a novel azepinylphenol, an OPIOID RECEPTOR AGONIST which is used as an OPIOID ANALGESIC to treat moderate to severe pain, including pain in childbirth, renal colic or following surgery.

meptazinol hydrochloride ➡ **meptazinol**.

Meptid™ ➡ **meptazinol**.

mepyramine [BAN, INN] (pyrilamine [USAN]; pyrilamine maleate [USAN]; Anthisan™) is one of the ethylenediamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS, with MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity and SEDATIVE effects. It has been used orally to treat hypersensitivity reactions, including urticaria and rhinitis, and in veterinary practice. There are a number of topical preparations to treat urticaria, insect bites etc. (e.g. Wasp-Eze™, with **benzocaine**). It is much used as a pharmacological tool. There also is a compound with bromotheophylline = pyrabrom [USAN].

mequitamium iodide ➡ **mequitazine**.

mequitazine [BAN, INN, JAN] (mequitamium iodide [INN]; Primalan™) is one of the phenothiazine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS, with MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity and SEDATIVE effects (though less than some of this series). It has been used orally to treat hypersensitivity reactions, including urticaria and rhinitis.

meractinomycin ➡ **dactinomycin**.

meralluride [BAN, INN] is a (mercurial) DIURETIC formerly used clinically.

Merbentyl™ ➡ **dicyclomine**.

merbromin [INN] (mercurochrome [JAN]) is a mercurifluorescein compound with ANTIBACTERIAL and ANTISEPTIC properties.

mercaptamine ➡ **cysteamine**.

2-mercaptoadenosine ➡ **2-thioadenosine**.

mercaptomerin ➡ **mercaptomerin sodium**.

mercaptomerin sodium [BAN] (mercaptomerin [INN]) is a (mercurial) DIURETIC formerly used clinically.

2-mercaptomethyl-3-guanidinoethylthiopropanoic acid ➡ **MERGETPA**.

mercaptopurine [BAN, INN, USAN] (NSC 755; WR 2785; Puri-Nethol™; Purinethol™) is an antimetabolite cytotoxic agent that interferes with cell replication. It is used in oral ANTICANCER treatment of acute leukaemias.

3-mercaptovaline ➡ **penicillamine**.

mercuderamide [INN] (Me ether, Na salt = mersalyl [INN]; Salyrgan™) is a (mercurial) DIURETIC formerly used clinically. It is a thiol-reactive agent used as a pharmacological tool in the study of sulphydryl-mediated pathways.

mercurobutol [INN] is an organic mercurial ANTISEPTIC with ANTIFUNGAL properties. It can be used topically

mercurochrome ➡ **merbromin**.

mercurophylline ➡ **mercurophylline sodium**.

mercurophylline sodium [BAN] (mercurophylline [INN]) is a (mercurial) DIURETIC.

MERGETPA (MGTA; 2-mercaptomethyl-3-guanidinoethylthiopropanoic acid) is a CARBOXYPEPTIDASE INHIBITOR of the mercapto group, and is active against the proteases, carboxypeptidase H (EC 3.4.27.10) and carboxypeptidase N (EC 3.4.17.3; kininase I). It can be used as an analytical tool in biochemistry and pharmacology.

mergocriptine [INN] is an ergot alkaloid **ergocryptine** derivative, and is a cerebral VASODILATOR. Also, it suppresses lactation as a PROLACTIN RELEASE INHIBITOR.

Merocet™ ➡ **cetylpyridinium chloride**.

Meronem™ ➡ **meropenem**.

meropenem [BAN, INN] (Meronem™) is a semisynthetic (carbapenem/β-lactam) ANTIBIOTIC similar to **imipenem**, but is stable to the renal enzyme which inactivates the latter (and therefore can be given without **cilastatin**). Clinically, it possesses a broad-spectrum of ANTIBACTERIAL activity.

merphalan ➡ **melphalan**.

mersalyl ➡ **mercuderamide**.

mesalamine ➡ **mesalazine**.

mesalazine [BAN, INN] (mesalamine [USAN]; 5-aminosalicylic acid; 5-ASA; Asacol™; Pentasa™; Rowasa™; Salofalk™) is one of the aminosalicylate group, an ANTIINFLAMMATORY and ANTICOLITIS AGENT used for treatment of ulcerative colitis. Esters are used as a sunscreen agent.

Mesantoin™ ➡ **methoin**.

mescal ➡ **mescaline**.

mescaline (trimethoxybenzeneethanamine; TMPEA) is an alkaloid of mescal from the peyote cactus (*Lophophora williamsii*), *Trichocereus* spp., *Gymnocalycium gibbosum*, *Opuntia cyclindrica* and other spp. in the Cactaceae. It is a PSYCHOTROPIC (hallucinogenic) agent, though to exert its action through interaction with monoamine neurotransmitters and their receptors. There are a number of related compounds: *N*-formylmescaline, an alkaloid from mescal; *N*-acetylmescaline, an alkaloid from mescal (*Lophophora williamsii*) a metabolite of mescaline; *N*-methylmescaline, an alkaloid from *Alhagi pseudalhagi* and *Pelecyphora aselliformis* (Leguminosae, Cactaceae).

mesna [BAN, INN, USAN] (MESMA; NSC 113891; UCB 3983; Ifex/Mesnex™; Uromitexan™ and many other names) is a mercaptosulphonic compound, which forms free thiol groups in solution that react like CHELATING AGENTS to bind toxic elements (e.g. in arsenic poisoning) or toxic groups of certain drugs, including ANTICANCER AGENTS and especially **cyclophosphamide** and **ifosfamide** to alleviate urotoxic side-effects. Also, it is a MUCOLYTIC AGENT.

mesna disulphide ➡ **dimesna**.

meso-inositol ➡ **myo-inositol**.

mesotocin ([Ile^8]oxytocin) is a (neurohypophyseal) PITUITARY HORMONE isolated from the brain and blood of mammals, birds and reptiles. It is a synthetic analogue of **oxytocin**, an agonist at oxytocin receptors ((OT) VASOPRESSIN RECEPTOR AGONIST) and has OXYTOCIC activity.

See also **argiprestocin**.

mesterolone [BAN, INN, USAN] (NSC 75054; SH 60723; Pro-Viron™) is a steroid with ANDROGEN properties. Clinically, it may be administered orally to treat hormonal deficiency, e.g. for delayed puberty in boys.

Mestinon™ ➡ pyridostigmine bromide.

mestranol [BAN, INN, USAN] (CB 8027; EE3ME; L 33355; RS 1044) is a synthetic steroid OESTROGEN, a constituent in many combined oral CONTRACEPTIVES, and also used in oral HRT.

mesulergine [INN] is an ergoline amine derivative, a (5-HT_{2C}) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST and DOPAMINE RECEPTOR ANTAGONIST.

mesulfen ➡ mesulphen.

mesulphen [BAN] (mesulfen [INN]) is used as a SCABICIDE in the treatment of skin infections.

Met ➡ methionine.

metabarbital ➡ metharbitone.

metabromsalan [INN, USAN] is a bromosalicylic acid derivative used as a DISINFECTANT and ANTHELMINTIC.

metaclazepam [INN] (KC 2547) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. Clinically, it has been used orally in the treatment of anxiety.

metacortandracin ➡ prednisone.

metacycline ➡ methacycline.

metahexamide [BAN, INN] is one of the sulphonylurea group of (oral) HYPOGLYCAEMICS. It can be used as an ANTIDIABETIC in non-insulin-dependent diabetes mellitus (NIDDM).

Metahydrin™ ➡ trichlormethiazide.

metalol [INN] (metalol hydrochloride [USAN]) is a β-ADRENOCEPTOR ANTAGONIST.

metalol hydrochloride ➡ metalol.

metamfetamine ➡ methylamphetamine hydrochloride.

metamizole sodium ➡ dipyrone.

metampicillin [INN] is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat certain infections.

metandienone [INN] is a steroid, with ANABOLIC properties more pronounced than its ANDROGEN effects, and with little PROGESTOGEN activity. It has been used orally as an anabolic for the relief of pain associated with osteoporosis.

metaniazide ➡ methaniazide.

metapramine [INN] is one of the tricyclic class of monoamine UPTAKE INHIBITORS and has been used as an oral ANTIDEPRESSANT.

metaproterenol sulfate ➡ orciprenaline.

metaraminol [BAN, INN, USAN] (metaraminol bitartrate [USAN]; Aramine™) is a phenylethylamine derivative with both direct and indirect SYMPATHOMIMETIC activity with predominant α-ADRENOCEPTOR AGONIST actions. It can be used as a hypertensive to treat acute HYPOTENSIVE states; also, it can be used to treat priapism.

metaraminol bitartrate ➡ metaraminol.

Metastron™ ➡ strontium chloride.

metaxalone [BAN, INN, USAN] (Skelaxin™) is an oxazolidinone derivative, a SEDATIVE/TRANQUILLIZER which can be used as a centrally acting SKELETAL MUSCLE RELAXANT in management of muscular spasm states.

metazocine [BAN, INN] (NIH 7410) is one of the benzomorphan series, an OPIOID RECEPTOR AGONIST that is an OPIOID ANALGESIC.

meteneprost [INN, USAN] (U 46785) is a prostaglandin and synthetic analogue of **dinoprostone** (PGE_2) and is a PROSTANOID RECEPTOR AGONIST. It is a LUTEOLYTIC AGENT and OXYTOCIC (uterine stimulant). It has been used in early pregnancy by application to the cervix by pessary in the therapeutic abortion procedure.

Metenix™ ➡ metolazone.

metenolone ➡ methenolone.

metergoline [BAN, INN] (methergoline; FI 6337) is an ergoline amine derivative, a DOPAMINE RECEPTOR ANTAGONIST with 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST activity. It has been used as a PROLACTIN RELEASE INHIBITOR.

metformin [BAN, INN, USAN] (Glucophage™) is one of the biguanide group of (oral) HYPOGLYCAEMICS that (unlike the sulphonylureas) act mainly by decreasing gluconeogenesis and by increasing peripheral utilization of glucose. It is only effective in diabetics with some residual functioning in the pancreatic islet cells. It can be used as an ANTIDIABETIC in Type 2 diabetes mellitus.

methacholine bromide ➡ methacholine chloride.

methacholine chloride [BAN, INN] (methacholine bromide; Betacholyl™; Provocholine™) is a quaternary ammonium compound, a MUSCARINIC CHOLINOCEPTOR AGONIST and PARASYMPATHOMIMETIC. It can be used as a MIOTIC AGENT and as a bronchoconstrictor in specialist testing of airways reactivity and as a diagnostic agent for asthma and airways hyperactivity.

methacycline [BAN, USAN] (metacycline [INN]; methacycline hydrochloride [USAN]) is a semisynthetic (tetracycline) ANTIBIOTIC. It can be used clinically as a broad-spectrum semisynthetic topical ANTIBACTERIAL for certain infections.

methacycline hydrochloride ➡ methacycline.

methadol ➡ dimepheptanol.

methadone [BAN, INN] (methadone hydrochloride [USAN]; AN 148; Amidone™; Dolophine™; Methadose™; Physeptone™) the archetypal member of the methadone-series of analgesics, of which there are now many examples, with a characteristic substituted quaternary carbon. It is a (mainly μ) OPIOID RECEPTOR AGONIST which is active as an OPIOID ANALGESIC. It has a similar potency to morphine as an analgesic, but has a considerably longer duration of action and is generally less sedative. It is used orally in the treatment of heroin dependency to stablize dependence and to suppress withdrawal symptoms. Methadone is the (*S*)-(±)-form, but the (*R*)-form, levomethadone [INN], has also been used.

methadone hydrochloride ➡ methadone.

Methadose™ ➡ methadone.

methadyl acetate ➡ dimepheptanol.

methallenestril ➡ methallenoestril.

methallenoestril [BAN] (methallenestril [INN]) is a synthetic steroid OESTROGEN, formerly used for menstrual problems.

methandriol [INN] is a steroid with ANABOLIC and ANDROGEN properties.

methaniazide [INN] (metaniazide) is the methanesulfonate derivative of **isoniazid**, with ANTIBACTERIAL properties. It is used as an ANTITUBERCULAR treatment in conjunction with other drugs.

methantheline bromide ➡ methanthelinium bromide.

methanthelinium bromide [BAN, INN] (methantheline bromide [USAN]) is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as an ANTISPASMODIC and ANTIULCEROGENIC AGENT.

methapyrilene [BAN, INN] (methapyrilene hydrochloride; thenylene; thenylpyramine; Histadyl™ and many other

names) is one of the ethylenediamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS which have SEDATIVE effects. It is a reported carcinogen in animals and is now little used.

methapyrilene hydrochloride ➡ **methapyrilene.**

methaqualone [BAN, INN, USAN] (B 100; formerly Quaalude™) is a quinazolinone derivative with HYPNOTIC and SEDATIVE properties. It has been used orally in the treatment of insomnia, but has been withdrawn in many countries since it is subject to abuse. A compound preparation with **diphenhydramine** (Mandrax™) was particularly subject to abuse.

metharbital ➡ **metharbitone.**

metharbitone [BAN] (metharbital [INN]; Sch 412; metabarbital) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **phenobarbitone**. It has been used as an ANTICONVULSANT in status epilepticus and as an ANTIEPILEPTIC AGENT.

methazolamide [BAN, INN] (Neptamox™; Neptazane™) chemically, is a sulphonamide derivative, a CARBONIC ANHYDRASE INHIBITOR that can be used as a DIURETIC. It can also be used in ANTIGLAUCOMA TREATMENT.

methazolastone ➡ **temozolomide.**

methdilazine [BAN, INN, USAN] (methdilazine hydrochloride [USAN]) is one of the phenothiazine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS, with MUSCARINIC CHOLINOCEPTOR ANTAGONIST, SEDATIVE and reported 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST activity. It has been used orally to treat hypersensitivity reactions, including rhinitis, as an antipruritic and to treat urticaria.

methdilazine hydrochloride ➡ **methdilazine.**

methenamine ➡ **hexamine hippurate.**

methenamine hippurate ➡ **hexamine hippurate.**

methenamine mandelate ➡ **hexamine hippurate.**

methenolone [BAN] (metenolone [INN]; methenolone acetate [USAN]; methenolone enanthate [USAN]; NSC 64967; SH 601; SQ 16374) is a steroid with ANABOLIC and ANDROGENIC properties. It has been used in bone-marrow disease and anaemia.

methenolone acetate ➡ **methenolone.**

methenolone enanthate ➡ **methenolone.**

Methergin™ ➡ **methylergometrine.**

methergoline ➡ **metergoline.**

Met-HGH ➡ **human pituitary growth hormone.**

methicillin [BAN] (meticillin [INN]; methicillin sodium [USAN]; meticillin sodium [JAN]; Staphcillin™) is a semisynthetic (penicillin) ANTIBIOTIC, the first to be resistant to β-lactamase. It can be used clinically as an ANTIBACTERIAL to treat certain infections.

methicillin sodium ➡ **methicillin.**

methimazole [BAN] (thiamazole [INN]; Tapazole™) is one of the thionamide (thioureylene) series of ANTITHYROID AGENTS that act on the thyroid gland to reduce the production of the thyroid hormones. It is used orally to treat hyperthyroidism (Graves' disease) and its detrimental effects (thyrotoxicosis).

methionine [INN] (*S*-methylhomocysteine; Met) is a dietary amino acid. It is used as an ANTIDOTE to an overdose of **paracetamol**. It is used to prevent serious toxic effects on the liver that take several days to develop, but must be started immediately after the overdose has been taken. Oral methionine is used until the more effective **acetylcysteine** can be given by intravenous infusion.

methionine enkephalin ➡ **enkephalins.**

methionyl human growth hormone ➡ **human pituitary growth hormone.**

N^2-L-methionylinterleukin I receptor antagonist (human isoform x reduced) ➡ **anakinra.**

methisazone [BAN, USAN] is a semicarbazide ANTIVIRAL that clinically has been used for smallpox prophylaxis and eczema treatment.

methixene [BAN] (metixene [INN]; methixene hydrochloride [USAN]; metixene hydrochloride [JAN]) is a tertiary amine with direct ANTISPASMODIC propertes. It can be used as an ANTIPARKINSONIAN AGENT.

methixene hydrochloride ➡ **methixene.**

methocarbamol [BAN, INN] (Robaxin™) is a carbamate of phenoxypropanediol. It can be used as a (CNS-acting) SKELETAL MUSCLE RELAXANT in management of muscular spasm states.

methohexital ➡ **methohexitone.**

methohexital sodium ➡ **methohexitone.**

methohexitone [BAN] (methohexital [INN, USAN]; methohexital sodium [USAN]; Brietal™; Brietal Sodium™; Brevital™) is a barbiturate used for intravenous induction of anaesthesia, or as an intravenous GENERAL ANAESTHETIC for short operations.

methoin [BAN] (mephenytoin [INN, USAN]; NSC 34652; Mesantoin™ and many other names) is one of the hydantoin series, similar to **phenytoin**, and acts as a use-dependent SODIUM-CHANNEL BLOCKER that modulates opening in neurons and attenuating high-frequency action potential firing. It has ANTICONVULSANT properties and is used as an ANTIEPILEPTIC (with restricted use due to potential toxicity; it has been discontinued in some countries).

methopholine ➡ **metofoline.**

methoprene [ANSI, BSI, INN, ISO] is an INSECTICIDE used for flea-control in domestic cats and dogs.

methopyrimazole ➡ **epirizole.**

methoserpidine [BAN, INN] is an alkaloid related to **reserpine** and with similar actions. It can be used as an ANTIHYPERTENSIVE and ANTIPSYCHOTIC.

methotrexate [BAN, INN, USAN] (amethopterin; CL 14377; MTX; NSC 740; Folex™; Rheumatrex™; Matrex™; Methotrexate™ and many other names) is a folic acid derivative that acts as a DIHYDROFOLATE REDUCTASE INHIBITOR. It is an antimetabolite cytotoxic agent used orally or by injection as an ANTICANCER AGENT for childhood acute lymphoblastic leukaemia, and also to treat other lymphomas, choriocarcinoma and some solid tumours. It is also used as an IMMUNOSUPPRESSANT to treat rheumatoid arthritis and sometimes for severe resistant psoriasis.

Methotrexate™ ➡ **methotrexate.**

methotrimeprazine [BAN, USAN] (levomepromazine [INN]; Bayer 1213; Nozinan™; Levoprome™) is a phenothiazine used as an ANTIPSYCHOTIC to tranquillize patients suffering from psychotic disorders, such as schizophrenia, and also to calm and soothe patients with a terminal illness.

methoxamine [BAN, INN] (methoxamine hydrochloride [USAN]; Vasoxine™) is a phenylethanolamine, an α-ADRENOCEPTOR AGONIST with VASOCONSTRICTOR and hypertensive activity. Clinically, it can be is used as an antihypotensive to maintain blood pressure during anaesthesia.

methoxamine hydrochloride ➡ **methoxamine.**

methoxsalen [BAN] (zanthotoxin; 8-methoxypsoralen; 8-MOP™; Oxsoralen™) is isolated from *Cnidium dubium*, *Ammi majus* (Umbelliferae) and a number or other plants. It is a photosensitizer used as a DERMATOLOGICAL AGENT in UV light ANTIINFLAMMATORY phototherapy for psoriasis and other skin disorders. It also has radioprotective actions.

methoxyflurane [BAN, INN, USAN] (DA 7591; NSC 110432; Penthrane™) is a halogenated ether and volatile liquid. It is used as an inhalation GENERAL ANAESTHETIC.

3-methoxyiminoquinuclidinium chloride (Org 32763) is a MUSCARINIC CHOLINOCEPTOR AGONIST investigated for possible use in cholinergic replacement therapy for Alzheimer's disease.

methoxymethylenedioxyamphetamine ➡ MMDA.

methoxyphenamine [BAN, INN] (methoxyphenamine hydrochloride [USAN]) is a β-ADRENOCEPTOR AGONIST that therapeutically can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.

methoxyphenamine hydrochloride ➡ **methoxyphenamine**.

8-methoxypsoralen ➡ **methoxsalen**.

methscopolamine bromide ➡ **hyoscine methobromide**.

methsuximide [BAN] (mesuximide [INN]; PM 396; Celontin™) is a succinimide ANTICONVULSANT used in ANTIEPILEPTIC treatment for absence (petit mal) seizures that are refractory to other drugs.

methyclothiazide [BAN, INN, USAN] (Enduron™) is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy and to treat oedema.

methylamphetamine hydrochloride (metamfetamine [INN]; deoxyephedrine) is the *N*-methyl derivative of **amphetamine**.

methyl aspartylphenylalanine ➡ **aspartame**.

9β-methylcarbacyclin ➡ **ciprostene**.

methyl CCNU ➡ **semustine**.

methylcobalamin ➡ **mecobalamin**.

methyl cysteine [BAN] (mecysteine [INN]; methyl cysteine hydrochloride; Visclair™) is a cysteine derivative, a MUCOLYTIC and EXPECTORANT used in treating respiratory disorders characterized by viscous or excessive mucus. It has some VASOCONSTRICTOR properties.

methyl cysteine hydrochloride ➡ **methyl cysteine**.

***N*-methyldeacetylcolchicine** ➡ **demecolcine**.

methyldopa [BAN, INN, USAN] (α-methyldopa; Aldomet™; ethyl ester = methyldopate [BAN]; ethyl ester hydrochloride = methyldopate hydrochloride [USAN]) is a centrally acting ANTIHYPERTENSIVE AGENT.

α-methyldopa ➡ **methyldopa**.

***N*-methyldopamine** ➡ **epinine**.

methyldopate ➡ **methyldopa**.

methyldopate hydrochloride ➡ **methyldopa**.

α,β-methylene-ATP a *synthetic analogue* of **ATP**, is a PURINE P2 RECEPTOR AGONIST, particularly active at the $P2_{X1}$ receptor subtype (but with rapid desensitization). It is used as a pharmacological tool in purine receptor classification and mechanistic studies.

methylene blue ➡ **methylthioninium chloride**.

methylenedioxyamphetamine ➡ **tenamfetamine**.

3,4-methylenedioxymethylamphetamine ➡ MDMA.

methylergometrine [BAN, INN] (methylergonovine maleate [USAN]; Methergin™) is a semisynthetic analogue of **ergometrine**, and is used for similar purposes. It is an OXYTOCIC AGENT used in childbirth, mainly postpartum as a HAEMOSTATIC to limit blood loss.

methylergonovine maleate ➡ **methylergometrine**.

α-methylfentanyl is a **fentanyl** analogue of the *phenylpiperidine series*, an (μ) OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC. It is sometimes illegally synthesized and used as a drug of abuse.

methylgenistein ➡ **genistein**.

methylglyoxal bisguanylhydrazone ➡ **mitoguazone**.

α-methylhistamine is a substituted **histamine** analogue, a potent and selective (H_3) HISTAMINE RECEPTOR AGONIST which crosses the blood–brain barrier. The (*R*)-form is the pharmacologically active isomer. It is used as a pharmacological tool.

***N*-methylhistamine** (ω-N-methyl histamine) is a **histamine** analogue, and a constituent of the skin of amphibians, e.g. *Nictimystes disrupta, Litoria glandulosa* and *Leptodactylus pentadactylus labyrinthicus*. It is a HISTAMINE RECEPTOR AGONIST, and is used as a pharmacological tool.

ω-N-methyl histamine ➡ **N-methylhistamine**.

methylhomatropine bromide ➡ **homatropine methylbromide**.

***S*-methylhomocysteine** ➡ **methionine**.

methylisogenistin ➡ **genistein**.

***N*-methylmescaline** ➡ **mescaline**.

methylmorphine ➡ **codeine**.

α-methylnoradrenaline ➡ **levonordefrin**.

methylpentynol [BAN, INN] is an acetylenic carbinol, with HYPNOTIC and SEDATIVE properties. It has been used in the treatment of insomnia and as an ANXIOLYTIC.

methyl-PGE_2 ➡ **arbaprostil**.

methylphenidate [BAN, INN] (methylphenidate hydrochloride [JAN, USAN]; Ritalin™) is a CNS STIMULANT and dopamine (re) UPTAKE INHIBITOR. It is used in the treatment of attention-deficit hyperactivity disorder in children.

methylphenidate hydrochloride ➡ **methylphenidate**.

methylphenobarbital ➡ **methylphenobarbitone**.

methylphenobarbitone [BAN] (methylphenobarbital [INN]; mephobarbital [USAN]; Mebaral™; Prominal™) is a barbiturate which is largely converted in the liver to **phenobarbitone** and therefore has similar actions. It has general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone** but of longer duration. It is used as an ANTICONVULSANT in ANTIEPILEPTIC treatment to treat all forms of epilepsy (except absence seizures), and also as an ANXIOLYTIC.

methylprednisolone [BAN] (meprednisone [INN, USAN]; meprednisone hydrogen succinate; NSC 527579; Sch 4358; Depo-Medrone™) is a CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used orally or by injection to relieve the inflammation of allergic reaction, to treat cerebral oedema, shock, rheumatic disease and topically for inflammatory skin disorders such as eczema. It can be used by injection with local anaesthetics (Depo-Medrone with Lidocaine™).

methylproscillaridin ➡ **meproscillarin**.

methylrosanilinium chloride ➡ **crystal violet**.

methyl salicylate (oil of wintergreen) is an oil with a characteristic odour found in the leaves of *Gaultheria procumbens* (Ericaceae) and the bark of *Betula lenta* (Betulaceae). It is the methyl ester of **salicylic acid**, one of the salicylate series of NSAID ANALGESICS. It has ANTIPYRETIC and weak ANTIINFLAMMATORY actions, but is a gastric irritant and is not normaly used by this route. It is used topically as a COUNTER-IRRITANT (rubefacient or topical analgesic) for symptomatic relief of underlying pain. It is a component of some compound topical preparations.

methyltestosterone [BAN, INN] (NSC 9701; Android-10™; Oretin Methyl™) is a steroid, an orally active

ANDROGEN and ANABOLIC AGENT. It can be used in HRT in hypogonadism, and in ANTICANCER therapy for breast cancer.

methyltheobromine ➡ **caffeine**.

methylthioAMP ➡ **2-methylthio-AMP**.

2-methylthio-AMP (methylthioAMP) is an *adenosine derivative*, a (P1 purinoceptor) ADENOSINE RECEPTOR AGONIST. It is a PLATELET AGGREGATION INHIBITOR and ANTITHROMBOTIC agent; used as a tool in adenosine receptor studies.

methylthioninium chloride [INN] (methylene blue [USAN]; Swiss blue; calcozine blue ZF; C.I. Basic blue 9; C.I. 52015 and many other names) is a bacteriological stain, a redox indicator, antimethaemoglobinaemic, an ANTIDOTE for methaemoglobinaemic agents. As an ANTIBACTERIAL and ANTISEPTIC it can be used to treat genital herpes.

methylthiouracil [INN] is one of the thionamide (thioureylene) series of ANTITHYROID AGENTS that act on the thyroid gland to reduce the production of the thyroid hormones. It has been used orally to treat hyperthyroidism (Graves' disease) and its detrimental effects (thyrotoxicosis).

8-methyltocol ➡ **δ-tocopherol**.

methyltyramine ➡ **hydroxyamphetamine**.

α-methyltyrosine ➡ **metirosine**.

methyl violet ➡ **crystal violet**.

methyprylone [BAN] (methyprylon [INN]; Ro 1-6463) is a piperidinedione with action similar to **glutethimide**, and was used as a HYPNOTIC and SEDATIVE.

methyprylon ➡ **methyprylone**.

methyridine [BAN] (metyridine [INN]) is an ANTHELMINTIC which is no longer marketed.

methysergide [BAN, INN, USAN] (methysergide maleate [USAN]; dimethylergometrine; Deseril™) is an ergot alkaloid derivative, a non-selective 5-HYDROXYTRYPTAMINE ANTAGONIST or partial agonist with VASOCONSTRICTOR properties. It is used in ANTIMIGRAINE prophylaxis (severe cases of cluster headache or refractory migraine).

methysergide maleate ➡ **methysergide**.

metiamide [BAN, INN, USAN] (SKF 92058) is an imidazolylthiourea, a HISTAMINE H_2-RECEPTOR ANTAGONIST, GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.

metiazinic acid [INN, JAN] (RP 16091) is chemically a phenothiazine and an ANTIINFLAMMATORY and antirheumatic agent.

meticillin ➡ **methicillin**.

meticillin sodium ➡ **methicillin**.

metildigoxin ➡ **medigoxin**.

metioprim [BAN, INN, USAN] is a DIHYDROFOLATE REDUCTASE INHIBITOR which is active as an ANTIBACTERIAL.

metipranolol [BAN, INN, USAN] is a β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically as an ANTIHYPERTENSIVE, ANTIANGINAL, ANTIARRHYTHMIC and in ANTIGLAUCOMA TREATMENT.

metirosine [BAN, INN] (metyrosine [USAN]; α-methyltyrosine; Demser™) is an ENZYME INHIBITOR, a tyrosine hydroxylase inhibitor that acts as an ANTISYMPATHETIC by inhibiting the rate-limiting stage in the endogenous biosynthesis of noradrenaline and other catecholamines. It can be used as an ANTIHYPERTENSIVE, especially in treating phaeochromocytoma. Metirosine is the (*S*)-((L))-form; the racemate is racemetirosine [INN].

metixene ➡ **methixene**.

metixene hydrochloride ➡ **methixene**.

metkefamide [INN] (metkephamid acetate [USAN]; LY 127623; BCW59-A) is a synthetic pentapeptide analogue of **enkephalin**, and is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

metkephamid acetate ➡ **metkefamide**.

metoclopramide [BAN, INN, JAN] (metoclopramide hydrochloride [JAN, USAN]; Gastrobid™; Gastroflux™; Gastromax™; Maxolon™; Migravess™; Paramax™; Parmid™; Primperan™; Reglan™) is a substituted benzamide, which acts as a DOPAMINE RECEPTOR ANTAGONIST, also with (5-HT_3) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST actions. It is an effective ANTIEMETIC and antinauseant with useful GASTRIC MOTILITY STIMULANT (prokinetic) properties. It can be used orally or by injection to prevent vomiting caused by gastrointestinal disorders, antimigraine treatment or chemotherapy or radiotherapy (in anticancer therapy). It enhances the strength of oesophageal sphincter contraction (preventing regurgitation), stimulates emptying of the stomach and increases the rate at which food is moved along the intestine. These last actions lead to its use in non-ulcer dyspepsia, gastric stasis and to prevent reflux oesophagitis.

metoclopramide hydrochloride ➡ **metoclopramide**.

metocurine iodide [USAN] (metubine iodide; curane B) is a derivative of an alkaloid from the stem and bark of *Chondodendron tomentosum* and from the roots of *Cyclea madagascariensis* (Menispermaceae). It is a NICOTINIC CHOLINOCEPTOR ANTAGONIST, a (competitive) neuromuscular blocking agent which can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia.

metofoline [BAN, INN] (methopholine [USAN]; NIH 7672; Ro 4-1778) is a methylisoquinoline, and an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

metolazone [BAN, INN, JAN, USAN] (Metenix™; Zaroxolyn™ etc.) is a (quinazoline) DIURETIC with thiazide-like properties, which can be used in ANTIHYPERTENSIVE therapy and to treat oedema.

metomidate [BAN, INN] is an imidazolecarboxylate, a veterinary SEDATIVE.

metopimazine [BAN, INN, USAN] (RP 9965) is a phenothiazine, and has been used as an ANTIEMETIC.

Metopirone™ ➡ **metyrapone**.

metopon [BAN, INN] is one of the thebaine series, and is an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC.

metoprolol [BAN, INN, USAN] (metoprolol tartrate [JAN, USAN]; Lopressor™; Betaloc™) is a β-ADRENOCEPTOR ANTAGONIST, which is relatively lipophilic. It can be used therapeutically in ANTIHYPERTENSIVE, ANTIARRHYTHMIC, ANTIANGINAL, ANTITHYROID and ANTIMIGRAINE TREATMENT.

metoprolol tartrate ➡ **metoprolol**.

metorphamide ➡ **adrenorphin**.

Metosyn™ ➡ **fluocinonide**.

metrenperone [BAN, INN, USAN] (R 50970) is a pyrimidinone, (5-HT_2-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It is a veterinary product used to treat acute respiratory distress syndrome in cattle, and is also used in topical treatment of wounds.

metrifonate ➡ **metriphonate**.

metriphonate [BAN] (metrifonate [INN]; trichlorfon [BSI, ISO]; trichlorphon; Bilarcil™) is a chlorophosphonate ANTICHOLINESTERASE activated upon metabolism. It is used as an ANTHELMINTIC and as an agricultural INSECTICIDE and ectoparasiticide.

metronidazole [BAN, INN, USAN] (metronidazole hydrochloride [USAN]; metronidazole phosphate [USAN]; carbamoyl derivative: bamnidazole [INN, USAN]; benzoyl derivative: metronidazole benzoate [BAN]; Flagyl™; Metrotop™; Zadstat™ etc.) is an (imidazole group)

ANTIMICROBIAL with ANTIBACTERIAL and ANTIPROTOZOAL actions. It widely used orally for a range of bacterial and protozoal infections. It acts as a potent ALDEHYDE DEHYDROGENASE INHIBITOR, which can lead to significant interactions with other drugs. It is also a DIAMINE OXIDASE INHIBITOR.

metronidazole benzoate ➡ **metronidazole**.

metronidazole hydrochloride ➡ **metronidazole**.

metronidazole phosphate ➡ **metronidazole**.

Metrotop™ ➡ **metronidazole**.

metubine iodide ➡ **metocurine iodide**.

metyrapone [BAN, INN, JAN, USAN] (metyrapone tartrate [USAN]; SU 4885; Metopirone™) is a non-steroid, a competitive inhibitor of 11β-hydroxylation in the adrenal cortex, and the resulting inhibition of **cortisol** (and to a lesser extent **aldosterone**) production leads to an increase in **ACTH** production, which leads to increased synthesis and release of cortisol precursors. It may be used as a diagnostic agent in assessment of hypothalamic–anterior pituitary–adrenocortical feedback function. It has also been used orally in long-term treatment of Cushing's disease. It can be used as an ANTICANCER AGENT for postmenopausal breast cancer.

metyrapone tartrate ➡ **metyrapone**.

metyridine ➡ **methyridine**.

metyrosine ➡ **metirosine**.

Mevacor™ ➡ **lovastatin**.

mevastatin [INN] (CS 500; ML 236B; antibiotic ML 236B; SIPI 8915; antibiotic SIPI 8915) is a metabolite of *Penicillium brevicompactum*. It is a potent inhibitor of cholesterol biosynthesis and a HMG-COA REDUCTASE INHIBITOR, and is an ANTIHYPERLIPIDAEMIC AGENT.

mexazolam [INN, JAN] (CS 386) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It has been used orally for anxiety, and is related to **cloxazolam**.

mexenone [BAN, INN] is a substituted benzophenone used extensively in sunscreen preparations.

mexiletine [BAN, INN] (mexiletine hydrochloride [JAN, USAN]; mexilitine hydrochloride [JAN]; Mexitil™) is an ethylamine derivative, a (class 1b) ANTIARRHYTHMIC/LOCAL ANAESTHETIC. It is used orally or by injection to treat venticular arrhythmias, particularly after myocardial infarction. It also has ANTICONVULSANT activity.

mexiletine hydrochloride ➡ **mexiletine**.

mexilitine hydrochloride ➡ **mexiletine**.

mexiprostil [INN] (MDL 646) is a synthetic prostaglandin, a PROSTANOID RECEPTOR AGONIST reported to have potential as a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC AGENT.

Mexitil™ ➡ **mexiletine**.

mexrenoate potassium ➡ **mexrenoic acid**.

mexrenoic acid (mexrenoate potassium [INN, USAN]) is a steroid, an ALDOSTERONE-ANTAGONIST (potassium-sparing) DIURETIC, which can be used in ANTIHYPERTENSIVE therapy.

mezacopride ➡ **zacopride**.

Mezlin™ ➡ **mezlocillin**.

mezlocillin [BAN, INN, USAN] (mezlocillin sodium [JAN, USAN]; Mezlin™) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat certain infections.

mezlocillin sodium ➡ **mezlocillin**.

M-FA 142 ➡ **amonafide**.

MG 13608 ➡ **domiodol**.

MGBG ➡ **mitoguazone**.

MGTA ➡ **MERGETPA**.

α-MgTx2.2 ➡ **margatoxin**.

MI 217 ➡ **ecothiopate iodide**.

Miacalcin™ ➡ **calcitonin**.

mianserin [BAN, INN] (mianserin hydrochloride [JAN, USAN]) is one of the piperazinoazepine group of tetracylic monoamine UPTAKE INHIBITORS, and is used as an oral ANTIDEPRESSANT, especially in cases where some degree of sedation is required. It is unlike early tricyclics in some ways as it does not inhibit peripheral uptake of **noradrenaline**, appears to have less MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity than some and is reported to have HISTAMINE H_1-ANTAGONIST and 5-HYDROXYTRYPTAMINE ANTAGONIST activity.

mianserin hydrochloride ➡ **mianserin**.

mibolerone [BAN, INN, USAN] (dimethylnortestosterone) is a steroid, an ANDROGEN and ANABOLIC which can be used as a CONTRACEPTIVE in veterinary practice for bitches. It is used as a pharmacological tool for investigation of androgenic-regulated processes.

Micanol™ ➡ **dithranol**.

miconazole [BAN, INN] (miconazole nitrate [JAN, USAN]; Daktarin™) is an (imidazole group) ANTIFUNGAL which can be used systemically or orally for a range of fungal infections.

miconazole nitrate ➡ **miconazole**.

micronomicin ➡ **gentamicin**.

Micronor™ ➡ **norethisterone**.

midaglizole [INN] is an imidazolylphenylethylpyridine derivative, a selective (peripheral α_2-subtype) α-ADRENOCEPTOR ANTAGONIST. It is under investigation as an (oral) HYPOGLYCAEMIC, and shows ANTIASTHMATIC properties.

Midamor™ ➡ **amiloride**.

midazogrel [INN] (CBS 645) is an imidazole, a THROMBOXANE SYNTHETASE INHIBITOR. It is a potential ANTITHROMBOTIC AGENT.

midazolam [BAN, INN] (midazolam maleate [USAN]; midazolam hydrochloride [USAN]; Ro 21-3981; Hypnovel™; Versed™) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It is widely used orally in preoperative medication; also for the treatment of severe insomnia, when it has a relatively prolonged action.

midazolam hydrochloride ➡ **midazolam**.

midazolam maleate ➡ **midazolam**.

midecamycin [INN, JAN] is a (macrolide) ANTIBIOTIC active against Gram-positive organisms.

midesteine [INN] (MR 889) is a substituted thiophenecarbothioate, a human neutrophil elastase inhibitor and MUCOLYTIC AGENT.

midodrine [BAN, INN] (midodrine hydrochloride [JAN, USAN]; Gutron™) is a phenylhydroxyethylacetamide derivative, an (α_1-subtype) α-ADRENOCEPTOR AGONIST with prolonged direct-acting SYMPATHOMIMETIC actions. It is a VASOCONSTRICTOR and hypertensive that can be used as an antihypotensive for treatment of hypotensive states.

midodrine hydrochloride ➡ **midodrine**.

Midrid™ ➡ **chloral hydrate**.

MIF ➡ **melanostatin**.

Mifegyne™ ➡ **mifepristone**.

mifentidine [INN] (DA 4577) is an imidazolylimidamide, a HISTAMINE H_2-RECEPTOR ANTAGONIST, GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC AGENT.

mifepristone [INN] (RU 486; Mifegyne™) is a synthetic steroid derivative, which acts as an PROGESTOGEN and is used as an ABORTIFACIENT for termination of pregnancy, as a postcoital CONTRACEPTIVE and for treating endometriosis and malignant neoplasms; also has antiglucocorticoid activity.

miglitol [BAN, INN, USAN] is a desoxynojirimycin derivative, an α- and β-glucosidase inhibitor which delays conversion in the intestine of starch and sucrose to glucose, so slows its subsequent absorption. It can be used as an ANTIDIABETIC, usually as an adjunct to sulphonylurea or biguanides (oral) HYPOGLYCAEMICS, in the treatment of non-insulin-dependent diabetes mellitus (NIDDM).

Migraleve™ ➡ **buclizine**; **paracetamol**; **codeine phosphate**.

Migran-eze™ ➡ **aloxiprin**.

Migravess™ ➡ **metoclopramide**.

Migril™ ➡ **ergotamine**.

milameline [INN] (milameline hydrochloride [USAN]) is a tetrahydronicotinaldehyde, a MUSCARINIC CHOLINOCEPTOR AGONIST. It has been investigated for possible use as a cholinergic NOOTROPIC AGENT (cognition enhancer).

milameline hydrochloride ➡ **milameline**.

Mildison™ ➡ **hydrocortisone**.

Milk of Magnesia™ ➡ **magnesium hydroxide**.

milnacipran [BAN, INN] (F 2207; TN 912) is a non-tricyclic class cyclopropanecarboxamide derivative, a serotonin and noradrenaline UPTAKE INHIBITOR, with ANTIDEPRESSANT properties.

Milontin™ ➡ **phensuximide**.

milrinone [BAN, INN, USAN] (Primacor™) is a bipyridinecarbonitrile, with actions similar to **amrinone**. It is a (type III) PHOSPHODIESTERASE INHIBITOR with VASODILATOR and CARDIAC STIMULANT activity, and can be used in congestive HEART FAILURE TREATMENT.

miltefosine [BAN, INN] (D 18506) is a phospholipid derivative with structural similarities to membrane constituents, and is thought to exert its ANTICANCER activity by disruption of cell membrane function. It has been used orally for treating skin metastases in breast cancer. It potentiates the anticancer activity of **cyclophosphamide**.

Miltown™ ➡ **meprobamate**.

minamestane [INN] is a steroid, an AROMATASE INHIBITOR, investigated as an ANTICANCER AGENT for oestrogen-dependent cancers, specifically breast cancer.

minaprine [BAN, INN, USAN] (minaprine hydrochloride [USAN]; CB 30038; AGR 1240) is a non-tricyclic oral ANTIDEPRESSANT with psychostimulant and experimental cerebroprotective properties.

minaprine hydrochloride ➡ **minaprine**.

mindodilol [INN] is a β-ADRENOCEPTOR ANTAGONIST.

MINERAL SUPPLEMENTS are usually taken as salts by mouth and are used to augment the diet in case of deficiencies, and where there are problems with absorption of the minerals into the body from normal foodstuffs. Important mineral elements commonly incorporated into mineral supplements include calcium, iodine, iron, phosphorus, potassium, selenium, sodium and zinc.

Calcium is essential for the normal growth and development of the body, especially (in the form of calcium phosphate) of the bones and teeth. Its level in the blood is regulated by the opposing actions of the thyroid hormone calcitonin, and the parathyroid hormone **parathormone**. Its uptake from food is enhanced by vitamin D (**calciferol**). Forms of calcium used therapeutically include the folinic acid supplement **calcium folinate**, and the mineral supplements **calcium bicarbonate**, **calcium carbonate**, **calcium gluconate** and **calcium lactate**.

Iodine is accumulated in the thyroid gland to synthesize the thyroid hormones **thyroxine** and **triiodothyronine**, which control a number of metabolic processes, and growth. A deficiency of iodine is one of the possible causes of the enlargement of the thyroid gland (goitre). Dietary sources of iodine are often supplemented by iodinated table salt, for which **potassium iodide** and **sodium iodide** are used.

Zinc supplements can be administered in order to make up a deficiency, e.g. as zinc sulphate.

Potassium supplements are sometimes used to treat conditions of potassium deficiency, especially during or following severe loss of body fluids (e.g. chronic diarrhoea) or treatment with drugs that deplete body reserves (e.g. some diuretics). It may also be used as a substitute for natural salt (sodium chloride) in cases where sodium is restricted (e.g. in hypertension).

Magnesium is essential to the bones and important to the functioning of the nerves and muscles. It is normally ingested as a trace element in the diet. Therapeutically, it is used in the form of its salts, mainly **magnesium chloride**. A number of magnesium salts are used as ANTACIDS or LAXATIVES.

Phosphorous supplements may be required in addition to vitamin D in patients with vitamin D-resistant rickets, and are commonly made by means of preparations of potassium phosphates or sodium phosphates at appropriate pH.

Iron supplements are often needed for anaemia treatment. Drugs used to treat iron-deficient anaemia are mainly salts of iron, used where there is deficiency of iron in the form of haemoglobin in the blood and a similar oxygen-carrier in the muscles. Dietary deficiency of iron in the diet, or disease states that prevent its proper absorption, lead to forms of anaemia. Iron supplements are commonly used where there is deficiency of iron during pregnancy. Supplements may be taken orally in the form of **ferrous fumarate**, **ferrous gluconate**, **ferrous glycine sulphate** and **ferrous sulphate**.

MINERALOCORTICOIDS form one of the two main divisions of the corticosteroids family of natural steroid hormones secreted by the adrenal cortex, and their synthetic analogues. There are two main types: *glucocorticoids* and *mineralocorticoids*: see CORTICOSTEROIDS. Glucocorticoids (e.g. **corticosterone**, **cortisone** and **hydrocortisone**) are essential for utilization of carbohydrate, fat and protein in the body, in the normal response to stress, and have a powerful antiinflammatory effect. In contrast, the mineralocorticoids (e.g. **aldosterone**) are necessary for regulation of the salt and water balance of the body. Corticosteroids can be used in HRT, e.g. **hydrocortisone** and the mineralocorticoid **fludrocortisone** can be given to patients where there is a deficiency, or in Addison's disease, or following adrenalectomy or hypopituitarism.

The mineralocorticoids have a main action on the distal tubules in the kidney to increase sodium absorption, with concomitant increased excretion of K^+ and H^+. **Aldosterone** is the main endogenous mineralocorticoid. It is produced in the outermost layer of the adrenal cortex (the zona glomerulosa). An excessive secretion of mineralocorticoids (e.g. in Conn's syndrome) causes marked salt and water retention, with a resultant increase in the volume of extracellular fluid, alkalosis, hyperkalaemia and often hypertension. A decrease in secretion (e.g. Addison's disease) causes a disproportional loss of Na^+ compared to fluid loss, so osmotic pressure of the extracellular fluid is reduced. This results in an increase in intracellular compared to extracellular fluid volume. The concomitant decrease in excretion of K^+ results in hyperkalaemia with some decrease in bicarbonate. The control of synthesis and release of aldosterone is complex and involves both the renin–angiotensin system and the electrolyte composition of the blood. As with other

steroids, aldosterone acts at nuclear receptors. However, unlike the glucocorticoid receptors, which have a ubiquitous distribution, mineralocorticoid receptors are found only on certain target tissues, such as the kidney, transporting epithelia in the colon and the bladder. The effect of these receptor-mediated changes is an early increase in the number of sodium channels in the apical membrane of the transporting cells, and a later increase in the number of Na^+/K^+-ATPase molecules in the basement membrane, resulting in increased Na^+ reabsorption from the renal tubules.

Aldosterone has only mineralocorticoid and no antiinflammatory properties. Although it is the main endogenous mediator, it is not normally used in therapeutics. Fludrocortisone is a synthetic agent that has mainly mineralocorticoid properties, and is the drug of choice for mineralocorticoid effects. Cortisone has both glucocorticoid and mineralocorticoid properties (in approximately equal measures), and can be used orally to correct hormonal deficiency, e.g. following adrenalectomy. It is not normally used for antiinflammatory purposes. It is converted in the body to hydrocortisone, and is now rarely used. Hydrocortisone has both glucocorticoid and mineralocorticoid properties (in approximately equal measures), and can be used systemically, by mouth, to correct hormonal deficiency, e.g. following adrenalectomy. More commonly, it is used to treat inflammation.

Those DIURETICS referred to as 'aldosterone antagonists' (e.g. **potassium canrenoate**, **spironolactone**) block the action of endogenous aldosterone, which leads to a loss of sodium with a loss of potassium. This is unlike other diuretics and so this class of 'potassium-sparing diuretics' can be used in conjunction with other types of diuretic, such as thiazides, which cause loss of potassium, to obtain a more beneficial action. They can be used to treat oedema associated with aldosteronism, congestive heart failure, renal disease, and oedema and ascites caused by cirrhosis of the liver.

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Wehling, M. *et al.* (1993) Aldosterone-specific membrane receptors and related rapid, non-genomic effects. *Trends Pharmacol. Sci.*, **14**, 1-4.
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mini-ANP is a substitute of ANF (5-19) amide fragment, a short-sequence version of ANP (ATRIAL NATRIURETIC PEPTIDE). Though the size is reduced by *c.* 50% (from 28), it retains high affinity as a (type A) ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONIST.

Minims Benoxinate™ ➡ **oxybuprocaine**.

Minipress™ ➡ **prazosin**.

Minocin™ ➡ **minocycline**.

minocycline [BAN, INN, USAN] (minocycline hydrochloride [JAN, USAN]; Minocin™) is a semisynthetic (tetracycline) ANTIBIOTIC. It can be used clinically as a broad-spectrum semisynthetic topical ANTIBACTERIAL to treat a variety of infections, including some tetracycline-resistant bacteria.

minocycline hydrochloride ➡ **minocycline**.

Minodiab™ ➡ **glipizide**.

minoxidil [BAN, INN, USAN] (Lonoten™; Rogaine™; Regaine™) is a piperidinylpyrimidine derivative with direct VASODILATOR activity. It can be used as an oral ANTIHYPERTENSIVE, and is also a hair-restorer used topically to treat male-pattern baldness.

Mintezol™ ➡ **thiabendazole**.

Miochol™ ➡ **acetylcholine chloride**.

mioflazine [BAN, INN] (mioflazine hydrochloride [USAN]) is a tetracyclic piperazine derivative, with CALCIUM-CHANNEL BLOCKER and coronary VASODILATOR activity. It is also a nucleoside transport inhibitor with cardioprotective activity.

mioflazine hydrochloride ➡ **mioflazine**.

Miostst™ ➡ **carbachol**.

MIOTIC AGENTS constrict the pupil of the eye (i.e. cause miosis). Such drugs are used in the treatment of glaucoma (raised intraocular pressure), because miosis may facilitate drainage of aqueous humour. Thus direct-acting parasympathomimetics and cholinergic agonists may be used, e.g. **pilocarpine** and **carbachol** (see MUSCARINIC CHOLINOCEPTOR AGONISTS). Also, some indirectly acting parasympathomimetics may be used, e.g. the ANTICHOLINESTERASE **physostigmine**.

In ocular pathology, miosis is a characteristic of inflammation and damage in the eye, and a number of inflammatory mediators have been implicated. There are a number of programmes testing antagonists of antiinflammatory mediators, e.g. BRADYKININ RECEPTOR ANTAGONISTS, ENDOTHELIN RECEPTOR ANTAGONISTS, TACHYKININ RECEPTOR ANTAGONISTS and VIP ANTAGONISTS.

Alessandri, M. *et al.* (1991) *In vivo* pupillary constrictor effects of substance P in man. *Life Sci.*, **48**, 2301-2308.
Patil, P.N. (1992) Reactivity of human iris-sphincter to muscarinic drugs *in vitro*. *Naunyn-Schmiedeberg's Arch. Pharmacol.*, **346**, 614-619.
Hall, J.M. *et al.* (1993) Tachykinin receptors mediating responses to sensory nerve stimulation and exogenous tachykinins and analogues in the rabbit isolated iris sphincter. *Br. J. Pharmacol.*, **109**, 1008-1013.
Gallar, J. *et al.* (1995) Irritation of the anterior segment of the eye by ultraviolet radiation: Influence of nerve blockade and calcium antagonists. *Curr. Eye Res.*, **14**, 827-835.

MIP-1α ➡ **nagrestipen**.

mipitroban [INN] (UP 1677) is an animidazopyridine derivative, a (TP) PROSTANOID RECEPTOR ANTAGONIST and ANTITHROMBOTIC.

mirfentanil [INN] (mirfentanil hydrochloride [USAN]) is one of the phenylpiperidine series, a (μ) OPIOID RECEPTOR AGONIST which has been used as an OPIOID ANALGESIC.

mirfentanil hydrochloride ➡ **mirfentanil**.

mirimostim [INN, JAN] (CSF-HU; hM-CSF) is more fully termed 1-214-colony-stimulating factor 1 human clone p3ACSF-69 protein moiety reduced, and is a CYTOKINE RECEPTOR AGONIST which acts as a haemopoietic agent and IMMUNOMODULATOR. It stimulates monocyte production, and can be used as a therapeutic and prophylactic agent for haemopoietic disorder-induced thrombocytopenia. See also **colony-stimulating factors**.

mirtazapine [BAN, INN, USAN] (6-azamianserin, Org 3770; Mepirzapin™; Remergon™; Remeron™) is an analogue of **mianserin**, and is one of the tetracyclic piperazinoazepine group unrelated to other classes of selective SSRIs, tricyclics or MAOI agents, but is used as an oral ANTIDEPRESSANT. It has potent presynaptic (α_2) α-ADRENOCEPTOR ANTAGONIST, (5-HT_3 & 5-HT_2, but not 5-HT_1) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST properties. It is also a HISTAMINE H_1-RECEPTOR ANTAGONIST, and this is thought to explain its SEDATIVE propertes.

misonidazole [BAN, INN, USAN] (NSC 261037) is structurally related to **metronidazole** and has similar properties. It can be used as a radiosensitizer to sensitize hypoxic cells to radiation used in anticancer treatment, and also has ANTIPROTOZOAL activity.

misoprostol [BAN, INN, USAN] (SC-29333; Cytotec™) is a prostaglandin and synthetic analogue of **alprostadil** (PGE_1). It is a PROSTANOID RECEPTOR AGONIST, and can be used as a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC. It can be used in protecting against ulcers caused by NSAID ANALGESICS, and is available in combination with such drugs: Arthrotec™

with **diclofenac**, and Napratec™ with **naproxen**.
Mithramycin™ ➡ **plicamycin**.
mithramycin A ➡ **plicamycin**.
mitiromycin E ➡ **mitomycin**.
mitobronitol [BAN, INN, JAN] (dibromomannitol; DBM; NSC 94100; WR 220057; Myelobromol™) is an alkylating ANTICANCER AGENT sometimes used for chronic myeloid leukaemia.
mitoguazone [INN] (methylglyoxal bisguanylhydrazone; MGBG; NSC 32946) inhibits polyamine biosynthesis and has ANTICANCER activity. It has been tried by injection for solid tumours.
mitomycin [INN, USAN] (mitomycin C [JAN]; mitomycin S; mitiromycin E; NSC 26980; Mitomycin C Kyowa™; Mutamycin™) is a (benzoquinone) ANTIBIOTIC, isolated from *Streptomyces verticillatus*. It is a cytotoxic agent which is used by injection in anticancer treatment for cancers of the upper gastrointestinal tract, breast tumours and recurrent superficial bladder tumours (by bladder instillation).
mitomycin C ➡ **mitomycin**.
Mitomycin C Kyowa™ ➡ **mitomycin**.
mitomycin S ➡ **mitomycin**.
mitotane [INN, JAN, USAN] (Lysodren™) is an organochlorine INSECTICIDE. It is also used as an (adrenal) cytotoxic ANTICANCER AGENT.
Mitoxana™ ➡ **ifosfamide**.
mitozantrone [BANM] (mitozantrone hydrochloride [USAN]) is structurally related to the (anthracycline group) ANTIBIOTIC **doxorubicin**, and also has cytotoxic properties. Clinically, it may be used as a parenteral ANTICANCER AGENT, particularly for breast cancer.
mitozantrone hydrochloride ➡ **mitozantrone**.
Mivacron™ ➡ **mivacurium chloride**.
mivacurium chloride [BAN, INN, USAN] (Mivacron™) is a bisquaternary ammonium heterocyclic complex, a NICOTINIC CHOLINOCEPTOR ANTAGONIST and (competitive) NEUROMUSCULAR BLOCKING AGENT, which can used as a short-acting SKELETAL MUSCLE RELAXANT in general anaesthesia. The commercial product is a mixture of isomers.
mizoribine [INN, JAN] is a (nucleoside) ANTIBIOTIC isolated from *Eupenicillium brefeldianum* and *Streptomyces brefeldianum*. It possesses ANTIVIRAL, ANTICANCER and IMMUNOSUPPRESSANT activity.
MJ 5048 ➡ **dimethisterone**.
MJ 10061 ➡ **benzbromarone**.
MJ 13,754-1 ➡ **nefazodone**.
MJ 13805 ➡ **gepirone**.
MJF 9325 ➡ **ifosfamide**.
MJF 12637 ➡ **suloctidil**.
MK 89 ➡ **anileridine**.
MK 185 ➡ **halofenate**.
MK 188 ➡ **zeranol**.
MK 208 ➡ **famotidine**.
MK 0217 ➡ **alendronic acid**.
MK 264 ➡ **fluvoxamine**.
MK 325 ➡ **cholestyramine**.
MK 329 ➡ **devazepide**.
MK 383 ➡ **tirofiban**.
MK 422 ➡ **enalaprilat**.
MK 0591 ➡ **quiflapon**.
MK 650 ➡ **cortivazol**.
MK 681 ➡ **trientine**.
MK 733 ➡ **simvastatin**.
MK 801 ➡ **dizocilpine**.
MK 810 ➡ **quinbolone**.
MK 965 ➡ **crisantaspase**.
ML 236B ➡ **mevastatin**.
ML 10302 (RS 70678) is a substituted benzamide and analogue of **metoclopramide**, and is a (5-HT_4-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST.
MMDA (methoxymethylenedioxyamphetamine) is a phenylethylamine compound structurally related to **amphetamine** and **mescaline**. It is a potent PSYCHOTROPIC (hallucinogenic) but is not used in therapeutics. It is a drug of abuse.
MNA ➡ **isonitrosoacetone**.
MOB ➡ **oxybenzone**.
Moban™ ➡ **molindone**.
Mobic™ ➡ **meloxicam**.
Mobiflex™ ➡ **tenoxicam**.
Mobilan™ ➡ **indomethacin**.
moclobemide [BAN, INN, USAN] (Ro 11-1163; Manerix™) is a benzamide, a RIMA, reversible, selective type A, MONOAMINE -OXIDASE INHIBITOR (MAOI) used as an ANTIDEPRESSANT.
modafinil [INN] (benzhydrylsulphinylacetamide) is an α-ADRENOCEPTOR AGONIST with CNS STIMULANT properties. It can be used in the treatment of narcolepsy and hypersomnia. Experimentally, it shows NEUROPROTECTIVE activity against MPTP-induced neurotoxicity in mice.
Modalim™ ➡ **ciprofibrate**.
Modecate™ ➡ **fluphenazine**.
modipafant [BAN, INN] (UK 80067) is a complex heterocyclic, a PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST.
Moditen™ ➡ **fluphenazine**.
Modrasone™ ➡ **alclometasone**.
Modrenal™ ➡ **trilostane**.
moexipril [INN] (moexipril hydrochloride [USAN]; Perdix™; Univasc™) is a non-sulphydryl containing ethyl ester prodrug of moexiprilat [INN], and is an ACE INHIBITOR used as an ANTIHYPERTENSIVE.
moexiprilat ➡ **moexipril**.
moexipril hydrochloride ➡ **moexipril**.
mofebutazone [INN] is an analogue of the pyrazolone series, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.
Mogadon™ ➡ **nitrazepam**.
molgramostim [BAN, INN, USAN] (recombinant human granulocyte macrophage-colony-stimulating factor, GM-CSF; CSF 2; Sch 39300; Leucomax™) is more fully described as colony-stimulating factor 2 (human clone pHG25 protein moiety reduced), and is a recombinant granulocyte macrophage colony-stimulating factor expressed by *E. coli*; a version of the endogenous factor. It is a (GM-CSF subtype) CYTOKINE RECEPTOR AGONIST, and acts as a haemopoietic agent and IMMUNOMODULATOR. It stimulates production of all granulocytes and monocytes. It is used for the reduction of severity of neutropenia (and risk of infection) in cytotoxic chemotherapy; for acceleration of myeloid recovery following bone-marrow transplantation; and for neutropenia in patients treated with **ganciclovir** in AIDS-related cytomegalovirus retinitis.
molindone [BAN, INN] (molindone hydrochloride [USAN]; Moban™) is a dihydroindolone, a structure unlike other major tranquillizers, and is used as a SEDATIVE and ANTIPSYCHOTIC AGENT.
molindone hydrochloride ➡ **molindone**.
Molipaxin™ ➡ **trazodone**.
molsidomine [BAN, INN, JAN, USAN] is a morpholinosydnone imine derivative that acts as a prodrug for NO (so is a NO donor) acting as a nitrergic stimulant. It can be used as an

antianginal and antihypertensive drug, and also as an experimental tool.

mometasone [BAN, INN] (mometasone furoate [USAN]; Sch 32088; Elocom™; Nasonex™) is a **CORTICOSTEROID**, a **GLUCOCORTICOID**, with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties. It is used topically for inflammatory skin disorders, such as dermatitis and eczema, that are unresponsive to less potent corticosteroids and also for psoriasis. It can also be used by nasal spray in the treatment of nasal allergy and rhinitis.

mometasone furoate ➡ **mometasone**.

monalazone (monalazone disodium [INN]) is a sulphonylbenzoic acid derivative used as a vaginal **DISINFECTANT** and spermicidal contraceptive.

monalazone disodium ➡ **monalazone**.

monensin [BAN, INN, USAN] is a (polyether) **ANTIBIOTIC** complex with broad-spectrum **ANTICOCCICIDIAL**, **ANTIFUNGAL** and **ANTI-HIV** activity.

MONOAMINE-OXIDASE-INHIBITORS (MAOIs) act on monoamine-oxidase (MAO) enzymes that are involved in the degradation of monoamines in the peripheral and central nervous system. Monoamine oxidase occurs within cells bound to the surface of the mitochondria. It is found not only within monoaminergic neurons, but also in the liver and intestinal epithelium. The enzyme converts amines to their corresponding aldehydes, which in the periphery are converted to their carboxylic acids by aldehyde dehydrogenase. Neurotransmitters degraded by monoamine oxidase include **dopamine**, **5-hydroxytryptamine** and **noradrenaline**.

MAO occurs in two similar but distinct molecular forms, MAO-A and MAO-B, which differ in their distributions, preferred substrate and susceptibility to inhibitor drugs. MAO-A has noradrenaline and 5-hydroxytryptamine as preferred substrate, and is inhibited specifically by **clorgyline**. MAO-B has phenylethylamine and benzylamine as preferred substrates, and is blocked specifically by **selegiline**. Substrates of both include dopamine and **tyramine**, and inhibitors active at both include **iproniazid**, **pargyline** and **tranylcypromine**. The main clinical use of MAOIs is in the treatment of depression, and hydrazine derivatives used as (irreversible) inhibitors include iproniazid and **phenelzine**; but these do not distinguish between the two forms of the enzyme. More recently isoform subtype specific inhibitors have been developed, and there have been efforts to discover if one or other form is involved in particular diseases, and particularly if abnormalities are involved in the aetiology of disease. It has been shown that there is a reduction in MAO-B in the platelets of depressed patients, and in some other disorders; though not that this is responsible for any disorder. There is much now known about the genetics of inherited disorders or isoforms of MAO, and it is thought that some forms may predispose to hypertension. One established specific inhibitor of MAO-B is selegiline, but though this is used in the treatment of Parkinson's disease, it is no longer used on its own in the treatment of depression (though it can be combined with other non-specific MAOIs), which suggests that the MAO-A form is associated with depression. One reason for an interest in subtype specificity, is the serious interaction of most MAOIs with foodstuffs that contain tyramine, since MAO detoxifies this amine which is a constituent of certain foodstuffs (e.g. cheese, fermented soya bean products, meat or yeast extracts, some alcoholic beverages), and if these are ingested when patients are on MAOI treatment (or sympathomimetic drugs taken) then the outcome may be a hypertensive crisis.

Most MAOIs are irreversible and the effects take weeks to stabilize. Chemically, they fall into a number of groups, including hydrazines, such as phenelzine and iproniazid, propargylamines, such as pargyline, chlorgyline and selegiline, and cyclopropylamines, such as tranylcypromine. A reversible inhibitor that may be safer under some circumstances is **moclobemide**. The use of MAOIs has declined and tricyclics and the SSRIs are being used more. See **ANTIDEPRESSANTS**.

Ashton. H. (1992) *Brain systems, disorders and psychotropic drugs.* Blackwell Scientific Publications, Oxford.

Benedetti, M.S. *et al.* (1992) Monoamine oxidase: from physiology and pathophysiology to the design and clinical applications of reversible inhibitors. *Adv. Drug Rs.*, **23**, 66-125.

Hollister, L.E. *et al.* (1993) New antidepressants. *Annu. Rev. Pharmacol. Toxicol.*, **32**, 165-177.

Yu, P.H. (1994) Pharmacological and clinical implications of MAO-B inhibitors. *Gen. Pharmacol.*, **25**, 1527-1539.

monobenzone [INN, USAN] (Benoquin™) is an **ANTIBACTERIAL** which clinically can be used as a depigmenting agent in vitiligo.

Monocid™ ➡ **cefonicid**.

Monoclate-P™ ➡ **factor VIII**.

monoclonal antibody OKT3 ➡ **muromonab-CD3**.

Monocor™ ➡ **bisoprolol**.

monoethylcholine mustard aziridinium ion ➡ **ethylcholine aziridinium**.

monoiodotyrosine (iotyrosine; 3-iodotyrosine) is an iodinated amino acid that occurs in thyroid tissue and human blood serum. It is also produced by sponges. It has been used as a radiopharmaceutical compound in the ^{131}I labelled form.

monoisonitrosoacetone ➡ **isonitrosoacetone**.

N^G-monomethyl-L-arginine ➡ **L-NMMA**.

Mononine™ ➡ **factor IX**.

mononitrogen monoxide ➡ **nitric oxide**.

Monoparin™ ➡ **heparin sodium**.

Monopril™ ➡ **fosinopril**.

monosulfiram [BAN] (sulfiram [INN]) is an ethylthiocarbonic acid derivative with **ANTIFUNGAL** properties and can be used as parasiticide and fungicide.

montelukast [BAN, INN] (montelukast sodium [USAN]; Singulair™) is a chloroquinolinyl derivative, a (LTD_4) **LEUKOTRIENE RECEPTOR ANTAGONIST**, which can be used as an **ANTIASTHMATIC**.

montelukast sodium ➡ **montelukast**.

8-MOP™ ➡ **methoxsalen**.

mopidamol [BAN, INN] (R-A 233-BS) is a piperidino-pyrimidopyrimidine, a **PLATELET-AGGREGATION INHIBITOR**, which also inhibits tumour metastases.

moprolol [INN] is a **β-ADRENOCEPTOR ANTAGONIST**. Chemically, activity resides in the (*S*)-form (which is available as levomoprolol). It can be used therapeutically as an **ANTIHYPERTENSIVE**.

moracizine [BAN, INN] (moricizine [USAN]; moricizine hydrochloride; Ethmozine™) is a phenothiazinecarbamate, a (class 1) **ANTIARRHYTHMIC** and **CARDIAC DEPRESSANT** used to treat venticular arrhythmias.

moramide (pyrrolamidol) is one of the methadone series, and is an **OPIOID RECEPTOR AGONIST** active as an **OPIOID ANALGESIC**. It is used in the form of various diastereoisomers. The (*S*)-form is **dextromoramide**; the (*R*)-form is levomoramide [BAN, INN]; and the (±)-form is racemoramide [BAN, INN].

morantel [BAN, INN] (morantel tartrate [USAN]) is an analogue of **pyrantel**, and is used as an **ANTHELMINTIC** frequently in veterinary practice.

morantel tartrate ➡ **morantel.**

morazone [BAN, INN] is an analogue of the pyrazolone series, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

Morcap™ ➡ **morphine.**

moricizine ➡ **moracizine.**

moricizine hydrochloride ➡ **moracizine.**

morniflumate [INN, USAN] (UP 164 and many other names) is the morpholinoester of **niflumic acid**, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC and ANTIINFLAMMATORY activity.

moroxydine [BAN, INN] is a morpholinecarboxamidine ANTIVIRAL AGENT used in the prophylaxis of herpes.

morpheridine [BAN, INN] (morpholinoethylnorpethidine) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC.

morphiceptin is a natural tetrapeptide, a non-enkephalin amide fragment of **β-casomorphin** in bovine milk. It is a (μ) OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity. Deproceptin is [D-Pro^4]morphiceptin.

morphine [BAN] (morphine sulfate [JAN, USAN]; morphine hydrochloride; morphine tartrate; Astramorph™; Infumorph™; Morcap™; MST Continus; MXL™; Oramorph™; Sevredol™) is the principal alkaloid of opium (*Papaver somniferum*) (Papaveraceae). It is a (μ) OPIOID RECEPTOR AGONIST and is extensively used as an OPIOID ANALGESIC in the control of severe pain. It also has ANTITUSSIVE, ANTIDIARRHOEAL and respiratory depressant properties. It is a drug of abuse.

morphine diacetate ➡ **diamorphine.**

morphine hydrochloride ➡ **morphine.**

morphine sulfate ➡ **morphine.**

morphine tartrate ➡ **morphine.**

morpholinoethylnorpethidine ➡ **morpheridine.**

mosapride [INN] is a benzamide, a (5-HT$_4$-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST, but is free from (D$_2$) DOPAMINE RECEPTOR ANTAGONIST activity. It is a GASTRIC MOTILITY STIMULANT, and is the subject of clinical studies.

Motifene™ ➡ **diclofenac.**

motilin is a 22 amino acid residue peptide gastrointestinal hormone. It stimulates specific receptors and acts as a GASTRIC MOTILITY STIMULANT (prokinetic agent) causing gastric emptying and postprandial gastric emptying. (The antibiotic **erythromycin** and some other derivatives of the macrolide are thought to have an agonist action at these receptors and show promise as a new class of prokinetics.)

Motilium™ ➡ **domperidone.**

Motipress™ ➡ **fluphenazine.**

Motival™ ➡ **fluphenazine.**

motretinide [INN, USAN] is a retinoid, a DERMATOLOGICAL AGENT that effects epithelial proliferation and is used topically to relieve severe acne and other skin conditions. It is also an ANTICANCER AGENT.

Motrin™ ➡ **ibuprofen.**

mouse prolactin ➡ **prolactin.**

moveltipril [INN] is a **capropril**-related ACE INHIBITOR that has ANTIHYPERTENSIVE properties.

moxalactam disodium ➡ **latamoxef.**

moxaverine [BAN, INN] is an isoquinoline derivative, an ANTISPASMODIC and VASODILATOR.

moxazocine [INN, USAN] is a benzazocin derivative, and is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC and ANTITUSSIVE activity.

moxestrol [INN] (R 2858; NSC 118191) is a synthetic steroid OESTROGEN formerly used for menstrual problems.

moxifensine ➡ **diclofensine.**

moxisylyte ➡ **thymoxamine.**

moxonidine [BAN, INN] (Physiotens™) is an imidazolyl derivative with properties similar to **clonidine**. There is evidence both of (α_2-subtype) α-ADRENOCEPTOR AGONIST actions, but it is also claimed to be first of a new class of centrally acting ANTIHYPERTENSIVES, the selective imidazoline receptor agonists, acting at novel receptors at the cardiovascular control centre in the brainstem.

MR 654 ➡ **sevoflurane.**

MR 889 ➡ **midesteine.**

MRIH ➡ **melanostatin.**

MSD 803 ➡ **lovastatin.**

α-MSH ➡ **melanocyte-stimulating hormone; α-melanocyte-stimulating hormone.**

β-MSH ➡ **melanocyte-stimulating hormone; β-melanocyte-stimulating hormone.**

MST Continus ➡ **morphine.**

m-THPC ➡ **temoporfin.**

MTX ➡ **methotrexate.**

Mucaine™ ➡ **oxethazaine.**

Mucodyne™ ➡ **carbocisteine.**

MUCOLYTIC AGENTS dissolve or otherwise break down mucus. They are generally used in an endeavour to reduce the viscosity of sputum in the upper airways, and thus facilitate expectoration, so they may also be regarded as EXPECTORANTS. It is not clear how they work, although some of them are thought to split disulphide bonds in the mucus thereby reducing viscosity. Mucolytic agents are prescribed to treat such conditions as asthma, chronic bronchitis and cystic fibrosis. Mucolytics may also be used to increase tear secretion (lacrimation) in chronic conditions where this is reduced, causing sore, dry eyes. Best-known and most-used mucolytic agents are **acetylcysteine**, **carbocisteine** and **methyl cysteine hydrochloride**. Acetylcysteine may also be used to treat abdominal complications associated with cystic fibrosis, and in the eye to increase lacrimation and mucus.

Mucomyst™ ➡ **acetylcysteine.**

multi-CSF ➡ **interleukin-3.**

multipotential colony-stimulating factor ➡ **interleukin-3.**

mupirocin [BAN, INN, USAN] (Bactroban™) is a derivative of pseudomonic acid, an ANTIBIOTIC. It has a broad-spectrum of ANTIBACTERIAL activity and is effective against Gram-positive organisms. Clinically, it is used topically, including for impetigo due to bacterial infection.

murabutide [INN] is a *N*-acetylmuramoyl dipeptide with (IMMUNOSTIMULANT) IMMUNOMODULATOR activity.

muramyl dipeptide ➡ **adjuvant peptide.**

murine EGF ➡ **murodermin.**

murine epidermal growth factor ➡ **murodermin.**

murodermin [INN] (murine EGF; murine epidermal growth factor; α-epidermal growth factor (mouse)) is a peptide mediator with 53 amino acid residues and 3 disulphide bridges, isolated from submaxillary gland of mice. It is a GASTRIC SECRETION INHIBITOR and a growth factor and stimulator of cell proliferation: see also **epidermal growth factor.**

muromonab-CD3 [INN, JAN, USAN] (monoclonal antibody OKT3; OKT3; Orthoclone OKT3™) is a monoclonal antibody. It blocks T-cell cytotoxic function, and is used as an IMMUNOSUPPRESSANT effective in reversing acute renal, hepatic, cardiac and combined kidney pancreas transplant rejection episodes.

muscarine is a furanmethanaminium quaternary ammonium compound, which is the main TOXIN/

NEUROTOXIN constituent of the fly agaric fungus *Amanita muscaria* and various *Inocybe* spp. It is a very potent MUSCARINIC CHOLINOCEPTOR AGONIST with pronounced PARASYMPATHOMIMETIC actions. It is a HYPOTENSIVE, causes bronchoconstriction and stimulates gut, bladder and exocrine glands. Stereoisomers show only a fraction of the activity, and it is valuable as a pharmacological tool in studies on muscarinic receptors. It is very toxic orally, with stimulatory actions on the CNS (**atropine sulphate** may be used as an antidote).

MUSCARINIC CHOLINOCEPTOR AGONISTS act at one of the two recognition sites for the neurotransmitter acetylcholine – muscarinic and nicotinic receptors. These receptors are named after the original plant alkaloids that selectively activate them – **muscarine** and **nicotine**, respectively. Muscarine was isolated from the poisonous mushroom *Amanita muscaria* in the middle of the 19th century. Muscarinic receptors are all of the seven-transmembrane G-protein-coupled superfamily, and five subtypes, M_1–M_5, have been cloned and are found to be expressed in a variety of tissues. Their role is very important and widespread in transducing the effects of acetylcholine when released from autonomic cholinergic nerves, which are found in the periphery (mainly within the parasympathetic and enteric divisions of the autonomic nervous system), and in a variety of tracts of the CNS. Notable effects include a slowing and weakening of the heartbeat, increased contractions and motility of the gastrointestinal tract and bladder, constriction of the pupils and focusing of the eye, and increased exocrine secretions, including saliva and sweat. Within the CNS, muscarinic receptors are involved in various processes, including motor control and possibly memory processes. Many of these effects can be related to the coupling processes of the receptor subtypes. The M_1 and M_3 receptors generally couple to the $InsP_3$/DAG systems, resulting, for instance, in contraction of smooth muscle and secretion of glands (M_3), and ganglionic and neural excitation or acid secretion of parietal cells (M_1). The M_2 and M_4 receptors couple to inhibition of adenylyl cyclase; which can, for example, lead to an opening of potassium-channels and inhibition of the heart (M_2), or presynaptic and neural inhibition (principally M_2): see POTASSIUM-CHANNEL ACTIVATORS; POTASSIUM-CHANNEL BLOCKERS. Little is known about the expression or properties of M_5 receptors. Cloning studies show that there are species-dependent subtype isoforms, but these have rather similar ligand-recognition properties within mammals. No agonist ligands are entirely selective for a single subtype (though some ligands show interesting patterns of activation (e.g. McN-A 343, L 687306, L 689660), so mainly antagonists are used in experimental receptor differentiation studies. Agonist ligands used in experimental studies and medicine include a number of chemical groups: the choline esters (e.g. **acetylcholine**, **bethanechol**, **carbachol**); plant alkaloids (e.g. muscarine, pilocarpine, arecoline); and other heterocyclic analogues with quaternary or tertiary nitrogen groups (e.g. **furtrethonium**, **oxotremorine**). Some of these ligands (e.g. carbachol and acetylcholine) also act at nicotinic receptors (which are of the oligomeric intrinsic-ion-channel superfamily).

Caulfield, M.P. (1993) Muscarinic receptors – Characterisation, coupling and function. *Pharmacol. Ther.*, **58**, 319-379.

Eglen, R.M. *et al.* (1994) Muscarinic acetylcholine receptor subtypes in smooth muscle. *Trends Pharmacol. Sci.*, **15**, 114-119.

Eglen, R.M. *et al.* (1996) Muscarinic receptor subtypes and smooth muscle function. *Pharmacol. Rev.*, **48**, 531-565.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

MUSCARINIC CHOLINOCEPTOR ANTAGONISTS act at one of the two recognition sites for the neurotransmitter acetylcholine in the body – muscarinic and nicotinic receptors. See MUSCARINIC CHOLINOCEPTOR AGONISTS.

Muscarinic antagonists in therapeutic use still lack adequate selectivity and have marked side-effects, though some have quite extensive usage. They may be used as ANTISPASMODICS, ANTIPARKINSONIAN AGENTS, ANTIEMETICS (antinauseant) in the treatment of motion sickness, as MYDRIATICS in ophthalmic examinations and as ANTIDOTES in antagonizing some adverse effects of ANTICHOLINESTERASES (in medicine, agricultural accidental poisoning, or warfare), and some can be used as ANTIULCEROGENICS for treating peptic ulcers (e.g. **pirenzepine**). The muscarinic antagonists used medically include a number of heterocyclic analogues with quaternary or tertiary nitrogen groups. The original ligands were the natural alkaloids, **atropine** and **hyoscine** (scopolamine), from solanaceous plants (e.g. *Atropa belladonna*), and a large number of synthetic analogues have since been developed (e.g. **benzhexol**, **cyclopentolate**, **dicyclomine**, **glycopyrronium**, **lachesine**, **pirenzepine**, **procyclidine**, **propantheline** and **tropicamide**). It should be noted that some antagonists have a quaternized nitrogen in order to limit entry of the charged moiety into the central or peripheral nervous system after injection or oral ingestion (e.g. **hyoscine butylbromide**) or inhalation (e.g. **ipratropium bromide**). Some antagonists showing a degree of selectivity (in some cases for two subtypes) that can be utilized experimentally include: at M_1, pirenzepine, **telenzepine** and MT7 toxin; AFDX 384, **himbacine**, **gallamine** (non-competitive), methoctramine, otenzepad; at M_2, AFDX 116; at M_3, darifenacin, himbacine, pirenzepine; and at M_4, MT3 toxin, PD 102807 and tropicamide

muscimol (pantherine; agarin; pyroibotenic acid; β-toxin) is a constituent of fly agaric (*Amanita muscaria*). It is a ($GABA_A$) GABA RECEPTOR AGONIST, extensively used in neurochemical research as a pharmacological tool. It also can be used as an INSECTICIDE against flies.

mustard oil ➡ **allyl isothiocyanate**.

Mustargen™ ➡ **mustine**.

mustine [BAN] (chlormethine [INN]; mechlorethamine hydrochloride [USAN]; chlormethine hydrochloride; nitrogen mustard gas; mechlorethamine; chloramine; HN 2; NSC 762; Mustargen™ and many other names) is a nitrogen analogue of sulphur mustard. It is an alkylating cytotoxic ANTICANCER AGENT, sometimes used in the treatment of the lymphatic cancer, Hodgkin's disease. It has a vesicant action on skin and mucous membranes, with severe eye irritant and generally SENSORY IRRITANT actions. It is an experimental carcinogen and teratogen. It can also be used in the form of its *N*-oxide, mustron (NSC 10107).

Mutamycin™ ➡ **mitomycin**.

MXL™ ➡ **morphine**.

My 101 ➡ **alclofenac**.

Mycardol™ ➡ **pentaerythritol tetranitrate**.

Mycifradin™ ➡ **neomycin**.

Mycil™ ➡ **chlorphenesin**; **tolnaftate**.

mycophenolate mofetil [USAN] (CellCept™) is converted *in vivo* to **mycophenolic acid**, which has antimetabolite cytotoxic properties. It shows experimental activity as an ANTICANCER and ANTIVIRAL AGENT. It may be clinically useful in treating psoriasis and as an ANTILEISHMANIAL. It shows IMMUNOSUPPRESSANT properties, and is used in the prophylaxis of acute kidney rejection.

mycophenolic acid [BAN, INN, USAN] is usually

administered as its prodrug, **mycophenolate mofetil**. It has antimetabolite cytotoxic properties, and shows experimental activity as an ANTICANCER and ANTIVIRAL AGENT. It may be clinically useful in treating psoriasis and leishmaniasis. It also has IMMUNOSUPPRESSANT properties, and can be used in the prophylaxis of acute kidney rejection.

mycoporphyrin ➡ **hypericin**.

Mycostatin™ ➡ **nystatin**.

Mydriacyl™ ➡ **tropicamide**.

MYDRIATIC AGENTS dilate the pupil of the eye (i.e. cause mydriasis). For medical purposes this may be required for ophthalmic examinations, diagnosis and some operative procedures. Mydriasis may be achieved through topical application of direct-acting sympathomimetics (see α-ADRENOCEPTOR AGONISTS), e.g. **adrenaline** or **phenylephrine**, or occasionally with indirect-acting sympathomimetics (see SYMPATHOMIMETICS), e.g. **cocaine**. Cholinergic antagonists are effective as mydriatics, and short-acting agents are generally used, e.g. **cyclopentolate**, **homatropine** or **tropicamide** (see MUSCARINIC CHOLINOCEPTOR ANTAGONISTS).

Mydrilate™ ➡ **cyclopentolate**.

Myelobromol™ ➡ **mitobronitol**.

Myleran™ ➡ **busulphan**.

Myocholine™ ➡ **bethanechol chloride**.

Myochrysine™ ➡ **gold sodium thiomalate**.

***myo*-inositol** (meso-inositol; i-inositol; inositol; 1,2,3,5/4,6-inositol) occurs commonly in plants and animals, and is the most widely distributed of the inositols. It is a growth factor for animals and microorganisms, and is a lipotropic agent. It is incorporated into some multivitamin preparations as a NUTRITIONAL AGENT (e.g. Ketovite™). The phosphates are important cellular second messengers.

Myotonine™ ➡ **bethanechol chloride**.

myristicin is a methylenedioxybenzene derivative, a constituent of *Illicium anisatum*, dill, nutmeg, parsley and many other essential oils. It has DIURETIC and narrow-spectrum INSECTICIDE activity. It is a PSYCHOTROPIC (hallucinogenic) AGENT in humans.

myrtecaine [INN] is an ester series LOCAL ANAESTHETIC. It has been used by topical application (sometimes in combination with lauryl sulphate) for local pain relief.

Mysoline™ ➡ **primidone**.

Mytelase™ ➡ **ambenonium chloride**.

N

N 0774 ➡ **luzindole**.

N 7001 ➡ **melitracen**.

N 7009 ➡ **flupenthixol**.

nabazenil [INN, USAN] (SP 175) is a synthetic cannabinoid, a CANNABINOID RECEPTOR AGONIST with ANTICONVULSANT activity.

nabilone [BAN, INN, USAN] (Cesamet™) is a synthetic cannabinoid, a (CB_1) CANNABINOID RECEPTOR AGONIST. It is an ANTIEMETIC used to reduce nausea associated with chemotherapy. It also has SEDATIVE and ANXIOLYTIC actions. It is being investigated for the treatment of multiple sclerosis.

naboctate [INN] (naboctate hydrochloride [USAN]; SP 325) is a synthetic cannabinoid, a CANNABINOID RECEPTOR AGONIST. It is an ANTIEMETIC, SEDATIVE and ANXIOLYTIC, and can be used in ANTIGLAUCOMA TREATMENT.

naboctate hydrochloride ➡ **naboctate**.

nabumetone [BAN, INN, USAN] (BRL 14777; Relifex™ and many other names) is a naphthalenylbutanone, a recently approved novel CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It has a relatively low incidence of adverse gastrointestinal effects and is used orally in the treatment of acute and chronic osteoarthritis and rheumatoid arthritis.

nacartocin [INN] is a synthetic analogue of **oxytocin** and agonist at oxytocin receptors ((OT) VASOPRESSIN RECEPTOR AGONIST). It has OXYTOCIC and natriuretic activity. See also **argiprestocin**.

Nacton™ ➡ **poldine methylsulfate**.

nadolol [BAN, INN, JAN, USAN] (Corgard™) is a (subtype-non-selective) β-ADRENOCEPTOR ANTAGONIST, which is relatively water-soluble. Chemically, it is a mixture of two racemates. Therapeutically, it can be used as an ANTIHYPERTENSIVE, ANTIANGINAL, ANTIARRHYTHMIC, ANTITHYROID and ANTIMIGRAINE AGENT.

nadoxolol [INN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIHYPERTENSIVE and ANTIARRHYTHMIC properties.

nadroparin (Ca salt is nadroparin calcium [BAN, INN]; Fraxiparin™) is a (parenteral) ANTICOAGULANT, chemically a low-molecular weight form of **heparin**. It can be used therapeutically in the treatment of thromboembolic disease.

nadroparin calcium ➡ **nadroparin**.

NAF ➡ **nafimidone**.

nafagrel [INN] (DP 1904) is an imidazolylmethylnaphthalenecarboxylic acid, a THROMBOXANE SYNTHETASE INHIBITOR. It inhibits renal thromboxane B_2 production and renal damage in hypertensive diabetic rats.

nafamostat [INN] (nafamostat mesylate [USAN]; nafamostat mesilate [JAN]; FUT 175) is a naphthyl derivative, an ENZYME INHIBITOR active as a (serine) PROTEASE INHIBITOR and anticomplement agent. It acts as an ANTIFIBRINOLYTIC and PLATELET AGGREGATION INHIBITOR, and can be used for the treatment of acute pancreatitis and cerebrovascular disorders.

nafamostat mesilate ➡ **nafamostat**.

administered as its prodrug, **mycophenolate mofetil**. It has antimetabolite cytotoxic properties, and shows experimental activity as an ANTICANCER and ANTIVIRAL AGENT. It may be clinically useful in treating psoriasis and leishmaniasis. It also has IMMUNOSUPPRESSANT properties, and can be used in the prophylaxis of acute kidney rejection.

mycoporphyrin ➡ **hypericin**.

Mycostatin™ ➡ **nystatin**.

Mydriacyl™ ➡ **tropicamide**.

MYDRIATIC AGENTS dilate the pupil of the eye (i.e. cause mydriasis). For medical purposes this may be required for ophthalmic examinations, diagnosis and some operative procedures. Mydriasis may be achieved through topical application of direct-acting sympathomimetics (see α-ADRENOCEPTOR AGONISTS), e.g. **adrenaline** or **phenylephrine**, or occasionally with indirect-acting sympathomimetics (see SYMPATHOMIMETICS), e.g. **cocaine**. Cholinergic antagonists are effective as mydriatics, and short-acting agents are generally used, e.g. **cyclopentolate**, **homatropine** or **tropicamide** (see MUSCARINIC CHOLINOCEPTOR ANTAGONISTS).

Mydrilate™ ➡ **cyclopentolate**.

Myelobromol™ ➡ **mitobronitol**.

Myleran™ ➡ **busulphan**.

Myocholine™ ➡ **bethanechol chloride**.

Myochrysine™ ➡ **gold sodium thiomalate**.

***myo*-inositol** (meso-inositol; i-inositol; inositol; 1,2,3,5/4,6-inositol) occurs commonly in plants and animals, and is the most widely distributed of the inositols. It is a growth factor for animals and microorganisms, and is a lipotropic agent. It is incorporated into some multivitamin preparations as a NUTRITIONAL AGENT (e.g. Ketovite™). The phosphates are important cellular second messengers.

Myotonine™ ➡ **bethanechol chloride**.

myristicin is a methylenedioxybenzene derivative, a constituent of *Illicium anisatum*, dill, nutmeg, parsley and many other essential oils. It has DIURETIC and narrow-spectrum INSECTICIDE activity. It is a PSYCHOTROPIC (hallucinogenic) AGENT in humans.

myrtecaine [INN] is an ester series LOCAL ANAESTHETIC. It has been used by topical application (sometimes in combination with lauryl sulphate) for local pain relief.

Mysoline™ ➡ **primidone**.

Mytelase™ ➡ **ambenonium chloride**.

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nafamostat mesilate ➡ **nafamostat**.

nafamostat mesylate ➡ **nafamostat**.

nafarelin [BAN, INN] (nafarelin acetate [USAN]; RS 94991-298; Synarel™) is a synthetic substituted nonapeptide analogue of **gonadorelin** (gonadotrophin-releasing hormone), a **LH-RH RECEPTOR AGONIST** with similar properties. It can be administered by a nasal spray, being absorbed for the systemic treatment of growth problems in LH-RH-dependent precocious puberty; also, for the treatment of endometriosis; and both for pituitary desensitization before induction of ovulation in an assisted conception (IVF), and as a potential contraceptive. For further details see **gonadotrophin-releasing hormone**.

nafarelin acetate ➡ **nafarelin**.

nafazatrom [BAN, INN] (Bay g 6575) is a pyrazolone derivative, a **LIPOXYGENASE INHIBITOR** thought to enhance synthesis of prostacyclin, and thus is a **PLATELET AGGREGATION INHIBITOR**. It has been used as an **ANTITHROMBOTIC** in the treatment of vascular disorders. It has also been used as an antimetastatic in **ANTICANCER** chemotherapy.

nafcillin [BAN, INN] (nafcillin sodium [USAN]; Unipen™) is a semisynthetic (penicillin) **ANTIBIOTIC**, resistant to β-lactamase. It can be used clinically as an **ANTIBACTERIAL** to treat certain infections.

nafcillin sodium ➡ **nafcillin**.

nafetolol [INN] is a **β-ADRENOCEPTOR ANTAGONIST** (never marketed).

nafimidone [INN] (nafimidone hydrochloride [USAN]; NAF; RS 81943) is an imidazolylnaphthyl ketone, an **ANTICONVULSANT** considered for use as an **ANTIEPILEPTIC**.

nafimidone hydrochloride ➡ **nafimidone**.

nafoxidine [INN] (nafoxidine hydrochloride [USAN]; NSC 70735; U 11100A) is a non-steroid, an **ANTIOESTROGEN**, used as an **ANTICANCER AGENT** for breast cancer.

nafronyl oxalate ➡ **naftidrofuryl**.

naftalofos ➡ **naphthalophos**.

naftazone [BAN, INN] (naphthoquinone semicarbazone) is a **HAEMOSTATIC** suggested in various conditions of venous insufficiency and in capillary haemorrhage.

naftidrofuryl [BAN, INN] (nafronyl oxalate [USAN]; naftidrofuryl oxalate; naftifurine oxalate; Praxilene™; Stimlor™) is a naphthalenyl-furan derivative, a ($5\text{-}HT_2$-subtype) **5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST**. It is a **VASODILATOR** (prevents serotonin-induced vasoconstriction) and is used in the treatment of peripheral and cerebral vascular disease.

naftidrofuryl oxalate ➡ **naftidrofuryl**.

naftifine [BAN, INN] (naftifine hydrochloride [USAN]; Naftin™) is a synthetic allylamine **ANTIFUNGAL**. It can be used systemically or orally to treat various fungal infections

naftifine hydrochloride ➡ **naftifine**.

naftifurine oxalate ➡ **naftidrofuryl**.

Naftin™ ➡ **naftifine**.

naftopidil [INN] is related to **urapidil**, and is an (α_1) **α-ANDRENOCEPTOR ANTAGONIST** and **CALCIUM-CHANNEL BLOCKER**. It has **ANTIHYPERTENSIVE** and **VASODILATOR** properties.

nagrestipen [BAN] (MIP-1α; BB 10010) is a genetically engineered variant of human macrophage inflammatory protein 1α. It is a (CCR5 chemokine) **CYTOKINE RECEPTOR AGONIST**, and acts as an **IMMUNOMODULATOR** and protects bone marrow stem cells.

nalbuphine [BAN, INN] (nalbuphine hydrochloride [USAN]; En 2234A; Nubain™) is one of the thebaine series of phenanthrene agents, and is a mixed (κ) **OPIOID RECEPTOR AGONIST** and (μ) **OPIOID RECEPTOR ANTAGONIST**, which has **OPIOID ANALGESIC** activity. It can be used by injection to treat moderate to severe pain, including that associated with myocardial infarction.

nalbuphine hydrochloride ➡ **nalbuphine**.

Nalfon™ ➡ **fenoprofen**.

nalidixate sodium ➡ **nalidixic acid**.

nalidixic acid [BAN, INN, JAN, USAN] (nalidixate sodium [USAN]; NegGram™; Uriben™ and many other names) is an **ANTIMICROBIAL**, an original member of the 4-quinolone family all related to nalidixic acid. These, though synthetic agents, are sometimes regarded as **ANTIBIOTICS**. It can be used clinically as an **ANTIBACTERIAL**, mainly orally against bacterial infections of the gut.

nalmefene [BAN, INN, JAN, USAN] (Nalmetrene™) is a **naltrexone** derivative and is an **OPIOID RECEPTOR ANTAGONIST**. It is used to reverse the effects of overdose with natural or synthetic analgesic **OPIOID ANALGESICS**, where it has an improved duration of action.

Nalmetrene™ ➡ **nalmefene**.

Nalorex™ ➡ **naltrexone**.

nalorphine [BAN, INN] (nalorphine hydrochloride [USAN]; *N*-allylnormorphine; Lethidrone™) is one of the phenanthrene series, and is a mixed (κ) opioid receptor agonist and (μ) **OPIOID RECEPTOR ANTAGONIST** with **OPIOID ANALGESIC** activity (with dysphoria and hallucinations) and also some narcotic analgesic antagonist ability.

nalorphine hydrochloride ➡ **nalorphine**.

naloxazone azine ➡ **naloxonazine**.

naloxonazine (naloxazone azine) is one of the phenanthrene series and analogue of **naloxone**. It is a (mainly μ) **OPIOID RECEPTOR ANTAGONIST**, and is used as a pharmacological tool.

naloxone [BAN, INN, JAN] (naloxone hydrochloride [USAN]; hydroxynormorphinone; EN 1530; Narcan™) is one of the phenanthrene series and an analogue of **nalophine**. It is a (largely subtype unselective) **OPIOID RECEPTOR ANTAGONIST**, which is used clinically by injection as an **ANTIDOTE** to reverse the effects, and treat overdose, of most classes of narcotic opiate (opioid) analgesics.

naloxone hydrochloride ➡ **naloxone**.

naltrexone [BAN, INN, USAN] (naltrexone hydrochloride; EN 1639A; UM 792; Nalorex™; Trexan™) is one of the phenanthrene series and an analogue of **oxymorphone** and **thebaine**, and is also an analogue of the antagonist **naloxone**. It is a (largely subtype-unselective) **OPIOID RECEPTOR ANTAGONIST**, and is used orally in detoxification treatment for formerly opioid-dependent individuals to help prevent relapse.

naltrexone hydrochloride ➡ **naltrexone**.

naltrindole is one of the phenanthrene series, and is a (predominantly δ-subtype) **OPIOID RECEPTOR ANTAGONIST**. It shows **ANTITUSSIVE** effects in rodents, and is used as a pharmacological tool.

nandrolone [BAN, INN] (19-nortestosterone; nandrolone decanoate [BAN, USAN]; nandrolone phenylpropionate [BAN]; nandrolone phenpropionate [USAN]; nandrolone cyclohexylpropionate [BAN]; nandrolone cyclotate [USAN]; nandrolone caproate; nandrolone hexyloxyphenylpropionate; nandrolone hydrogen succinate; nandrolone laurate [BAN]; NTCHP; nandrolone cyclohexane carboxylate nandrolone cipionate; nandrolone undecylate; RS 3268R; SG 4341; NSC 3351; NSC 23162; Deca-Durabolin™; Hybolin decanoate™) is a steroid with **ANDROGENIC** and **ANABOLIC** properteis. It has similar actions to the male sex hormone **testosterone**, but with far fewer

masculinizing effects. It can be used to treat osteoporosis and aplastic anaemia, and as an ANTICANCER AGENT for breast cancer. Is has experimental use as a male CONTRACEPTIVE.

nandrolone caproate ➡ **nandrolone**.

nandrolone cipionate ➡ **nandrolone**.

nandrolone cyclohexane carboxylate ➡ **nandrolone**.

nandrolone cyclohexylpropionate ➡ **nandrolone**.

nandrolone cyclotate ➡ **nandrolone**.

nandrolone decanoate ➡ **nandrolone**.

nandrolone hexyloxyphenylpropionate ➡ **nandrolone**.

nandrolone hydrogen succinate ➡ **nandrolone**.

nandrolone laurate ➡ **nandrolone**.

nandrolone phenpropionate ➡ **nandrolone**.

nandrolone phenylpropionate ➡ **nandrolone**.

nandrolone undecylate ➡ **nandrolone**.

nanterinone [BAN, INN] is an imidazolquinolinone and a (inotropic) CARDIAC STIMULANT, which can be used in congestive HEART FAILURE TREATMENT.

nantradol [INN] (nantradol hydrochloride [USAN]; CP 44001-1) is a synthetic cannabinoid, a CANNABINOID RECEPTOR AGONIST. It has ANTIEMETIC, SEDATIVE, ANXIOLYTIC, ANALGESIC and ANTIGLAUCOMA actions. The pharmacologically active isomer is levonantradol.

nantradol hydrochloride ➡ **nantradol**.

naphazoline [BAN, INN] (naphazoline hydrochloride [USAN]) is an imidazoline derivative acting as an (α_1-subtype) α-ADRENOCEPTOR AGONIST with VASOCONSTRICTOR properties. It can be used as a nasal DECONGESTANT.

naphazoline hydrochloride ➡ **naphazoline**.

naphthalinic acid ➡ **lawsone**.

naphthalophos [BAN] (naftalofos [INN, USAN]) is an (organophosphate group) ANTICHOLINESTERASE used as a veterinary ANTHELMINTIC and nematocide.

naphthoquinone semicarbazone ➡ **naftazone**.

1-naphthoyl-[DAla24,DPro26,ψ26-27]GRP$_{20\text{-}27}$ is a pseudopeptide (BB_2) BOMBESIN RECEPTOR ANTAGONIST; used as a pharmacological tool.

Napratec™ ➡ **misoprostol**; **naproxen**.

Naprosyn™ ➡ **naproxen**.

naproxen [BAN, INN, JAN, USAN] (naproxen sodium [USAN]; Anaprox™; Napratec™; Naprosyn™; Synflex™ and many other names) is a member of the propionic acid series, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

naproxen sodium ➡ **naproxen**.

Naqua™ ➡ **trichlormethiazide**.

narasin [BAN, INN, USAN] is a (polyether) ANTIBIOTIC, an ionophore effective as an ANTIVIRAL and particularly as an ANTICOCCIDIAL in chickens.

Narcan™ ➡ **naloxone**.

narceine is an alkaloid from *Papaver somniferum* (Papaveraceae). It is a RESPIRATORY STIMULANT and ANTITUSSIVE. It shows no analgesic activity, but it does have ANTIHYPERTENSIVE and intestinal SMOOTH MUSCLE STIMULANT properties.

narcotine ➡ **noscapine**.

L-α-narcotine ➡ **noscapine**.

nardeterol [INN] is a β-ADRENOCEPTOR AGONIST which therapeutically can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.

Nardil™ ➡ **phenelzine**.

Narphen™ ➡ **phenazocine**.

NAS (*N*-acetyl-5-hydroxytryptamine) is a MELATONIN RECEPTOR AGONIST, possibly an endogenous ligand.

Nasalcrom™ ➡ **cromoglycic acid**.

Nasalide™ ➡ **flunisolide**.

nasaruplase [INN] (prourokinase) is more fully described as prourokinase (enzyme-activating) (human clone pA3/pD2/pF1, and is a proform of a proteolytic ENZYME of the plasminogen activator group, forming plasmin which degrades fibrin so breaking up thrombi, thus acting as a THROMBOLYTIC. Chemically, it is recombinant protein of the urokinase-type. Therapeutically, it can be used to treat thromboembolytic disease.

Nasonex™ ➡ **mometasone**.

Natacyn™ ➡ **natamycin**.

natamycin [BAN, INN, USAN] (Natacyn™) is a (polyene group) ANTIBIOTIC which shows ANTIFUNGAL, ANTIVIRAL and ANTIMICROBIAL properties. Clinically, it can be used topically for fungal infections of the eye. It is a permitted agent in the USA for surface treatment of cheeses as a mould-inhibitor.

natralinium chloride ➡ **dequalinium chloride**.

Natrilix™ ➡ **indapamide**.

Natulan™ ➡ **procarbazine**.

Navelbine™ ➡ **vinorelbine**.

Navidrex™ ➡ **cyclopenthiazide**.

Navoban™ ➡ **tropisetron**.

naxagolide [INN] (naxagolide hydrochloride [USAN]) is a naphthoxazinol derivative, with (D_2) DOPAMINE RECEPTOR AGONIST activity, and is used as an ANTIPARKINSONIAN AGENT.

naxagolide hydrochloride ➡ **naxagolide**.

naxaprostene [INN] (CG 4305; EL 784) is a synthetic prostaglandin analogue that is a PROSTANOID RECEPTOR AGONIST. It has transient HYPOTENSIVE and PLATELET AGGREGATION INHIBITOR properties.

NBQX (FG 9202) is a quinoxaline-sulphonamide that is a (AMPA) GLUTAMATE RECEPTOR ANTAGONIST with ANTICONVULSANT and experimental NEUROPROTECTIVE actions. It is used as a pharmacological tool.

ND 1966 ➡ **aminoglutethimide**.

ND-STAT™ ➡ **brompheniramine**.

nebacumab [BAN, INN, USAN] (HA-1A) is a monoclonal antibody (MW *c.* 1,000,000) that has IMMUNOMODULATOR/IMMUNOSUPPRESSANT activity. It has been used for treatment of Gram-negative sepsis and septic shock. Withdrawn from European market in 1994.

nebivolol [BAN, INN, USAN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIANGINAL, ANTIHYPERTENSIVE and VASODILATOR properties.

nebramycin VI ➡ **tobramycin**.

nedocromil [BAN, INN, USAN] (nedocromil sodium [USAN]; nedocromil calcium [USAN]; Tilade™; Tilarin™; Rapitil™ and many other names) is a chromone, an ANTIALLERGIC AGENT and mediator release inhibitor similar to **cromoglycic acid**, which can be used for prophylaxis of allergic conditions, such as antiasthmatic prophylaxis by inhalation.

nedocromil calcium ➡ **nedocromil**.

nedocromil sodium ➡ **nedocromil**.

nefazodone [BAN, INN] (nefazodone hydrochloride [USAN]; MJ 13,754-1; Serzone™) is a novel phenylpiperazine derivative unrelated to other classes of selective SSRIs, tricyclics or MAOI agents, but is used as an oral ANTIDEPRESSANT. It has ($5\text{-}HT_{2A}$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST and 5-HT UPTAKE INHIBITOR activity. It has been studied for alleviation of premenstrual syndrome.

nefazodone hydrochloride ➡ **nefazodone**.

nefopam [BAN, INN] (nefopam hydrochloride [USAN]; benzoxazocine; fenazoxine; Acupan™) is a benzoxazocine

derivative, an atypical non-opioid non-NSAID ANALGESIC, which can be used to treat persistant moderate pain unresponsive to other classes of analgesic. Its mechanism of action is uncertain, but is thought to involve interaction with CNS monoaminergic nerve pathways.

nefopam hydrochloride ➡ **nefopam.**

NegGram™ ➡ **nalidixic acid.**

Nembutal™ ➡ **pentobarbitone.**

Nembutal sodium™ ➡ **pentobarbitone.**

nemonapride [INN, JAN] (YM 09151-2) is a benzamide, a (D_2) DOPAMINE RECEPTOR ANTAGONIST that has been used as an ANTIPSYCHOTIC in the treatment of schizophrenia.

neoarsphenamine [INN] is an arsenical with ANTIMICROBIAL activity, used as a veterinary antiinfective and antisyphilitic.

Neo-Benadryl™ ➡ **bromodiphenhydramine.**

neocarzinostatin ➡ **zinostatin.**

α-neoendorphin is a decapeptide isolated from pig hypothalamus and a (κ) OPIOID RECEPTOR AGONIST.

β-neoendorphin (des-lysine^{10}-α-neoendorphin (pig); β-neoendorphin (human and pig)) is a nonapeptide and a (κ) OPIOID RECEPTOR AGONIST.

Neo-Mercazole™ ➡ **carbimazole.**

neomycin [BAN, INN] (neomycin sulphate; Mycifradin™) is an (aminoglycoside) ANTIBIOTIC composed of a complex of neomycin A, B and C – early members of the aminoglycoside family produced by the mould *Streptomyces fradiae*. It has broad-spectrum ANTIBACTERIAL properties but is too toxic to be injected, though it can be used in treating some superficial bacterial infections, and is occasionally taken by mouth to reduce the levels of bacteria in the gut (it is not absorbed).

neomycin B ➡ **framycetin sulphate.**

neomycin sulphate ➡ **neomycin.**

neopentanetetrayl nicotinate ➡ **niceritrol.**

Neoral™ ➡ **cyclosporine.**

Neosar™ ➡ **cyclophosphamide.**

neosaxitoxin is a 5-hydroxy derivative of **saxitoxin** and which acts as a potent SODIUM-CHANNEL BLOCKER and NEUROTOXIN. It is produced by *Protogonyaulax* and is found in shellfish responsible for poisoning.

neostigmine bromide [BAN, INN, JAN, USAN] (neostigmine methylsulfate [JAN, USAN]; neostigmine methylsulphate [BAN]; Prostigmin™; Robinul-Neostigmine™) is a quaternary ammonium reversible ANTICHOLINESTERASE. It is a PARASYMPATHOMIMETIC that therapeutically can be used to stimulate the bladder to treat urinary retention and the intestine to treat paralytic ileus. It can also be used to enhance neuromuscular transmission in myasthenia gravis.

neostigmine methylsulfate ➡ **neostigmine bromide.**

neostigmine methylsulphate ➡ **neostigmine bromide.**

neosurugatoxin is a complex glycoside, a NEUROTOXIN isolated from the mid-gut gland of the Japanese ivory shell mollusc *Babylonia japonica*. It is an irreversible NICOTINIC CHOLINOCEPTOR ANTAGONIST, acting both at muscle and neuronal subtypes, and is used as a pharmacological tool.

Neothylline™ ➡ **diprophylline.**

Neotigason™ ➡ **acitretin.**

neotocopherol ➡ **β-tocopherol.**

Nephril™ ➡ **polythiazide.**

Neptamox™ ➡ **methazolamide.**

Neptazane™ ➡ **methazolamide.**

neraminol [INN] is a β-ADRENOCEPTOR ANTAGONIST.

Nerisone™ ➡ **diflucortolone.**

Nesacaine™ ➡ **chloroprocaine.**

nesosteine [INN] is a thiazolidinylbenzoic acid derivative, a MUCOLYTIC used in the treatment of bronchitis.

Nethalide™ ➡ **pronethalol.**

Netillin™ ➡ **netilmicin.**

netilmicin [BAN, INN] (netilmicin sulfate [JAN, USAN]; Netillin™; Netromycin™) is an (aminoglycoside) ANTIBIOTIC. Clinically, it has broad-spectrum ANTIBACTERIAL properties and can be used systemically and topically often in conjunction with other drugs (it synergizes with β-lactam antibiotics).

netilmicin sulfate ➡ **netilmicin.**

netobimin [BAN, INN, USAN] is a veterinary ANTHELMINTIC.

Netromycin™ ➡ **netilmicin.**

Neulactil™ ➡ **pericyazine.**

Neupogen™ ➡ **filgrastim; lenograstim.**

neurokinin A (NKA; substance K; neurokinin α; neuromedin L) is a mammalian *C*-terminally amidated decapeptide tachykinin isolated from porcine spinal cord. It is formed from the precursor preprotachykinin A (PPT-A). It acts as a TACHYKININ RECEPTOR AGONIST (showing greater activity at NK_2/NK_3 than at NK_1 receptors). It stimulates extravascular smooth muscle, is a powerful VASODILATOR and transient HYPOTENSIVE. It is used as a pharmacological tool.

neurokinin α ➡ **neurokinin A.**

neurokinin B (NKB; neuromedin K; neurokinin β) is a *C*-terminally amidated decapeptide tachykinin isolated from porcine spinal cord. It is formed from the precursor preprotachykinin B (PPT-B). It acts as a TACHYKININ RECEPTOR AGONIST (showing greater activity at NK_3/NK_2 than at NK_1 receptors). It stimulates extravascular smooth muscle, is a powerful VASODILATOR and transient HYPOTENSIVE.

neurokinin β ➡ **neurokinin B.**

neuromedin B (NMB) is a decapeptide hormone, and possibly a neurotransmitter, originally isolated from porcine spinal cord. It is an analogue of the amphibian peptide **bombesin**. It is a BOMBESIN RECEPTOR AGONIST more active at the BB_1 receptor subtype, and stimulates gastric acid secretion, contracts intestinal smooth muscle and can contract or relax a range of vascular tissues. A number of neurons in the enteric and CNS are excited.

neuromedin C ➡ **gastrin-releasing peptide GRP18–27.**

neuromedin K ➡ **neurokinin B.**

neuromedin L ➡ **neurokinin A.**

neuromedin N is a pentapeptide originally isolated from pig spinal cord, and is synthesized from a precursor common to **neurotensin** in mammalian brain and intestine. It is a *C*-terminal analogue of neurotensin, and a NEUROTENSIN RECEPTOR AGONIST with similar properties as a HYPOTENSIVE and intestinal smooth muscle stimulant.

NEUROMUSCULAR BLOCKING AGENTS relax skeletal (voluntary) muscle by acting directly at the skeletal neuromuscular junction. In conventional usage the name is taken to mean agents that act directly at nicotinic cholinergic receptors. It thus excludes agents that relax muscles by other mechanisms, such as **diazepam** or **baclofen**, that work at a CNS level, or **dantrolene** that works on the sarcoplasmic reticulum within the muscle (see SKELETAL MUSCLE RELAXANTS). The neuromuscular blocking agents fall into two classes.

Competitive blockers (*non-depolarizing blockers*) act by competing with acetylcholine at the nicotinic receptor, thereby blocking transmission and producing a flaccid paralysis. The advantages are that this method does not cause muscle pain when the patient recovers from general anaesthesia. Also, the block can be reversed at the end of the

operation by giving an ANTICHOLINESTERASE (e.g. **neostigmine**). The disadvantage is that the duration of action of all agents developed to date is too long for relatively short operations. Examples of this class are: **atracurium besylate**, **gallamine**, **mivacurium**, **pancuronium**, **rocuronium bromide**, **tubocurarine chloride** and **vecuronium bromide**. See NICOTINIC CHOLINOCEPTOR ANTAGONISTS.

Depolarizing blockers (*non-competitive blockers*) are actually *agonists* at the nicotinic receptors, but with a longer duration of action than acetylcholine. The effect of a prolonged action at these intrinsic-ion-channel receptors is to give a depolarization block. The initial stimulation may result in the patient experiencing some muscle pain on recovery from general anaesthesia. The main drug used clinically for this purpose is **suxamethonium chloride** and since it is hydrolysed by plasma cholinesterase, its duration of action is normally less than ten minutes. Anticholinesterases cannot be used to reverse paralysis. A relatively minor disadvantage of suxamethonium is that there are two rare genetically determined adverse reactions to it; one where the duration is prolonged due to slow hydrolysis ('Scoline apnoea'); and the other a serious muscle spasm and generalized pyretic reaction due to a mutant ryanodine receptor in the sarcoplasmic reticulum (in malignant hyperthermia). Another depolarizing blocking agent is **decamethonium iodide** (which is no longer clinically available). See NICOTINIC CHOLINOCEPTOR AGONISTS.

Neurontin™ ➡ **gabapentin**.

neuropeptide γ (γ-preprotachykinin 72-92) is a 21 residue peptide *C*-terminally amidated peptide, a tachykinin that is an *N*-terminally extended form of NKA, isolated from porcine brain. It is formed from the precursor preprotachykinin A (PPT-A). It acts as a TACHYKININ RECEPTOR AGONIST and stimulates extravascular smooth muscle, is a powerful VASODILATOR and transient HYPOTENSIVE. It is used as a pharmacological tool.

NEUROPEPTIDE Y RECEPTOR AGONISTS act at sites that recognize neuropeptide Y (NPY) and analogues. This is a 36 amino acid linear amidated neuropeptide with an extensive distribution in the central and peripheral nervous systems. Although much remains to be learned about its roles, it has a well established co-transmitter role with noradrenaline on release from sympathetic neurons. Fibres having co-location of these two neurotransmitters innervate blood vessels and there is a synergism between their vasoconstrictor actions (which are mediated in the case of NPY via Y_1 receptors). There are also prejunctional Y_2 receptors, where NPY can have an inhibitory action on mutual release with noradrenaline. There are a number of central autonomic actions, particularly associated with stimulation of food and water intake. NPY belongs to a family of peptides with a number of emerging members, including **pancreatic polypeptide** (PP) and **peptide YY** (PYY). These peptides appear to share a number of receptors, the identity of which is still in flux. There appear to be five or more of these.

At Y_1 receptors the activity of the agonists is PYY ≥ NPY >> PP, and some selective ligands include: [Leu^{31},Pro^{34}]PYY, [Pro^{34}]NPY, Pro^{34}]PYY, and [Leu^{31},Pro^{34}]NPY.

At Y_2 receptors the activity of the agonists also is PYY ≥ NPY >> PP, and some selective ligands include: PYY_{3-36}, PYY_{13-36}, NPY_{13-36}, [γ-Glu^2-ε-Lys^{30}]NPY and NPY(1-4)Ahx$_{25-36}$.

At Y_3 receptors (tentatively named since they have not yet been cloned) the activity of PYY is characteristically very low compared to NPY.

At Y_4 (or PP_1) receptors the activity of the agonist ligands is PP >> NPY ≈ PYY, and a reasonably selective agonist ligand is PP.

At Y_5 ('Y_1-like') receptors the activity of the agonists is NPY ≥ PYY ≥ PP; and a reasonably selective agonist ligand is PYY_{3-36}.

At y_6 receptors (previously referred to as Y_5, PP_2, Y_{2B}; and denoted in lower-case as a non-expressed gene). The activity of the agonist ligands is NPY = PYY > PP.

These receptors are all of the seven-transmembrane G-protein-coupled types, and can couple negatively to adenylyl cyclase.

Applications of NPY receptor agonists remain to be developed. However, Y_2 agonists potentially have antihypertensive actions. Central administration produces anxiolytic and sedative effects. There are some data to suggest that NPY release can modify hyperalgesia.

Wan, C.P. *et al.* (1995) Neuropeptide Y receptor subtypes. *Life Sci.*, **56**, 1055-1064.
Lundberg, J.M. *et al.* (1996) Recent developments with neuropeptide Y receptor antagonists. *Trends Pharmacol. Sci.*, **17**, 301-304.
Playford, R.J. *et al.* (1996) Peptide YY and neuropeptide Y: two peptides intimately involved in electrolyte homeostasis. *Trends Pharmacol. Sci.*, **17**, 436-438.
Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

NEUROPEPTIDE Y RECEPTOR ANTAGONISTS act at receptors recognizing neuropeptide Y and analogues. The receptors are of at least five or six types. Some antagonists are known. At Y_1 receptors, antagonists include **BIBP 3226**, **SR 120107A** and **SR 120819A**. **Benextramine** is a putative Y_1 and Y_2 non-competitive antagonist.

Potential uses of Y_1 antagonists are principally aimed at hypertension, and these antagonists reduce blood pressure in spontaneously hypertensive rats. Other uses are as dietary modifiers and analgesics.

Doods, H.N. *et al.* (1995) Pharmacological characterisation of the selective nonpeptide neuropeptide Y Y_1 receptor antagonist BIBP 3226. *J. Pharmacol. Exp. Ther.*, **275**, 136-142.
Wieland, H.A. *et al.* (1995) Subtype selectivity and antagonistic profile of the nonpeptide Y_1 receptor antagonist BIBP 3226. *J. Pharmacol. Exp. Ther.*, **275**, 143-149.
Lew, M.J. *et al.* (1996) Synthesis and characterization of a selective peptide antagonist of neuropeptide Y vascular postsynaptic receptors. *Br. J. Pharmacol.*, **117**, 1768-1772.
Lundberg, J.M. *et al.* (1996) Recent developments with neuropeptide Y receptor antagonists. *Trends Pharmacol. Sci.*, **17**, 301-304.

neuropeptide K (NPK; substance K) is a 36 residue peptide *C*-terminally amidated peptide, a tachykinin that is an *N*-terminally extended form of NKA, isolated from porcine brain. It is formed from the precursor preprotachykinin A (PPT-A). It acts as a TACHYKININ RECEPTOR AGONIST and stimulates extravascular smooth muscle, is a powerful VASODILATOR and transient HYPOTENSIVE and causes increased capillary permeability. It is used as a pharmacological tool.

neuropeptide Y (NPY) is a 36 amino acid residue amidated peptide (human variant) that is widely distributed throughout the mammalian central and peripheral sympathetic nervous systems. NPY belongs to a family of peptides with a number of emerging members, including **pancreatic polypeptide** (PP) and **peptide YY** (PYY). These peptides appear to share a family of receptors (five or more in number). NPY is a NEUROPEPTIDE Y RECEPTOR AGONIST, and has potent appetite stimulant and anxiolytic properties. It also promotes the release of **prolactin**, **growth hormone** and **luteinizing hormone**. It is co-located with noradrenaline in sympathetic nerves, where on release they have synergistic VASOCONSTRICTOR actions postjunctionally, though NPY also inhibits release prejunctionally.

NEUROPROTECTIVE AGENTS help protect against

neuronal damage. There are many causes of neuronal cell death, and so potentially many possible ways of protecting neurons according to the circumstances or disease state. However, ischaemic brain damage (stroke) is one of the few neurodegenerative disorders, along with Parkinson's disease (*vide supra*), that is amenable to study in animals, so there is more known about the mechanisms involved – as compared to dementia (such as Alzheimer's) or Huntington's disease.

Excitotoxicity: It is now accepted that excitatory amino acids play an important part in the aetiology of neurodegeneration. There is good evidence that excitatory amino acids – endogenous glutamate, or exogenous application of the neurotoxins such as **kainic acid** – lead to opening of NMDA receptor channels (see GLUTAMATE RECEPTOR ANTAGONISTS). This allows the ingress of Ca^{2+} through these channels, and depolarization, and the cytotoxicity of Ca^{2+} is exacerbated by further entry through voltage-sensitive Ca^{2+}-channels. This sequence of events, with calcium overload, can kill the cells through activating intracellular proteases and lipases, impaired mitochondrial function, and generation of free-radicals (oxidative stress, *vide infra*) – referred to as excitotoxicity – and is triggered by excitation of glutamate-containing nerves, particularly in ischaemia. For this reason, experimental models have been developed that mimic this state of affairs, and antagonists of NMDA receptor channel activation have featured high in tested treatments. Agents studies include **ARL 15896**, **cyclazocine**, **dextrorphan**, **dizocilpine (MK 801)**, **memantine**, **remacemide** and **selfotel**. A number of non-psychotropic cannabinoids with potential use in the treatment of brain damage have been tested, and interact with NMDA receptors (and also have free-radical scavenging abilities), e.g. dexanabinol (HU-211). These miscellaneous drugs have a variety of types of antagonism with NMDA, and some block other channels and a few have advanced into administration to patients with ischaemic stroke and other neurotoxic afflictions.

Calcium- and sodium-channel blockers: Agents that block other voltage-sensitive channels showing promise as neuroprotective agents include the mixed calcium-/sodium-channel blockers **lifarizine**, the novel antiepileptic **lamotrigine** and **clomethiazole**, a GABA agonist. Compounds proposed as neuroprotective agents include agents better known as polyamine amide neurotoxins, e.g. some philanthotoxins and **agatoxins** that are potent antagonists of ionotropic glutamate receptors, and the neurotoxin **ω-conotoxin MVIIA**, which is a selective Ca^{2+} voltage-sensitive N-type channel blocker (which has advanced into clinical trials as a neuroprotective agent). In fact, block of voltage-sensitive Ca^{2+} channel blockers to limiting calcium cytotoxicity and reducing excitatory neurotransmitter release following neuronal depolarization, is a posssibility, and here N-type channel blockers seem logical. Also, there have been trials of L-type Ca^{2+} channel blockers in stroke. However, **nimodipine** which, on the basis of *in vitro* studies was expected to be beneficial in stroke, was ineffective in trials and actually increased risk of haemorrhage. However, it is used acutely to treat subarachnoid haemorrhage; it is a vasodilator with some selectivity for the smooth muscle of the cerebral vasculature. A related approach has been to try and buffer intracellular levels of Ca^{2+} within neurons, and TMB-8 and **dantrolene**, are being tested.

Adenosine is now recognized as a major central neurotransmitter, and some attention is being given to adenosine receptor activation as a means of reducing output of excitatory neurotransmitters: see ADENOSINE RECEPTOR AGONISTS.

Monoamine-oxidase inhibitors: The normal use of the selective MAO-B inhibitor **selegiline** is in the treatment of Parkinson's disease (where it inhibits dopamine breakdown) and slow progression of the disease; but it has also come to be used in the prevention of MPTP toxicity, and this has subsequently suggested further uses in treating neurodegeneration. It is now hypothesized that it might also prevent the formation of some naturally occurring, or environmental, MPTP-like substance involved in the neurodegeneration. See NEUROTOXINS; TOXINS.

Dopamine agonists: Recent studies point to the possibility of neuroprotection from aging and parkinsonism by the administration of dopamine receptor agonists. Agents showing some promise include **bromocriptine**, **α-dihydroergocryptine**, **lisuride** and **pergolide**.

Oxidative stress and free-radicals: The production of free-radicals and other reactive species has been much implicated in cytotoxicity. This topic is discussed in more detail elsewhere: see ANTIOXIDANTS & FREE-RADICAL SCAVENGERS; NITRIC OXIDE SYNTHASE INHIBITORS. The production of these species in oxidative stress is well established. Advances in therapy may well be in the direction of boosting and augmenting natural defence processes, for example, by superoxide dismutase (SOD), catalase, α-tocopherol, glutathione, ascorbic acid and perhaps melatonin. Surprisingly, some forms of the enzyme SOD can be administered *in vivo* and are protective.

Myseros, J.S. *et al.* (1995) The rationale for glutamate antagonists in the treatment of traumatic brain injury. *Ann. N. Y. Acad. Sci.*, **765**, 262-71; discussion 298.

Dawson, V.L. *et al.* (1996) Nitric oxide in neuronal degeneration. *Proc. Soc. Exp. Biol. Med.*, **211**, 33-40.

Koroshetz, W.J. *et al.* (1996) Emerging treatments for stroke in humans. *Trends Pharmacol. Sci.*, **17**, 227-233.

Urenjak, J. *et al.* (1996) Pharmacological modulation of voltage-gated Na+ channels: a rational and effective strategy against ischemic brain damage. *Pharmacol. Rev.*, **48**, 21-67.

neurotensin (NT) is a 13-residue amino acid peptide, originally isolated from the hypothalamus and later from bovine intestines. Neurotensin, and its *C*-terminal analogue, **neuromedin N**, were first isolated from the spinal cord. In the rat, the precursor consists of a 169-residue polypeptide containing several copies each of neurotensin and neuromedin N. In the brain, neurotensin is exclusively found in nerve cells, fibres and terminals; whereas the majority of peripheral neurotensin is found in the neuroendocrine N-cells located in the intestinal mucosa. It is a NEUROTENSIN RECEPTOR AGONIST, and has HYPOTENSIVE and intestinal smooth muscle stimulant activity, and is an analgesic modulator of central monoamine nerve cells.

NEUROTENSIN RECEPTOR AGONISTS act at sites recognizing neurotensin and analogues. Neurotensin is a 13-residue amino acid peptide originally isolated from the hypothalamus, and later from bovine intestines. The peptide is present throughout the animal kingdom, suggesting its participation in processes basic to animal physiology. Neurotensin and its *C*-terminal analogue, **neuromedin N**, first isolated from the spinal cord, are synthesized from a common precursor in mammalian brain and intestine. In the rat, the precursor consists of a 169-residue polypeptide containing several copies each of neurotensin and neuromedin N, though what controls differential expression of products is not understood. The central and peripheral distribution and effects of neurotensin have been extensively studied. In the brain, neurotensin is exclusively found in

nerve cells, fibres and terminals; whereas the majority of peripheral neurotensin is found in the neuroendocrine N-cells located in the intestinal mucosa. Central or peripheral injections of neurotensin produce different pharmacological effects as the peptide does not cross the blood–brain barrier.

At least two receptors have been cloned. These include NTS1 (NTR-1; NT1; high-affinity neurotensin receptor) at which the synthetic peptide analogue JMV449 is selective, and nts2 (where the functional relevance is yet to be elucidated) and here **levocabastine**, a histamine H_1 receptor antagonist, has a reasonably high affinity.

Like many other neuropeptides, neurotensin has central neurotransmitter or neuromodulator roles, whilst it acts as a neuroendocrine hormone in the periphery. Thus, pharmacological, morphological and neurochemical data suggest that one of the functions of neurotensin in the brain is to regulate dopamine neurotransmission along the nigrostriatal and mesolimbic pathways. There is quite good evidence that neurotensin is involved in regulation of pain and can act as an analgesic. In the periphery, it has been shown that gut peptides, including neurotensin, can regulate growth of some cancers of the GI tract and pancreas.

Neurotensin is a substrate for several neuropeptidases. **JMV-390-1** is a multipeptidase inhibitor based on the *C*-terminal sequence common to neurotensin and neuromedin N, and behaves as a full inhibitor of the major neurotensin/neuromedin N degrading enzymes *in vitro*. This agent may well prove to limit neurotensin degradation *in vivo*, so potentiating and highlighting its physiological actions; and potentially it is an analgesic. See ENDOPEPTIDASE INHIBITORS; NEUTRAL ENDOPEPTIDASE INHIBITORS; PROTEASE INHIBITORS.

A number of analogues of neurotensin have been developed. As with several other families of mediator peptides, receptor activity survives *N*-terminal deletions. For instance, the *C*-terminal hexapeptide of NT, NT_{8-13}, has been shown to possess similar properties to NT itself, and in fact, an analogue of NT_{8-13} has been reported to possess central activity after peripheral administration. Cyclic derivatives of this hexapeptide show high affinity for the NT receptor. With the future development of stable and subtype-selective neurotensin receptor agonist and antagonists, the development of putative therapeutic agents can be anticipated. In particular, neurotensin modulates the activity of the mesolimbic dopamine system, and antagonizes the behavioural action of dopamine in a manner similar, but not identical, to that of antipsychotic drugs. Neurotensin is even suggested to be an endogenous neuroleptic. Development of drugs of this type and for these actions, and also analgesic agents, are anticipated. See NEUROTENSIN RECEPTOR ANTAGONISTS.

Keegan, K.D. *et al.* (1994) The pharmacology of neurotensin analogues on neurones in the rat substantia nigra, pars compacta *in vitro*. *Eur. J. Pharmacol.*, **253**, 131-137.

Vincent, J.P. (1995) Neurotensin receptors: binding properties, transduction pathways, and structure. *Cell Mol. Neurobiol.*, **15**, 501-512.

Le, F. *et al.* (1996) The neurotensin receptor: Is there more than one subtype? *Trends Pharmacol. Sci.*, **17**, 1-3.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

NEUROTENSIN RECEPTOR ANTAGONISTS act at sites recognizing neurotensin, and there is evidence of more than one receptor subtype. An important agent in providing functional evidence has been the recently disclosed novel nonpeptide neurotensin receptor antagonist, **SR 48692**. This has been shown to inhibit neurotensin binding to the cloned rat and human NT receptor, and to antagonize NT effects in some, but not all, of a variety of *in vitro* and *in vivo* assays. In contrast to its antagonistic action on neurotensin-induced hypomotility in the rat, SR 48692 failed to antagonize neurotensin-induced hypothermia and analgesia in the mouse and rat, suggesting that these effects might be mediated through a SR 48692-insensitive subtype of neurotensin receptor. The fuller definition of receptor subtypes, coupled with the development of subtype-selective probes, may be anticipated.

Gully, D. *et al.* (1993) Biochemical and pharmacological profile of a potent and selective nonpeptide antagonist of the neurotensin receptor. *Proc. Natl. Acad. Sci. U. S. A.*, **90**, 65-69.

Dubuc, I. *et al.* (1994) The nonpeptide neurotensin antagonist, SR 48692, used as a tool to reveal putative neurotensin receptor subtypes. *Br. J. Pharmacol.*, **112**, 352-354.

Gully, D. *et al.* (1995) Neuropharmacological profile of non-peptide neurotensin antagonists. *Fundam. Clin. Pharmacol.*, **9**, 513-521.

NEUROTOXINS and TOXINS are separated into two entries in this book. This convenient division is not necessarily exact, nor mutually exclusive – toxins often have several actions, and not all toxic mechanisms have been fully investigated. However, there are very many known toxins that have such extraordinary precision of action that they are now extensively used as 'molecular scalpels' in electrophysiology, pharmacology and molecular biology. Most of these are essentially either ion-channel blockers or activators, or neurotransmitter receptor agonist and antagonists. Most toxins that work to poison neurotransmission will for convenience be referred to as 'neurotoxins', even though some actually interfere with neurotransmission by a postjunctional action on muscle and some other cells types. Many of these (e.g. **α-bungarotoxin**) have actions both on neurons and on muscle. A further important example, the ANTICHOLINESTERASES, have some actions on neuronal function (particularly within the CNS), but more widespread actions on postjunctional structures (through their prolongation of the actions of the neurotransmitter acetylcholine), but are generally regarded as neurotoxins ('nerve gases').

The organization of material within the neurotoxins heading is largely by mechanism and site of action for naturally occurring toxins and venoms, rather than by genus of organism that elaborate them. This is because the mechanisms of action are now often well established, whereas a given organism or family of organisms may provide a number of venoms with quite different mechanisms of toxic effect. For instance, the common honey bee (*Apis mellifera*) provides four different toxins, each with a different mechanistic heading. Also, some typical or important non-natural neurotoxins are also discussed – largely for the purposes of comparison – but their coverage is not exhaustive. More detail is provided in the entries for individual agents, including the latin names of organisms from which they are derived.

Toxins in general are potent poisons. Nevertheless, the selectivity of action of some of these toxins means they have been harnessed in medical therapeutics (and even more widely in experimental pharmacology and physiology). Toxins that have been, or still are, used in medicine include **atropine**, **botulinum toxin**, CARDIAC GLYCOSIDES, **colchicine**, **eserine**, **hyoscine**, **picrotoxin**, **morphine**, **ouabain**, **strychnine**, **veratridine**, vinca alkaloids and many more. All these work by an action at a defined molecular site, whether ion channel, neurotransmitter receptor, enzyme, pump or intracellular organelle. Those toxins that work at non-neuronal, or not specifically at neuronal sites (e.g. **cholera toxin**, **pertussis toxin**, cardiac glycosides, phospholipases) are discussed under TOXINS.

Sodium-channel blockers – guanidinium toxins: These include **tetrodotoxin** (TTX), which is found in the Japanese

puffer fish and is identical with **tarichatoxin** from a salamander and **maculotoxin** from the blue-ringed octopus. TTX is a complex guanidinium heterocyclic molecule, and blocks voltage-activated Na^+ channels through binding to known external sites on the channel. The overall effect is to block action potentials in nerves and skeletal muscle, certain currents in the CNS and in cardiac muscle, but with little effect in smooth muscle. **Saxitoxin** (STX) is produced by dinoflagellates, but poisoning follows uptake and concentration in other species, especially bivalve mussels. STX is a complex guanidinium heterocyclic molecule. It blocks the same channels as TTX, but has a slightly different binding site. See SODIUM-CHANNEL BLOCKERS.

Sodium-channel blockers or activators – lipophilic toxins: **Aconitine** and **delphinine** are alkaloids that bind to Na^+-channels, slow inactivation, shift inactivation to a more negative value and alter ion specificity. The overall actions include repetitive firing of neurons, with marked effects on the heart, including positive inotropism and arrhythmias. **Batrachotoxinin**, the brevetoxins (PbTX-1, PbTX-2, PbTX-3, PbTX-9), ervatamine, **grayanotoxin**, ciguatoxin, pumiliotoxins (pumiliotoxin A & B), veratridine, and the pyrethroids have essentially similar actions. See SODIUM-CHANNEL ACTIVATORS; SODIUM-CHANNEL BLOCKERS.

Sodium-channel blockers or activators – polypeptide toxins: A number of peptide marine snail, spider, sea anemone and scorpion toxins cause membrane depolarization, altered neurotransmitter release or paralysis through actions on Na^+-channel activation: see SODIUM-CHANNEL ACTIVATORS; SODIUM-CHANNEL BLOCKERS. These include **μ-conotoxins GIIIA**, **GIIIB** and IIIC; μ-argatoxins (I–VI), anthopleurin A and B, PnIVA and PnIVB, μO-conotoxins MrVIA and MrVIB, δ-conotoxins TxVIA, δ-conotoxins GmVIA δ-conotoxins PVIA, α-scorpion toxins (AaH I and AaH II, toxin M7 and toxin 2001, toxin V and var.1–3, LqTx IV and V), LqhαIT scorpion toxin, β-scorpion toxins (Css II, TiTxγ), AaH IT_4 scorpion toxin, LqhIT2 and AaHIT_2 scorpion, sea anemone toxins (Toxin I, Toxin II, Toxin III, ATX I, ATX II, ATX III), curatoxins, Toxin ShI, Phoneutria toxins (Tx2 series), versutoxin.

Potassium-channel blockers – guanidinium toxins: A number of peptide scorpion, honey bee, marine snail, snake, spider and sea anemone toxins block one or other of the many subsets of K^+-channels: see POTASSIUM-CHANNEL BLOCKERS. These include α-agitoxins (α-AgTx3.2, 3.3, 3.4), **apamin**, **charybdotoxin** (α-KTx1.1), **dendrotoxin** (α, β1, β2, γ, δ, forms), **iberiotoxin**, **kaliotoxin** (α-KTx3.1) hanatoxin (α-KTx1.3), κ-conotoxin PVIIA, kalicludines, kaliseptine, leiurotoxin I (scyllatoxin), **margatoxin** (α-MgTx2.2), mast cell-degranulating peptide (MCD-peptide), **noxiustoxin** (α-NTx2.1), PO5, stichodactyla toxin (ShK) and tityus toxin K-alpha (TsTx-K alpha).

Calcium-channel blockers – polypeptide toxins: A number of peptide marine snail, snake, beetle and spider toxins block one or other of the many subsets of Ca^{2+}-channels: see CALCIUM-CHANNEL BLOCKERS. These include the **ω-agatoxins** (ω-Aga-IA, ω-Aga-IIA, ω-Aga-IIIA, -IIIB, -IIIC, -IIID, -IVA and ω-Aga-IVB (or ω-Aga-TK)), agelenin, calcicludine, **ω-conotoxins (GVIA**, **MVIIA**, MVIIC, MVIID, SVIA, SVIB), grammotoxin SIA, hololena toxin, β-leptinotarsin-h, PLTXII, SNX-325, taicatoxin.

Calcium-channel blockers and activators – nonpeptide toxins: Some polyamine toxins isolated from spiders and dinoflagellates that block Ca^{2+}-entry include FTX (funnel toxin) and maitotoxin.

Chloride-channel blockers – polypeptide toxins: The scorpion toxin **chlorotoxin** blocks small-conductance Cl^--channels from rat enterocytes. See CHLORIDE-CHANNEL BLOCKERS.

Presynaptic toxins – polypeptide snake venoms: This group contains multimeric polypeptides containing subunits with phospholipase A_2 activity, and often contains other subunits with a 'chaperone' role. Toxicity does not normally rest on enzyme activity alone, and binding may occur other than on neuronal tissue, e.g. some cause skeletal muscle cytotoxicity. Examples from snake and viper venoms include agkistrodotoxin, ammodytoxin A, **β-bungarotoxins**, mojave toxin, notexin, taipoxin and textilotoxin.

Presynaptic toxins – polypeptide insect venoms: A phospholipase A_2 venom is elaborated by the honey bee.

Toxins – ionophores: There are a number of toxins that form membrane pores that are permeable to physiological inorganic ions, and are very toxic in all cells including neurons (e.g. **A23187**, **α-toxin**, **melittin**, **monensin**, **palytoxin** and **pardaxin**). However, they are not selective for neurons.

Acetylcholine receptors – nicotinic agonists: Natural alkaloids include **anatoxin**, **epibatidine** and **nicotine**. See NICOTINIC CHOLINOCEPTOR AGONISTS.

Acetylcholine receptors – nicotinic antagonists: Natural agents including a number of α-snake venoms; α-bungarotoxin (α-Btx), κ-bungarotoxin (neuronal bungarotoxin; Bgt3.1 or toxin F), cobra α-neurotoxin; a number of marine snail venoms, α-conotoxins (EI, GI, GIA, GII, IMI, MI, MII, PIVA, SI, SIA, SII), erabutoxins; plant alkaloids including **d-tubocurarine chloride**; and assorted other toxins from frogs, marine annelids, corals, molluscs, including histrionicotoxin, gephyrotoxin, nereistoxin, lophotoxin, neosurugatoxin. See NICOTINIC CHOLINOCEPTOR ANTAGONISTS; NEUROMUSCULAR BLOCKING AGENTS.

Acetylcholine receptors – muscarinic agonists: There are a number of natural plant alkaloid toxins, including **arecoline**, **muscarine** and **pilocarpine**; and green mamba snake peptides venoms, including MT1, MT2, MT3 and MT4. See MUSCARINIC CHOLINOCEPTOR AGONISTS.

Acetylcholine receptors – muscarinic antagonists: Notable active solanaceous plant alkaloids include **atropine** and **hyoscine** (scopolamine). See MUSCARINIC CHOLINOCEPTOR ANTAGONISTS.

$GABA_A$ receptors – agonists: Active plant alkaloids include **muscimol** and isoguvacine. See GABA RECEPTOR AGONISTS.

GABA receptors – antagonists: Active plant alkaloids, mainly convulsants, include **bicuculline** and **picrotoxin** (active principle is picrotoxinin). Important synthetic agents include the synthetic chlorinated hydrocarbon (cyclodiene) insecticide **dieldrin**, which is similar to many other insecticides, including aldrin, heptachlor and chlordane. In mammals they cause central stimulation and convulsions. See GABA RECEPTOR ANTAGONISTS.

Glutamate ionotropic receptors – agonists: Important agents include the plant agents **ibotenic acid**, acromelic acid and BMAA (β-*N*-oxalylamino-L-alanine), and also **domoic acid** (amnesic shellfish poison). See GLUTAMATE RECEPTOR AGONISTS.

Glutamate ionotropic receptor antagonists: These are found in spider and cone snails wasp toxins, including **α-agatoxins**, argiopines, argiopinins, pseudoargiopinins and argiotoxins, conantokins, JSTX (*Joro toxin*), δ-philanthotoxin and β-philanthotoxin. See GLUTAMATE RECEPTOR ANTAGONISTS.

Glutamate metabotropic receptors – agonists. Plant toxins

include **ibotenic acid** and quisqualic acid. See GLUTAMATE RECEPTOR AGONISTS.

Glycine ionotropic receptors – antagonists: Plant alkaloid toxins include **picrotoxin** (active principle is **picrotoxinin**) and **strychnine**.

Other hormone, neurotransmitter and mediator receptors – agonists: **Capsaicin** and **resiniferatoxin** can cause sensory neuron degeneration (see SENSORY IRRITANTS). Conopressins from cone snails mimic neurohypophyseal hormones on intracranial injection. Deltorphin and **dermorphin** are peptides from frog skin, acting as OPIOID RECEPTOR AGONISTS. **Eledoisin**, **kassinin** and **physalaemin**, venom peptides from reptiles and octopods, are TACHYKININ RECEPTOR AGONISTS. **Sarafotoxins** (types A, B, C), peptides venoms from an asp snake, act as powerful ENDOTHELIN RECEPTORS AGONISTS.

Exocytosis targeted exocytotoxins: **α-Latrotoxin** (black widow spider venom) causes a massive exocytotic release, followed by depletion of acetylcholine and other neurotransmitters. Botulinum toxins (A, B,C, D, E, F, G serotypes) are peptide exotoxins elaborated by a bacterium (*Clostridium botulinum*) that cause flaccid paralysis through inhibition of depolarization-induced release of acetylcholine at the skeletal neuromuscular junction. Tetanus toxin elaborated by bacterium (*Clostridium tetani*), is a polypeptide A–B exotoxin transported retrogradely along sensory neurons to the CNS, leading to tetanic paralysis.

Neurotransmitter inactivation. A number of animal and plant agents act as ANTICHOLINESTERASES, so interfering with synaptic trasmission. These include fasciculins (Fas1, Fas2, Fas3), which are peptide snake venoms, huperzine from a plant, onchidal from molluscs and **physostigmine** (eserine) from the calabar bean.

Neurotransmitter transporters: **Cocaine**, an alkaloid from an Andean shrub, inhibits dopamine, noradrenaline and 5-hydroxytryptamine transporters, and is a powerful CNS STIMULANT. Guvacine and isoguvacine from the betel nut inhibit the GABA transporter, and are anticonvulsant. **Hemicholinium-3** is a synthetic choline analogue that blocks the choline transporter in cholinergic nerve terminals, and thus eventually prevents choline synthesis. **Kainic acid**, a cyclic amino acid from red algae, is a glutamate-transporter antagonist, and also a defining agonist at the kainate subtype of the $GABA_A$ glutamate receptor acute seizures and excitotoxic neurological changes. See GLUTAMATE RECEPTORS AGONISTS.

δ-Philanthotoxin, a wasp paralytic venom, blocks high affinity uptake of glutamate in mammalian hippocampal brain cells as well as acting as a blocker of glutamate ion channel receptors. **Reserpine** is a plant alkaloid that inhibits monoamine transporters. **Vesamicol** is a synthetic agent that blocks the vesicular acetylcholine transporter. See NEUROTRANSMITTER RELEASE MODULATING AGENTS; UPTAKE INHIBITORS.

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Valtorta, F. *et al.* (1993) The pharmacology of botulinum toxin. *Pharmacol. Res.*, **27**, 33-44.
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NEUROTRANSMITTER RELEASE MODULATING AGENTS act at one or more of the many stages in the storage and release of neurotransmitters. Some of these are discussed in more detail under other headings. An outline account will be given here, considering, in turn, the cholinergic and noradrenergic systems.

Cholinergic transmission in the somatic and autonomic nervous systems: The neurotransmitter **acetylcholine** (ACh) is synthesized in nerve terminals from choline that is taken up into the terminals by an active uptake process, and this is susceptible to either reversible inhibition or chronic poisoning by a range of substances, after which release of ACh may quickly diminish. **Hemicholinium-3** and **triethylcholine** compete for the carrier and have a reversible action; **ethylcholine aziridinium** (monoethylcholine mustard aziridinium ion) and hemicholinium mustard are alkylating neurotoxins. See UPTAKE INHIBITORS. The packaging of ACh into vesicles can be disrupted by the experimental agent vesamicol, resulting in a slowly developing block of neurotransmission. For release of neurotransmitter to take place, the action potential must reach the nerve endings; this may be blocked by LOCAL ANAESTHETICS and by toxins that are Na^+-channel blockers (e.g. **tetrodotoxin**). For release of ACh to take place, entry of Ca^{2+} is required, normally through N-type Ca^{2+}-channels, and there are a number of synthetic drugs and naturally occurring NEUROTOXINS that can prevent this. See CALCIUM-CHANNEL BLOCKERS. Also, there are certain toxins that specifically interfere with the release process, e.g. β-BUNGAROTOXINS and botulinum toxin. Once released, break down of ACh can be very rapid, and this degradation may be inhibited by ANTICHOLINESTERASES. At the skeletal neuromuscular junction and at autonomic ganglia, anticholinesterases may initially potentiate transmission, but with higher doses or with time this gives way to depolarization block. However, with postganglionic parasympathetic nerves, the end response is sustained parasympathomimetic activity.

Noradrenergic transmission in the autonomic nervous system: The neurotransmitter **noradrenaline** is both synthesized in nerve terminals from precursor amino acids, and re-uptaken up into the terminals by an active uptake process: both are susceptible to inhibition. Of the various stages in synthesis, **α-methyltyrosine** inhibits tyrosine hydroxylase, and **disulfiram** inhibits dopamine-β-hydroxylase. See DOPA DECARBOXYLASE INHIBITORS; DOPAMINE β-HYDROXYLASE INHIBITORS. The uptake process ($Uptake_1$) is inhibited by a number of agents, including **cocaine**, **reserpine** and many of the clinically used uptake blockers (tricyclic antidepressants, e.g. **desipramine**, **imipramine**). See UPTAKE INHIBITORS. Note that there are differences in mechanism, extent and duration of action, and agents such as reserpine can more readily deplete the terminals of noradrenaline. A synthetic neurotoxin that is up-taken into the terminals and produces a 'chemical sympathectomy' is **6-hydroxydopamine**. The release of noradrenaline is inhibited by agonists acting at autoreceptors (α_2-adrenoceptors); e.g. the selective agent **clonidine**, or noradrenaline itself. See α-ADRENOCEPTOR AGONISTS; ANTISYMPATHETIC AGENTS. Also, ADRENERGIC NEURON BLOCKING AGENTS have a slowly developing action to reduce release of noradrenaline, e.g. **bethanidine**, **bretylium**, **debrisoquine**, **guanethidine**. Indirect sympathomimetic drugs mimic the actions of the sympathetic nervous system by release of noradrenaline. Some agents work by displacing noradrenaline from its storage sites (though they may also have other actions), e.g. **amphetamine**, **ephedrine**, **pseudoephedrine**, **tyramine**. Also, the reuptake blockers are also indirect sympathomimetics (*vide supra*). MONOAMINE-OXIDASE INHIBITORS may enhance sympathetic activity.

Other systems: These basic processes can be modified in much the same way within the CNS, and for other

neurotransmitters. Some further details of dopaminergic transmission are detailed elsewhere in relation to the treatment of Parkinson's disease: see ANTIPARKINSONIAN AGENTS. Some neurotoxins that are relatively specific for the glutamate, GABA or glycine systems in the brain are listed under a section on NEUROTOXINS; examples include guvacine and isoguvacine, which inhibit the GABA transporter, **kainic acid** is a glutamate-transporter antagonist, nipecotic acid inhibits the GABA transporter, δ-philanthotoxin blocks high affinity uptake of glutamate in mammalian hippocampal brain cells and tiagabine inhibits the GABA transporter. See UPTAKE INHIBITORS.

NEUTRAL ENDOPEPTIDASE (NELP, EC 3.4.24.11; neprilysin, enkephalinase) is an enzyme that cleaves peptides within the sequence, rather than at the terminal residues as with ectopeptidases, such as the carboxypeptidases and aminopeptidases. This enzyme was originally referred to as enkephalinase, in view of its ability to degrade **leucine-enkephalin, methionine-enkephalin** and certain other endogenous opioids. However, it has become clear that it can also degrade a wide variety of other peptides, including **atrial natriuretic peptide, cholecystokinin**, endothelins (**ET-1, ET-2, ET-3**), **neurotensin, somatostatin** and tachykinins (**neurokinin A, neurokinin B, substance P**). It is therefore now referred to as NELP or neprilysin. It is a zinc metallopeptidase, and is inhibited by **phosphoramidon, SCH 32615** and **thiorphan**. Some neutral endopeptidase inhibitors, such as thiorphan, have been tested in humans (in conjunction with aminopeptidase inhibition) as potential analgesics. However, NELP inhibitors have not yet reached clinical use.

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Neutrexin™ ➡ **trimetrexate**.

neutrophil chemotactic factor (human isoform) ➡ **interleukin-8**.

nevirapine [INN, USAN] (Viramune™) is a non-nucleoside REVERSE TRANSCRIPTASE INHIBITOR, an ANTIVIRAL which clinically is being explored as an ANTI-HIV AGENT in AIDS.

niacin ➡ **nicotinic acid**.

niacinamide ➡ **nicotinamide**.

Niacor™ ➡ **nicotinic acid**.

nialamide [BAN, INN] (P 1133) is one of the hydrazine class, an irreversible MONOAMINE-OXIDASE INHIBITOR (MAOI active against both A and B) formerly used as an ANTIDEPRESSANT.

nicametate [BAN, INN] is a nicotinic acid derivative with properties similar to **nicotinic acid**, to which it is slowly hydrolysed *in vivo*. It is a peripheral VASODILATOR that was formerly been used in treating peripheral vascular disease and cerebrovascular insufficiency.

nicaraven [INN] is a pyridinecarboxamide under investigation as a cerebral VASODILATOR to treat brain oedema. It is a potential radioprotective agent.

nicarbazin [BAN] has ANTIPROTOZOAL activity and can be used as a veterinary ANTICOCCIDIAL AGENT.

nicardipine [BAN, INN] (nicardipine hydrochloride [JAN, USAN]; Cardene™) is a didydropyridine CALCIUM-CHANNEL BLOCKER with VASODILATOR properties which can be used as an ANTIHYPERTENSIVE and ANTIANGINAL.

nicardipine hydrochloride ➡ **nicardipine**.

nicergoline [BAN, INN, USAN] is an ergot alkaloid derivative that acts as an (α_1-subtype) α-ADRENOCEPTOR ANTAGONIST. It is also a CALCIUM-CHANNEL BLOCKER and cholinergic agent. It has VASODILATOR and NEUROPROTECTIVE properties, and has been used in the treatment of senile dementia.

niceritrol [BAN, INN, JAN] (neopentanetetrayl nicotinate; 8 AL; SK 1) is a four-ringed heterocyclic, an ANTIHYPERLIPIDAEMIC and VASODILATOR. It shows protective effects in animal model of diabetic neuropathy.

Niclocide™ ➡ **niclosamide**.

niclofolan [BAN, INN] is an ANTHELMINTIC active against trematoids (flukes).

niclosamide [BAN, BSI, INN, ISO, USAN] (Niclocide™; Yomesan™) is an ANTHELMINTIC, clinically used in tapeworm infections.

nicoclonate [INN] (S 486) is a derivative of **nicotinic acid**, and has been used as an ANTIHYPERLIPIDAEMIC.

nicocodine [BAN, INN] (codeine nicotinate; RC 146) is a phenanthrene series derivative, an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC and ANTITUSSIVE properties. Its 7,8-dihydro derivative is nicodicodine [BAN, INN], which also is an antitussive.

nicodicodine ➡ **nicocodine**.

nicofibrate [INN] is a derivative of **clofibrate** and **nicotinic acid**. It has been used as an ANTIHYPERLIPIDAEMIC.

nicofuranose [BAN, INN, JAN] is a fructofuranose tetranicotinate compound, a peripheral VASODILATOR and ANTITHROMBOTIC with properties similar to **nicotinic acid**, to which it is slowly hydrolysed *in vivo*.

Nicolar™ ➡ **nicotinic acid**.

nicomol [INN, JAN] (K 31) is a derivative of **nicotinic acid**, and has been used as an ANTIHYPERLIPIDAEMIC. It exerts a protective effect in toxicity induced by adriamycin-group cytotoxic agents.

nicomorphine [BAN, INN] is one of the phenanthrene series, and a prodrug for **morphine**. It is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC properties.

nicorandil [BAN, INN, JAN, USAN] (Ikorel™) is a pyridine-carboxamide derivative, a POTASSIUM-CHANNEL ACTIVATOR. It has SMOOTH MUSCLE RELAXANT, VASODILATOR, ANTIANGINAL and antiischaemic properties, and is an experimental NEUROPROTECTIVE AGENT. Clinically, it is used as an ANTIANGINAL.

nicotinamide [INN] (nicotinic acid amide; vitamin B_3; niacinamide; PP-factor; antipellagra factor and many other names) is a VITAMIN widespread in plants, e.g. rice, yeast and fungi. It is a water-soluble factor which is converted to coenzymes involved in enzyme transfer in the respiratory chain. As a vitamin it is an antipellegra substance, and can be used in the treatment of pellagra. Pharmacologically it and **nicotinic acid** are VASODILATORS, and it has been used for this action in treating peripheral vascular disease and other circulatory disorders. It has also been used as an ANTIHYPERLIPIDAEMIC.

nicotine [BSI, ISO] is an alkaloid from *Nicotiana tabacum* and other *Nicotiana* spp. It is a GANGLION BLOCKING AGENT (stimulating before blocking) by virtue of acting as a NICOTINIC CHOLINOCEPTOR AGONIST. It is used as a horticultural INSECTICIDE; also as a SCABICIDAL. Used in chewing gum and transdermally in treating tobacco dependence.

nicotinic acid [INN] (niacin [USAN]; Hexopal™; Niacor™; Nicolar™; Ronicol™) is a pyridinecarboxylic acid, and is present in fruits and other plant materials. It is a vitamin of the B complex and an enzyme cofactor for two hydrogen-transporting systems (coenzymes I & II). In high dose it is a VASODILATOR, used especially in symptomatic relief of

peripheral vascular disease (Raynaud's phenomenon). Derivatives (such as **inositol nicotinate** and **nicotinyl alcohol**) are also used for their vasodilator actions It is also used as an ANTIHYPERLIPIDAEMIC because it reduces blood levels of lipids by inhibiting their synthesis in the liver.

nicotinic acid amide ➡ **nicotinamide**.

NICOTINIC CHOLINOCEPTOR AGONISTS are ligands that act at one of the two recognition sites for the neurotransmitter **acetylcholine** in the body – nicotinic and muscarinic receptors. These receptors are named after the original plant alkaloids that selectively activate them, **nicotine** and **muscarine**, respectively. Nicotine is a poisonous oil derived from the tobacco plant, *Nicotiana tabacum*. Nicotinic receptors are involved in 'fast' neurotransmission, and are of the oligomeric intrinsic-ion-channel superfamily. Nicotinic receptors may be composed, in molecular terms, of various pentameric assemblies of receptor subunits, but seem to fall into a number of groups, including skeletal muscle and two or three neuronal types. These channels are permeant to cations in the selectivity order $Na^+/K^+/Ca^{2+}$, so have an equilibrium potential leading to marked depolarization (one subtype, a neuronal **α-bungarotoxin**-sensitive channel, is rather more permeable to Ca^{2+}). These structural groups are reflected in slightly different receptor recognition properties, which can be taken advantage of in drug design: see GANGLION BLOCKING AGENTS; NEUROMUSCULAR BLOCKING AGENTS. Nicotine itself, has an initial stimulatory agonist action at the skeletal neuromuscular junction, autonomic ganglia and within the CNS. This stimulation quickly gives way to refractoriness of responses to other nicotinic agonists, including the neurotransmitter acetylcholine, with consequent paralysis of transmission. This paralysis of neurotransmission, after initial stimulation, is how depolarizing neuromuscular blocking agents exert their action, e.g. **decamethonium** and **suxamethonium chloride** (succinylcholine). Agonist ligands discriminate little between nicotinic receptor subtypes, though antagonists do to some extent. Some ligands bind to both nicotinic and muscarinic receptors (e.g. acetylcholine, **carbachol**) but most are largely selective between the two. Anatoxin shows some selectivity for the α-bungarotoxin sensitive neuronal site. A poison frog toxin, **epibatidine**, is a unique alkaloid which shows some agonist selectivity for the α-bungarotoxin-insensitive neuronal site.

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NICOTINIC CHOLINOCEPTOR ANTAGONISTS are ligands that act at one of the two main recognition sites for the neurotransmitter **acetylcholine** in the body – nicotinic and muscarinic receptors, which are taken advantage of in drug design: see NICOTINIC CHOLINOCEPTOR AGONISTS. A number of competitive antagonists show greater blockade at the skeletal neuromuscular junction than at autonomic ganglia, which is advantageous when using these agents as muscle relaxants in anaesthesia, e.g. **atracurium**, **gallamine**, **mivacurium**, **pancuronium**, **rocuronium**, **tubocurarine** and **vecuronium**: see NEUROMUSCULAR BLOCKERS; GANGLION BLOCKERS. Other agents show greater blocking activity at autonomic ganglia, though the mechanism is more channel-blocking than competitive, e.g. **hexamethonium**, **mecamylamine** and **pentamethonium**. A high-affinity specific pseudo-irreversible block is produced by **α-bungarotoxin** (from the snake venom of the krait, *Bulgarus multicinctus*) at the muscle, but not at one of the major neuronal types (the 'α7' site), thus offering further support for a difference between these two sites. Recently, a further α-bungarotoxin-sensitive site in epithelial and neuronal tissues ('α9') has been identified, which can be blocked by **strychnine** and **atropine**.

nicotinyl alcohol [BAN] (3-hydroxymethylpyridine; NSC 526046) is a VASODILATOR used orally to help improve blood circulation to the hands and feet when this is impaired, e.g. in peripheral vascular disease (Raynaud's phenomenon).

nicoumalone [BAN] (acenocoumarol [INN]; Sinthrome™) is an (oral) ANTICOAGULANT (acting through vitamin K antagonism to depresses synthesis of coagulation factors). Chemically, it is one of the coumarin group. It can be used therapeutically to prevent the formation of clots in venous thrombosis and pulmonary embolism, and after heart surgery (especially after heart valve surgery). The onset of effect is delayed by several days.

nifedipine [BAN, INN, JAN, USAN] (Adalat™; Beta-Adalat™; Nifensar™) is a didydropyridine CALCIUM-CHANNEL BLOCKER with VASODILATOR properties. It can be used as an ANTIHYPERTENSIVE and ANTIANGINAL, and in the treatment of peripheral vascular disease. It has also been tried in migraine prophylaxis.

nifenalol [INN] is a β-ADRENOCEPTOR ANTAGONIST.

nifenazone [BAN, INN] is an analogue of the pyrazolone series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

Nifensar™ ➡ **nifedipine**.

niflumic acid [INN] (UP 83) is an analogue of the fenemate series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

nifuratel [BAN, INN, USAN] is a nitrofuran derivative with ANTIBACTERIAL and ANTIFUNGAL activity; also used as an ANTIPROTOZOAL in the treatment of trichomoniasis

nifuroxazide [INN] is a nitrofurfurylidenehydrazide, an ANTIBACTERIAL that is poorly absorbed from the gut, which can be used as an ANTICOLITIS AGENT and for diarrhoea.

nifurtimox [BAN, INN] is an ANTIPROTOZOAL used as an ANTITRYPANOSOMAL, especially for Chagas' disease.

nifurzide [INN] is an ANTIMICROBIAL used for treatment of acute infectious diarrhoea.

nigerine ➡ **DMT**.

NIH 756 ➡ **diphenoxylate**.

NIH 2820 ➡ **normethadone**.

NIH 2933 ➡ **dimepheptanol**.

NIH 4185 ➡ **diethylthiambutene**.

NIH 5145 ➡ **ethylmethylthiambutene**.

NIH 7343 ➡ **dipipanone**.

NIH 7410 ➡ **metazocine**.

NIH 7440 ➡ **allylprodine**.

NIH 7519 ➡ **phenazocine**.

NIH 7557 ➡ **norpipanone**.

NIH 7574 ➡ **benzethidine**.

NIH 7586 ➡ **clonitazene**.

NIH 7590 ➡ **piminodine**.

NIH 7591 ➡ **phenoperidine**.

NIH 7602 ➡ **phenampromide**.

NIH 7672 ➡ **metofoline**.

NIH 7981 ➡ **cyclazocine**.

NIH 8068 ➡ **etorphine**.

NIH 8074 ➡ **acetorphine**.

NIH 8112 ➡ **cyprenorphine**.

nikethamide [BAN, INN] is an ethylnicotinamide derivative, with similar properties to **doxapram** as a CNS STIMULANT and RESPIRATORY STIMULANT. It was previously used orally or by injection, including for barbiturate and other CNS depressant overdose.

nileprost [INN] (ZK 34798; SH 427) is a modified prostaglandin, a PROSTANOID RECEPTOR AGONIST. It has transient HYPOTENSIVE properties.

niludipine [BAN, INN] is a dihydropyridine CALCIUM-CHANNEL BLOCKER with VASODILATOR properties. It has been investigated as an ANTIHYPERTENSIVE and ANTIANGINAL.

nilutamide [BAN, INN] (RU 23908) is a non-steroid, an ANTIANDROGEN and ANTICANCER AGENT, used for the treatment of prostatic cancer.

nilvadipine [INN, JAN, USAN] is a didydropyridine CALCIUM-CHANNEL BLOCKER with VASODILATOR properties. It can be used as an ANTIHYPERTENSIVE and ANTIANGINAL.

nimetazepam [INN, JAN] (ID 530; S 1530) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity, and has been used orally for insomnia.

nimodipine [BAN, INN, USAN] (Nimotop™) is a dihydropyridine CALCIUM-CHANNEL BLOCKER with cerebral VASODILATOR properties. It can be used parenterally to treat and prevent ischaemic damage following subarachnoid haemorrhage.

nimorazole [BAN, INN] is an (imidazole group) ANTIPROTOZOAL used in the treatment of trypanosomiasis.

Nimotop™ ➡ **nimodipine**.

nimustine [INN] (nimustine hydrochloride [JAN]; NSC 245382; CS 439) is a nitrosourea ANTICANCER AGENT with properties similar to **carmustine**. It has been used in the treatment of leukaemia .

nimustine hydrochloride ➡ **nimustine**.

97-139 is a multi-ringed myricerone structure that acts as a selective (ET_A-subtype) ENDOTHELIN RECEPTOR ANTAGONIST. It is used as a pharmacological tool.

Nipent™ ➡ **pentostatin**.

niperotidine [INN] (AP 880) is a piperonylranitidine, a HISTAMINE H_2-RECEPTOR ANTAGONIST. It is a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.

nipradilol [INN, JAN] is a combined α-ADRENOCEPTOR ANTAGONIST and β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically in ANTIHYPERTENSIVE treatment.

niprofazone [INN] (Ra 101) is an analogue of the pyrazolone series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

niridazole [BAN, INN, USAN] is a nitrothiazole derivative active as an ANTISCHISTOSOMAL and ANTHELMINTIC.

Nirolex™ ➡ **dextromethorphan**.

nisoldipine [BAN, INN, JAN, USAN] (Sular™; Syscor™) is a dihydropyridine CALCIUM-CHANNEL BLOCKER with coronary VASODILATOR properties, which can be used as an oral ANTIHYPERTENSIVE and ANTIANGINAL.

nitalapram ➡ **citalopram**.

Nitoman™ ➡ **tetrabenazine**.

nitrazepam [BAN, INN, JAN, USAN] (NSC 58775; Mogadon™ and many other names) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It is used orally for insomnia, when it has a relatively long duration of action.

nitrefazole [BAN, INN] (Altimol™) is a nitrophenylimidazole, an ALDEHYDE DEHYDROGENASE INHIBITOR with general properties similar to **disulfiram**. It can be used in treating alcoholism (alcohol deterrent).

nitrendipine [BAN, INN, JAN, USAN] is a didydropyridine with CALCIUM-CHANNEL BLOCKER and (I_{KCa}) POTASSIUM-CHANNEL BLOCKER properties. It also has VASODILATOR properties and can be used as an ANTIHYPERTENSIVE.

NITRERGIC STIMULANTS mimic, or cause the production and release of **nitric oxide** (NO), which is an important mediator that is synthesized on demand. The actions of nitric oxide are very widespread, and imbalance is likely to be involved in a number of disease states. Nitric oxide synthase (NOS) has a widespread distribution in the body, and isoforms are recognized specifically constitutive and inducible (iNOS) forms. Both forms are cytosolic, Ca^{2+}/calmodulin and NADPH-dependent, and inhibited by L-arginine derivatives. Induction of iNOS is by various inflammatory cytokines, particularly those stimulated by bacterial lipopolysaccarides, including tumour necrosis factor α, interferon γ and interleukin 1β. Induction of iNOS only is inhibited by GLUCOCORTICOIDS.

The actions of NO are mediated by activation of the soluble form of guanylyl cyclase, which then elevates cyclic GMP (cGMP). The substrate for the reaction is L-arginine, and this reaction is blocked by poor substrates such as **L-NMMA** (N^G-monomethyl-L-arginine): see NITRIC OXIDE SYNTHASE INHIBITORS. In many cases, the cellular effects of NO are not in the cell that produces it, but in an adjacent cell – in other words, it has a paracrine rather than an autocrine effect. Notably, this paracrine effect is seen in the vasculature, where a number of hormones or other mediators act on receptors on the endothelium (e.g. **acetylcholine**, **bradykinin** and **substance P**) and cause subsequent relaxation of the smooth muscle layers of the blood vessels. NO synthase is found in a number of nerve types, and NO is thought to be an inhibitory mediator for some peripheral nerves with NANC (non-adrenergic non-cholinergic) effects. Its absence may account for some clinical conditions, e.g. human pyloric stenosis. Within the CNS, NO may be involved physiologically in long-term potentiation and plasticity – and hence have a role in memory. Quite probably, when the constitutive NOS system is activated by calcium when the cytosolic calcium concentration rises through opening of calcium channels – e.g. with the influx that occurs on NMDA receptors by glutamate – then the NOS/NO system may come into play to inhibit neuronal activity, providing feedback control. This mechanism may help control the cytotoxicity of glutamate due to calcium overload of the neuron.

It is now realized that a number of well-known nitrates or nitrite vasodilators work by activating the NO pathway. Some of these used in therapeutics include **amyl nitrate**, **glyceryl trinitrate**, **isosorbide dinitrate**, **pentaerythritol tetranitrate**, **sodium nitrate**, **sodium nitrite** and **sodium nitroprusside**. Also, agents used as NO donors include **molsidomine** and *S*-nitroacetylpenicillamine.

Inhaled NO has proved of value in adult respiratory distress syndrome, where it causes pulmonary vasodilation and inhibits bronchoconstriction. However, at high concentrations NO is cytotoxic. See NITRIC OXIDE SYNTHASE INHIBITORS.

Garthwaite, J. *et al.* (1995) Nitric oxide signalling in the central nervous system. *Annu. Rev. Physiol.*, **57**, 683-706.

Gross, S.S. *et al.* (1995) Nitric oxide: Pathophysiological mechanisms. *Annu. Rev. Physiol.*, **57**, 737-769.

Rand, M.J. *et al.* (1995) Nitric oxide as a neurotransmitter in peripheral nerves: Nature of transmitter and mechanism of transmission. *Annu. Rev. Physiol.*, **57**, 659-682.

Zhang, J. *et al.* (1995) Nitric oxide in the nervous system. *Annu. Rev. Pharmacol. Toxicol.*, **35**, 213-233.

nitric oxide (NO; mononitrogen monoxide; nitrogen oxide; nitrogen monoxide; endothelium-derived relaxing factor; EDRF) is an endogenous mediator and neurotransmitter substance formed from L-arginine, the major endogenous **NITRERGIC STIMULANT**. Its actions are biochemically mediated by activation of the soluble form of guanylyl cyclase, which then elevates cyclic GMP levels. It is a powerful **VASODILATOR**. Nitrergic stimulants, including nitrite and nitrate drugs, mimic, or cause the production and release of nitric oxide. A number of hormones or other mediators act on receptors on the endothelium (e.g. **acetylcholine**, **adenosine diphosphate** (ADP), **bradykinin** and **substance P**) and cause subsequent relaxation of the smooth muscle layers of the blood vessels through the mediation of the NO system.The actions of nitric oxide are very widespread, and imbalance is likely to be involved in a number of disease states, including hypertension and neurotoxicity. It is also utilized as a cytotoxic chemical defence substance elaborated by macrophages.

NITRIC OXIDE SYNTHASE INHIBITORS act to prevent production of **nitric oxide** (NO), which is an important mediator that is synthesized on demand. The actions of nitric oxide are widespread, and are described in more details in **NITRERGIC STIMULANTS**. Nitric oxide synthase exists in several forms and this allows some selectivity in inhibition. Three distinct isoforms have recently been cloned, corresponding to the neuronal (nNOS, type I), inducible (iNOS, type II) and endothelial (eNOS, type III). There are now quite a number of inhibitors known, and of these 7-nitroindazole and TRIM are more active on neuronal sites. Other inhibitors include **L-NAME**, **L-NIO**, **L-NMMA**, **L-NNA** and **L-NOARG**. An endogenous inhibitor is haemoglobin. There are a number of states where overproduction of NO has been implicated in the pathophysiology, and inhibitors may prove to be important drugs. It has already been shown in human patients that NO inhibition is life-saving in certain states of shock, particularly endotoxic shock. Other possible indications include ulcerative colitis, hypercholesterolaemia, arterial hypertension and atheromatous vascular disease in diabetes mellitus. At high concentrations, NO can react with a superoxide anion (O_2^-) to form a peroxynitrite radical ($ONOO^-$), a potent oxidant which is thought to mediate some of the cytotoxic action of NO. Overactivity of these reactions may be inappropriate, and the inhibition of the NO/NOS system may be of value in conditions such as AIDS, dementia and even cancer.

Moore, P.K. *et al.* (1993) 7-Nitroindazole, an inhibitor of nitric oxide synthase, exhibits anti-nociceptive activity in the mouse without increasing blood pressure. *Br. J. Pharmacol.*, **108**, 296-297.

Fukuto, J.M. *et al.* (1995) Inhibition of constitutive and inducible nitric oxide synthase: Potential selective inhibition. *Annu. Rev. Pharmacol. Toxicol.*, **35**, 165-194.

Griffith, O.W. *et al.* (1995) Nitric oxide synthases: Properties and catalytic mechanism. *Annu. Rev. Physiol.*, **57**, 707-736.

Moore, P.K. *et al.* (1997) Selective inhibitors of nitric oxide synthase – is NOS really good NOS for the nervous system. *Trends Pharmacol. Sci.*, **18**, 204-211.

nitroarginine methyl ester ➡ **L-NAME**.

L-N^G-nitroarginine ➡ **L-NOARG**.

L-N^G-nitroarginine methyl ester ➡ **L-NAME**.

N^G-nitro-L-arginine methyl ester ➡ **L-NAME**.

nitrofural ➡ **nitrofurazone**.

nitrofurantoin [BAN, INN] (Furadantin™; Macrobid™; Macrodantin™) is a (nitrofuran) **ANTIBIOTIC** with **ANTIBACTERIAL** activity used to treat urinary tract infections.

nitrofurazone [BAN, USAN] (nitrofural [INN]; Furacin™) is an **ANTIBACTERIAL** which is used as a topical antiinfective.

Nitrogen Lost ➡ **trimustine**.

nitrogen monoxide ➡ **nitric oxide**.

nitrogen mustard gas ➡ **mustine**.

nitrogen oxide ➡ **nitric oxide**; **nitrous oxide**.

7-nitroindazole (**7-NI**) is a **NITRIC OXIDE SYNTHASE INHIBITOR**; used as a pharmacological tool.

nitromannite ➡ **mannitol hexanitrate**.

nitromannitol ➡ **mannitol hexanitrate**.

Nitromaxitate™ ➡ **mannitol hexanitrate**.

Nitropress™ ➡ **sodium nitroprusside**.

nitroscanate [BAN, INN, USAN] is a veterinary **ANTHELMINTIC**.

nitrous oxide [JAN, USAN] (nitrogen oxide; N_2O; dinitrogen monoxide; 'Laughing gas') is a gaseous **GENERAL ANAESTHETIC** with **ANALGESIC** actions. It is often used in induction or as an adjunct to the more potent anaesthetics.

nitrovin [BAN] is a veterinary growth promoter and **ANTIBACTERIAL**.

nitroxinil ➡ **nitroxynil**.

nitroxynil [BAN] (nitroxinil [INN]) is an **ANTHELMINTIC** (fasciolicide).

Nivaquine™ ➡ **chloroquine**.

nizatidine [BAN, INN, JAN, USAN] (LY 139037; Axid™) is a thiazolyl compound, a **HISTAMINE H_2-RECEPTOR ANTAGONIST**, **GASTRIC SECRETION INHIBITOR** and **ANTIULCEROGENIC**. It also has **ANTICHOLINESTERASE** activity.

nizofenone [INN] (nizofenone fumarate [JAN]; Y 9179) is an imidazolyl compound with antianoxic and cerebroprotective actions. It has been used as a **NOOTROPIC AGENT**.

nizofenone fumarate ➡ **nizofenone**.

Nizoral™ ➡ **ketoconazole**.

NK 421 ➡ **bestatin**.

NK 622 ➡ **toremifene**.

NKA ➡ **neurokinin A**.

[β-Ala^8]NKA$_{4-10}$ is a **neurokinin A** derivative, a **TACHYKININ RECEPTOR AGONIST** selective at the NK_2-receptor subtype. It is used as a pharmacological tool.

[Lys^5,MeLeu^9,Nle^{10}]NKA$_{4-10}$ is a **neurokinin A** derivative, a **TACHYKININ RECEPTOR AGONIST** reasonably selective at the NK_2-receptor subtype. It is used as a pharmacological tool.

NKB ➡ **neurokinin B**.

[MePhe^7]NKB is a **neurokinin B** derivative, a **TACHYKININ RECEPTOR AGONIST** reasonably selective at the NK_3-receptor subtype. It is used as a pharmacological tool.

[Pro^7]NKB is a **neurokinin B** derivative, a **TACHYKININ RECEPTOR AGONIST** reasonably selective at the NK_3-receptor subtype. It is used as a pharmacological tool.

NKT 01 ➡ **gusperimus**.

NMB ➡ **neuromedin B**.

NO ➡ **nitric oxide**.

N_2O ➡ **nitrous oxide**.

nociceptin (orphanin-FQ) is a recently discovered **dynorphin**-like heptapeptide sequence which acts at an 'orphan' receptor termed ORL_1. This is an opioid-like receptor, but conventional **OPIOID RECEPTOR ANTAGONISTS**, such as **naloxone**, do not bind to this novel site. Nociceptin can have **ANALGESIC** or algesic actions, depending on the method and site of administration. The significance of these receptors in pathophysiology remains to be elucidated.

nocloprost [INN] (ZK 94726; SH 475) is a synthetic prostaglandin, a PGE_2 analogue and **PROSTANOID RECEPTOR**

AGONIST. It is a gastric cytoprotective and ANTIULCEROGENIC AGENT, and can be used in the treatment of gastric ulcers.

Noctec™ ➡ **chloral hydrate**.

nolinium bromide [INN, USAN] (EU 2972) is a quinolizinium, a GASTRIC PROTON PUMP INHIBITOR and (H^+/K^+) ATPASE INHIBITOR. Potentially, it can be used as an ANTIULCEROGENIC in the treatment of gastric ulcers and other gastric acid-related gastrointestinal disorders.

Nolvadex™ ➡ **tamoxifen**.

nomegestrol [INN] is a synthetic steroid, a PROGESTOGEN, and has been used in the treatment of menstrual disorders.

nomifensine [BAN] (nomifensine maleate [USAN]) is a tetrahydroisoquinolinamine, a CNS STIMULANT and ANTIDEPRESSANT. It was withdrawn worldwide in 1986 because of adverse effects including risk of haemolytic anaemia and renal failure.

nomifensine maleate ➡ **nomifensine**.

nonanedioic acid ➡ **azelaic acid**.

nonathymulin [INN] (serum thymic factor; FTS) is a nonapeptide found in serum of several mammalian species. It is a thymic factor thought to play a crucial role in the later stages of T-lymphocyte maturation. It is claimed to have IMMUNOMODULATOR and ANTIVIRAL properties, and to protect against some radiation damage. It is active as a Zn-complex.

nonivamide [INN] (N-vanillylnonanamide; synthetic capsaicin; HH 50; PSVA; pseudocapsaicin) is, along with **capsaicin**, a pungent principal of various hot peppers of various members of *Capsicum* spp. (Solanaceae). It is now regarded as a VANILLOID RECEPTOR AGONIST. Clinically, it is used as a COUNTER-IRRITANT (rubefacient or topical analgesic) for some painful skin conditions.

nonoxinol 9 [INN] (nonoxynol 9 [USAN]; Delfen™; Duracreme™; Duragel™; Ortho-Cream™; Ortho-Gynol™) is a surfactant with spermicide CONTRACEPTIVE properties, and also putative HIV-inhibitor activity.

nonoxynol 9 ➡ **nonoxinol 9**.

NOOTROPIC AGENTS (noötropic agents) are thought to be cognition enhancers or drugs that enhance mental performance. The term was coined to define drugs resembling **piracetam** (Nootropil™), which were reported to improve mental function in tests – by an unknown mechanism. The main putative use for such drugs is in the treatment of Alzheimer's disease and related neurodegenerative diseases, though trials do not thus far offer much encouragement. Several hypothetical bases have been proposed for the action of such drugs. Some agents are also claimed to have memory-modulating or reinforcing (mneutropic) effects (e.g. CCK fragments).

Cerebral vasodilators are believed to increase blood supply to areas of the brain that are supposed to have a defective blood supply in some neurodegenerative diseases. Such drugs include β-adrenoceptor agonists (e.g. **isoxsuprine**), calcium-channel blockers (e.g. **nimodipine**), ergot alkaloids (e.g. **co-dergocrine mesylate**) and **papaverine**. Defective cholinergic muscarinic mechanisms have long been supposed to have a role in Alzheimer's disease. Anticholinesterases, especially the atypical agent **tacrine** and the recently clinically introduced **donepezil**, have been used to enhance cholinergic function (though at the price of extensive side-effects). At least a dozen other anticholinesterases are currently undergoing clinical trial. In animal experiments, muscarinic agonists (e.g. **oxotremorine**) seem to have potential. However, side-effects necessitate identification of the involvement of a specific receptor subtype and such studies are in progress.

The evidence for the involvement of cholinergic mechanisms in cognition, derive partly from observed memory impairment caused by **hyoscine** and **atropine**. This is supported by animal studies of lesions of neurons in the basal forebrain and of chemical cholinergic lesions caused with **hemicholinium-3**. Numerous other neuromediators have been implicated in memory loss, including excitatory amino acid pathways, serotonergic mechanisms ($5\text{-}HT_1$, $5\text{-}HT_3$ or $5\text{-}HT_4$ receptors), cholecystokinin receptor mechanisms (CCK fragments have mneutropic effects) and monoaminergic mechanisms. A large number of other agents have been advanced as having cognition-enhancing properties, but clearly little is known about basic mechanisms.

Jane, F. *et al.* (1991) Pharmacological treatment of Alzheimer's disease: present situation and perspectives. The role of interactions between the cholinergic system and other neuromodulatory systems in learning and memory. *Synapse*, **7**, 151-168.

Giacobini, E., *et al.* (1994) Second and third generation cholinesterase inhibitors: from preclinical studies to clinical efficacy, in *Alzheimer Disease: Therapeutic Strategies*, (eds E. Giacobini *et al.*). Birkhauser, Boston, pp. 155-171.

Maltby, N. *et al.* (1994) Efficacy of tacrine and lecithin in mild to moderate Alzheimer's disease: double blind trial. *Br. Med. J.*, **308**, 879-883.

Mondadori, C. (1994) In search of the mechanism of action of the nootropics: new insights and potential clinical implications. *Life Sci.*, **55**, 2171-2178.

Nootropil™ ➡ **piracetam**.

noracetylmethadol ➡ **noracymethadol**.

noracymethadol [INN] (noracymethadol hydrochloride [USAN]; noracetylmethadol; Lilly 30109) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST which is active as an OPIOID ANALGESIC.

noracymethadol hydrochloride ➡ NORACYMETHADOL.

noradrenaline [BAN] (noradrenaline acid tartrate [BANM]; epinephrine [INN]; norepinephrine bitartrate [USAN]; levarterenol; Adrenor™; Levophed™) acts both as an α-ADRENOCEPTOR AGONIST and a β-ADRENOCEPTOR AGONIST, and in its natural form is a (catecholamine) hormone secreted by the adrenal gland in mammals and neurotransmitter released from peripheral sympathetic neurons and within the CNS. The (laevo)-(*R*)-form is the pharmacologically active isomer, and is normally used in therapeutics. It has powerful SYMPATHOMIMETIC actions and is occasionally used as a VASOCONSTRICTOR, as a hypertensive in some hypotensive states, and as a CARDIAC STIMULANT.

noramidopyrine methanesulfonate ➡ **dipyrone**.

norbinaltorphimine is a *bis*-phenanthrene series derivative, a (predominantly κ) OPIOID RECEPTOR ANTAGONIST which is used as a pharmacological tool.

norclostebol [INN] (SKF 6611; CP 73) is a steroid with ANABOLIC properties and has been used by intramuscular injection.

norcholine ➡ **deanol**.

norcodeine [BAN, INN] is one of the phenanthrene series, an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC.

Norcuron™ ➡ **vecuronium bromide**.

nordazepam [INN] (demethyldiazepam; Ro 5-2180) is the active metabolite of **diazepam**, one of the [1,4]benzodiazepines. It is a BENZODIAZEPINE BINDING-SITE AGONIST with HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity.

Norditropin™ ➡ **human pituitary growth hormone**.

norephedrone ➡ **cathinone**.

norethandrolone [BAN, INN] (CB 8022) is a steroid, an ANDROGENIC and ANABOLIC AGENT, used mainly for its anabolic effects.

norethindrone ➡ **norethisterone**.

norethindrone acetate ➡ **norethisterone**.

norethisterone [BAN, INN] (norethindrone [USAN];

norethisterone enanthate [BAN]; norethisterone acetate [BAN]; norethindrone acetate [USAN]; NSC 9564; Kliofem™; Menzol™; Micronor™; Noriday™; Noristerat™; Primolut™; Utovlan™) is a synthetic steroid, a PROGESTOGEN. It is used primarily and extensively as a constituent in combined oral CONTRACEPTIVES (with an OESTROGEN), in implant contraception, in HRT, sometimes as skin patches, and as an oral ANTICANCER AGENT to assist in the treatment of oestrogen-dependent cancers (e.g. breast cancer).

norethisterone acetate ➡ **norethisterone**.

norethisterone enanthate ➡ **norethisterone**.

norfenefrine [INN] (norfenefrine hydrochloride [JAN]; *m*-norsynephrine) is closely related to **phenylephrine**, and is also a SYMPATHOMIMETIC. It is predominantly an α-ADRENOCEPTOR AGONIST with hypertensive activity which has been used to treat hypotensive states.

norfenefrine hydrchloride ➡ **norfenefrine**.

Norflex™ ➡ **orphenadrine**.

norfloxacin [BAN, INN, JAN, USAN] (Chibroxin™; Noroxin™; Utinor™) is a fluorinated 4-quinolone, a metabolite of **pefloxacin**. It is an ANTIBACTERIAL used especially for urinary tract infections.

norgestimate [BAN, INN, USAN] (dexnorgestrel acetime; D 138; ORF 10131; Cilest™) is a synthetic steroid, a PROGESTOGEN that is used as a constituent of the combined oral CONTRACEPTIVES that contain an OESTROGEN.

norgestrel [BAN, INN, JAN, USAN] (*dl*-norgestrel; dexnotgestril; Wy 3707) is a synthetic steroid and (±)-form of **levonorgestrel**. It is a PROGESTOGEN that is used as a component of numerous oral CONTRACEPTIVE preparations.

***dl*-norgestrel** ➡ **norgestrel**.

norgestrienone [INN] (A 301; R 2010) is a synthetic steroid, a PROGESTOGEN, which has been used as a constituent of combined oral contraceptives that contain an OESTROGEN.

Noriday™ ➡ **norethisterone**.

norimipramine ➡ **desipramine**.

Noristerat™ ➡ **norethisterone**.

norleusactide ➡ **pentacosactride**.

normal immunoglobulin ➡ **globulin, immune**.

nor MDP ➡ **almurtide**.

Normegon™ ➡ **menotrophin**.

normethadone [BAN, INN] (desmethylmethadone; Hoechst 10582; NIH 2820; U 9558) is a **methadone** analogue, an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC and ANTITUSSIVE activity.

normethandrone (normethisterone; NSC 10039) is a steroid with ANDROGEN activity.

normethisterone ➡ **normethandrone**.

normorphine [INN] (desmethylmorphine) is one of the phenanthrene series, an OPIOID RECEPTOR AGONIST which is active as an OPIOID ANALGESIC. Its 3-methyl ether is **norcodeine**.

noroxedrine ➡ **topamine**.

Noroxin™ ➡ **norfloxacin**.

Norpace™ ➡ **disopyramide**.

norpipanone [BAN, INN] (Hoechst 10495; NIH 7557) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

Norpramin™ ➡ **desipramine**.

norsynephrine ➡ **topamine**.

***m*-norsynephrine** ➡ **norfenefrine**.

19-nortestosterone ➡ **nandrolone**.

nortriptyline [BAN, INN] (nortriptyline hydrochloride [JAN, USAN]; desitriptyline; Aventyl™; Pamelor™ and many other names) is an active metabolite of **amitryptyline**, one of the tricyclic class of monoamine UPTAKE INHIBITORS. It is used as an oral ANTIDEPRESSANT with antimuscarinic and SEDATIVE effects when used therapeutically.

nortriptyline hydrochloride ➡ **nortriptyline**.

Norvasc™ ➡ **amlodipine**.

Norvir™ ➡ **ritonavir**.

Novoseven™ ➡ **eptacog alfa; factor VII**.

noscapine [BAN, INN] (narcotine; L-α-narcotine) is an alkaloid from *Corydalis cava* (*Corydalis tuberosa*), *Papaver somniferum* and other *Papaver* spp. It is a by-product in extraction of **morphine** from opium, and one of the first alkaloids to be isolated. It can be used as a centrally acting ANTITUSSIVE, similar in pharmacology to **codeine**.

novobiocin [BAN, INN] (Albamycin™) is an ANTIBIOTIC with ANTIBACTERIAL activity against Gram-positive bacteria. It is also a LEUKOTRIENE RECEPTOR ANTAGONIST.

Novocain™ ➡ **procaine**.

noxiptiline ➡ **noxiptyline**.

noxiptyline [BAN] (noxiptiline [INN]) is a tricyclic ANTIDEPRESSANT.

noxiustoxin (α-NTx2.1) is a 39 amino acid peptide from a scorpion (*Centruroides noxius*), and is structurally related to other scorpion toxins, e.g. **charybdotoxin** and **iberiotoxin**. It is a POTASSIUM-CHANNEL BLOCKER and TOXIN/NEUROTOXIN. It blocks voltage-activated potassium channels ($K_{v1.3}$, $K_{v1.2}$, I_k current of the squid giant axon, and K_v current of human lymphocytes).

noxythiolin [BAN] (noxytiolin [INN]) is a thiourea ANTIFUNGAL, ANTISEPTIC and ANTIBACTERIAL useful in the treatment of peritonitis.

noxytiolin ➡ **noxythiolin**.

Nozinan™ ➡ **methotrimeprazine**.

NPC 361 ➡ **[Hyp³,DPhe⁷]bradykinin**.

NPC 431 ➡ **[Thi⁵,⁸,DPhe⁷]-bradykinin**.

NPK ➡ **neuropeptide K**.

NPY ➡ **neuropeptide Y**.

NSAID ANALGESICS are one of the two main classes of ANALGESICS, which are the non-narcotic analgesics (non-steroidal antiinflammatory drugs, NSAIDs), e.g. **aspirin**; and the narcotic analgesics, e.g. **morphine**. The two groups differ in every aspect of their pharmacology. See also OPIOID ANALGESICS.

The NSAIDs have no tendency to produce dependence, but are by no means free of side-effects. This class is referred to by many names, including 'weak analgesics' – something of a misnomer in view of their powerful actions in treating pain of inflammatory origin. The valuable antiinflammatory action of some members of the class is a property shared with the CORTICOSTEROIDS – though via a very different mechanism. This class of drug is used for a variety of purposes, ranging from treating mild aches and pains to fever (over a lower range of dosages), to the treatment of rheumatoid arthritis and osteoarthritis (over a higher range of dosages). **Paracetamol** (acetaminophen, USA) does not have significant antiinflammatory actions, but is a useful non-narcotic analgesic, and – along with other drugs in this class – has a valuable application in treating pyrexia (i.e. lower raised body temperature: see ANTIPYRETICS).

This family of drugs works mainly by inhibiting the synthesis of **prostanoids** (most of which, chemically, are **prostaglandins**) – natural local hormones within the body, which are proinflammatory, hyperalgesic and pyrexic. The inhibitors do this by binding, reversibly or irreversibly, to an enzyme called cyclooxygenase. It is now believed that the rather different pharmacology of members within the

NSAID class can in part be accounted for by their different activities against two recently discovered cyclooxygenase isoenzymes. One, COX-1, is constitutively expressed, but the other, COX-2, is inducible. Individual NSAIDs have different ratios of activity against the two forms of the enzyme, and this accounts partly for their side-effects when used for a particular purpose. For most antiinflammatory uses a relatively high activity against the induced enzyme is desirable – whereas for anti-platelet-aggregation purposes, high activity at the constitutive form is required: see CYCLOOXYGENASE INHIBITORS; PLATELET AGGREGATION INHIBITING AGENTS. In spite of their important actions and uses, all members of the NSAID class have side-effects of concern which (for other than paracetamol) include gastrointestinal upsets ranging from dyspepsia to serious haemorrhage. In practice, for antirheumatic and similar uses it is the highest dose that can be tolerated by the individual patient that limits usefulness.

NSAID agents can usefully be divided by chemical groups because there is some consistency of pharmacology within these groups.

Salicylates constitute the original group. They arise from a folk remedy – recognized in the mid-18th century to have a foundation in fact – whereby the bark of the willow tree (*Salix* spp.) proved to contain a glycoside (**salicin**) with antipyretic and analgesic properties. Salicin is too irritant to the stomach for general medical use. The simpler derivatives **salicylic acid** and **sodium salicylate** are active, but still irritant. Some salicylates are used by topical application (e.g. **ammonium salicylate**, **choline salicylate**, **diethylamine salicylate**, **ethyl salicylate**, **glycol salicylate**, **methyl salicylate**, **salicylamide**). These topical agents are termed rubefacients in view of the skin erythaema they produce; and may work, in part, atypically by some sort of COUNTER-IRRITANT mechanism. Acetylsalicylic acid was introduced in 1899 – under the trade-name Aspirin – as a synthetic analogue with less irritant and other toxic properties. It is now used, with the generic name aspirin, on a scale that reaches tens-of-thousands of tonnes per annum in many countries of the world. Though still regarded as the 'gold-standard' to which other NSAIDs are compared, it is difficult to exploit its full potential because of gastrointestinal and other side-effects. Salicylates may be complexed, modified or combined with other compounds, e.g. **benorylate**, **diflunisal**, **salsalate**. The aminosalicylates are important compounds used to treat inflammatory conditions of the gastrointestinal tract. Drugs in this group include **mesalazine** (which is 5-aminosalicylic acid itself), **olsalazine sodium** (which is two coupled molecules of 5-aminosalicylic acid) and **sulfasalazine** (which links 5-aminosalicylic acid to **sulfapyridine** – an antibacterial sulphonamide): see ANTICOLITIS AGENTS.

Aniline derivatives (*para-aminophenol derivatives*) were, historically, also introduced in the last century. The original member used extensively in medicine was **phenacetin**, but this has been replaced by paracetamol (acetaminophen, USA). Phenacetin is the prodrug of paracetamol, and has known toxic actions in uncontrolled general use – principally renal and hepatic toxic actions, and propensity to cause methaemoglobinaemia. However, now that paracetamol is in uncontrolled general use, it too has proved to have renal and hepatic toxic actions, especially in overdose and largely due to production of a toxic metabolite *N*-acetyl-*p*-benzoquinone. Paracetamol is an effective weak analgesic that does not cause gastric irritation, and is a useful antipyretic (especially in children who should not be given aspirin because of a risk of the rare, but serious, condition called Reye's Syndrome, causing inflammation of the brain and liver). However, it has virtually no antiinflammatory activity and so, semantically speaking, is not an NSAID and is of no value in treating rheumatoid or other inflammatory conditions. Indeed, it has only weak activity on either COX-1 or COX-2, and is presumed to have its analgesic and antipyretic actions via some other uncharacterized isoform of COX within the brain.

Indole-acetic acid derivatives with NSAID action include **etodolac**, **indomethacin** and **sulindac**. The first produced was indomethacin which, though very powerful as an antirheumatic and antiosteoarthritic agent, has serious toxic GI effects. The more recently introduced members seem better and show promise.

Fenamic acid (*fenemate*) *derivatives* include **mefenamic acid** and **meclofenamic acid**. These, too, are very powerful NSAIDs, but their GI side-effects seriously limit their use as antirheumatics.

Phenylacetic acid derivatives and related agents were introduced fairly recently. Those used therapeutically include **diclofenac**, **ketorolac** and **tolmetin**. They are reasonably well tolerated in use against skeletal muscle and joint pain. Diclofenac is sometimes used (by injection) for preoperative medication. Also, it is available in a preparation combined with a prostaglandin in an attempt to counteract its ulcerogenic effects (see ANTIULCEROGENIC AGENTS).

Propionic acid (*propanoic acid*) *derivatives* have been extensively developed since the original introduction of **ibuprofen** into clinical use. Other examples of those in clinical use include **fenbufen**, **flurbiprofen**, **ketoprofen**, **naproxen** and **oxaprozin**. Many of these agents have a relatively low incidence of reported side-effects, however, their usage varies. Ibuprofen is the first analgesic since paracetamol to be licensed in the UK for non-prescription use; but such use is limited to the treatment of relatively minor pain states, even though it has fair antiinflammatory properties. Most other members are reserved for systemic use to treat rheumatoid and osteoarthritis, musculoskeletal pain and similar states (some applied topically).

Oxicams are a class of recently introduced enolic acid derivatives, including **meloxicam**, **piroxicam** and **tenoxicam**. So far only piroxicam has any extensive usage and is mainly used to treat rheumatoid and osteoarthritis, and for musculoskeletal pain.

There are a number of other drugs with an NSAID spectrum of pharmacology under development. They are all acidic in nature, working at least in part through an inhibitory action on the cyclooxygenase enzymes. The test of the effectiveness of all such agents is not their potency *per se*, but their effectiveness against inflammatory pain and inflammatory pathology, in relation to individual maximum tolerated doses. There is certainly a need for improving this margin. See also ANTIINFLAMMATORY AGENTS.

Murray, M.D. *et al.* (1993) Renal toxicity of the nonsteroidal antiinflammatory drugs. *Annu. Rev. Pharmacol. Toxicol.*, **33**, 435-465.

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Vane, J.R. *et al.* (1995) New insights into the mode of action of antiinflammatory drugs. *Inflamm. Res.*, **44**, 1-10.

Frolich, J.C. (1997) A classification of NSAIDs according to the relative inhibition of cyclooxygenase isoenzymes. *Trends Pharmacol. Sci.*, **18**, 30-34.

NSC 740 ➡ methotrexate.

NSC 746 ➡ urethane.

NSC 750 ➡ busulphan.

NSC 752 ➡ thioguanine.
NSC 755 ➡ mercaptopurine.
NSC 757 ➡ colchicine.
NSC 762 ➡ mustine.
NSC 1026 ➡ cycloleucine.
NSC 1390 ➡ allopurinol.
NSC 1879 ➡ phenazopyridine.
NSC 3053 ➡ dactinomycin.
NSC 3055 ➡ puromycin.
NSC 3070 ➡ stilboestrol.
NSC 3088 ➡ chlorambucil.
NSC 3096 ➡ demecolcine.
NSC 3351 ➡ nandrolone.
NSC 4911 ➡ thioinosine.
NSC 6135 ➡ cholic acid.
NSC 6396 ➡ thiotepa.
NSC 6738 ➡ dichlorvos.
NSC 7760 ➡ pralidoxime.
NSC 7778 ➡ oxybenzone.
NSC 9120 ➡ prednisolone.
NSC 9564 ➡ norethisterone.
NSC 9698 ➡ mannomustine.
NSC 9701 ➡ methyltestosterone.
NSC 9703 ➡ cortisone.
NSC 9894 ➡ hexestrol.
NSC 10023 ➡ prednisone.
NSC 10039 ➡ normethandrone.
NSC 10108 ➡ chlorotrianisene.
NSC 10973 ➡ ethinyloestradiol.
NSC 12165 ➡ fluoxymesterone.
NSC 12169 ➡ oestriol.
NSC 12198 ➡ drostanolone.
NSC 13875 ➡ altretamine.
NSC 15200 ➡ gallium nitrate.
NSC 16895 ➡ lithium carbonate.
NSC 18268 ➡ actinomycin C.
NSC 19043 ➡ oxycodone.
NSC 19893 ➡ fluorouracil.
NSC 23162 ➡ nandrolone.
NSC 23759 ➡ testolactone.
NSC 24567 ➡ vindesine.
NSC 24818 ➡ podophyllotoxin.
NSC 25116 ➡ cysteamine.
NSC 25141 ➡ buclizine.
NSC 25154 ➡ pipobroman.
NSC 25159 ➡ pemoline.
NSC 26198 ➡ oxymetholone.
NSC 26386 ➡ medroxyprogesterone.
NSC 26980 ➡ mitomycin.
NSC 29485 ➡ elmustine.
NSC 30211 ➡ trimustine.
NSC 32065 ➡ hydroxyurea.
NSC 32946 ➡ mitoguazone.
NSC 33001 ➡ fluorometholone.
NSC 34249 ➡ calcium trisodium pentetate.
NSC 34462 ➡ uramustine.
NSC 34652 ➡ methoin.
NSC 35770 ➡ clomiphene.
NSC 37725 ➡ lynoestrenol.
NSC 38297 ➡ broxuridine.
NSC 39069 ➡ treosulfan.
NSC 39084 ➡ azathioprine.
NSC 40902 ➡ phencyclidine.
NSC 43193 ➡ stanozolol.
NSC 45388 ➡ dacarbazine.
NSC 47439 ➡ fluprednisolone.
NSC 49842 ➡ vinblastine.
NSC 54702 ➡ flumethasone.
NSC 55975 ➡ epimestrol.
NSC 56769 ➡ dioxybenzone.
NSC 58775 ➡ nitrazepam.
NSC 62323 ➡ fluphenazine.
NSC 63278 ➡ medrysone.
NSC 64013 ➡ ethosuximide.
NSC 64967 ➡ methenolone.
NSC 65411 ➡ flugestone acetate.
NSC 66233 ➡ bolasterone.
NSC 66847 ➡ thalidomide.
NSC 67068 ➡ oxandrolone.
NSC 67239 ➡ azaribine.
NSC 69856 ➡ zinostatin.
NSC 70735 ➡ nafoxidine.
NSC 71423 ➡ megestrol.
NSC 71755 ➡ carphenazine.
NSC 73205 ➡ dipyrone.
NSC 75054 ➡ mesterolone.
NSC 76239 ➡ oxypurinol.
NSC 77213 ➡ procarbazine.
NSC 77370 ➡ fenclonine.
NSC 79389 ➡ clofibrate.
NSC 80439 ➡ ethoglucid.
NSC 81430 ➡ cyproterone.
NSC 82699 ➡ flufenamic acid.
NSC 84054 ➡ gestronol.
NSC 84223 ➡ 4-hydroxybutanoic acid.
NSC 88536 ➡ calusterone.
NSC 92336 ➡ dydrogesterone.
NSC 92338 ➡ chlormadinone.
NSC 92339 ➡ fluocinolone acetonide.
NSC 94100 ➡ mitobronitol.
NSC 95441 ➡ semustine.
NSC 100638 ➡ amfonelic acid.
NSC 101791 ➡ fluocinonide.
NSC 102824 ➡ azapropazone.
NSC 107079 ➡ chymopapain.
NSC 107429 ➡ cyclazocine.
NSC 107430 ➡ pentazocine.
NSC 107680 ➡ flumethasone.
NSC 108160 ➡ doxepin.
NSC 109229 ➡ crisantaspase.
NSC 109723 ➡ trofosfamide.
NSC 109724 ➡ ifosfamide.
NSC 110432 ➡ methoxyflurane.
NSC 112931 ➡ tetroquinone.
NSC 113891 ➡ mesna.
NSC 114650 ➡ dimefline.
NSC 114901 ➡ desipramine.
NSC 115944 ➡ enflurane.
NSC 118191 ➡ moxestrol.
NSC 119875 ➡ cisplatin.
NSC 122758 ➡ tretinoin.
NSC 122819 ➡ teniposide.
NSC 123018 ➡ medrogestone.
NSC 123127 ➡ doxorubicin.
NSC 125973 ➡ paclitaxel.
NSC 127716 ➡ decitabine.
NSC 129220 ➡ ancitabine.
NSC 129943 ➡ razoxane.
NSC 130004 ➡ thiethylperazine.
NSC 134087 ➡ prednimustine.

NSC 134454 ➡ **dronabinol.**
NSC 134679 ➡ **carboquone.**
NSC 140115 ➡ **ethebenecid.**
NSC 141540 ➡ **etoposide.**
NSC 169780 ➡ **razoxane.**
NSC 180973 ➡ **tamoxifen.**
NSC 182986 ➡ **diaziquone.**
NSC 192965 ➡ **spirogermanium.**
NSC 194684 ➡ **epitiostanol.**
NSC 208734 ➡ **aclarubicin.**
NSC 224131 ➡ **sparfosic acid.**
NSC 233898 ➡ **6-hydroxydopamine.**
NSC 241240 ➡ **carboplatin.**
NSC 245382 ➡ **nimustine.**
NSC 249008 ➡ **trimetrexate.**
NSC 256927 ➡ **iproplatin.**
NSC 261037 ➡ **misonidazole.**
NSC 264137 ➡ **elliptinium acetate.**
NSC 269148 ➡ **menogaril.**
NSC 270516 ➡ **ranimustine.**
NSC 281272 ➡ **fazarabine.**
NSC 287513 ➡ **ametantrone.**
NSC 308847 ➡ **amonafide.**
NSC 310633 ➡ **tilomisole.**
NSC 311056 ➡ **spiroplatin.**
NSC 312887 ➡ **fludarabine.**
NSC 331615 ➡ **levonantradol.**
NSC 332488 ➡ **anaxirone.**
NSC 337766 ➡ **bisantrene.**
NSC 349174 ➡ **piroxantrone.**
NSC 351521 ➡ **piritrexim.**
NSC 356894 ➡ **gusperimus.**
NSC 362856 ➡ **temozolomide.**
NSC 409962 ➡ **carmustine.**
NSC 526046 ➡ **nicotinyl alcohol.**
NSC 527579 ➡ **methylprednisolone.**
NSC 527604 ➡ **desferrioxamine.**
NSC 609699 ➡ **topotecan.**
NSC 612049 ➡ **didanosine.**
NSC 628503 ➡ **docetaxel.**
NSD 1055 ➡ **brocresine.**
NT ➡ **neurotensin.**
NTA 194 ➡ **tiaramide.**
NTCHP ➡ **nandrolone.**
α-NTx2.1 ➡ **noxiustoxin.**
Nu 896 ➡ **properidine.**
Nu 903 ➡ **pyrithyldione.**
Nu 1504 ➡ **phenindamine.**
Nu 2206 ➡ **racemorphan.**
Nubain™ ➡ **nalbuphine.**
Nuelin™ ➡ **theophylline.**
Numorphan™ ➡ **oxymorphone.**
nupafant [INN] is an imidazopyridinyl-benzenesulphonamide, a PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST.
Nupercaine hydrochloride™ ➡ **cinchocaine.**
Nurofen™ ➡ **ibuprofen.**
Nurofen Plus™ ➡ **codeine.**
Nutrasweet™ ➡ **aspartame.**
NUTRITIONAL AGENTS are taken here to include a variety of agents having dietary or nutritional uses. See also DIGESTIVE AGENTS.

Mineral dietary supplements are salts of essential dietary minerals, which may be taken, usually by mouth, to make up deficiencies in the diet, or where there are problems with absorption of the minerals into the body from normal foodstuffs. Examples of important mineral elements include calcium, iron, phosphorus, potassium, sodium and zinc: see MINERAL SUPPLEMENTS. **Fructose** (laevulose, fruit sugar) can be used as part of a normal diet as a source of energy. It offers no particular advantage in normal individuals, but medically may be used by patients who suffer from glucose or galactose intolerance. Choline occurs free and combined in many animal and vegetable products and is a constituent of lecithin. It is important as a precursor of **acetylcholine**, and has been used as a lipotropic agent to treat liver disorders: see **choline chloride**. **Myo-inositol** commonly occurs in plants and animals, and is the most widely distributed of the inositols. It is a growth factor for animals and microorganisms, and is a lipotropic agent. It is incorporated into some multivitamin preparations, e.g. Ketovite™. These phosphates are important cellular second messengers.

VITAMINS are dealt with at their own entry.

Nutrizym™ ➡ **pancreatin.**
Nutropin™ ➡ **human pituitary growth hormone.**
NVB ➡ **vinorelbine.**
Nydrazid™ ➡ **isoniazid.**
nylidrin hydrochloride ➡ **buphenine.**
Nystaform™ ➡ **nystatin.**
nystatin [BAN, INN] (Mycostatin™; Nystaform™; Nystatin™) is a (polyene group) ANTIBIOTIC complex with ANTIFUNGAL activity against yeasts, but no significant effect on bacteria or viruses. Clinically, it is mainly used sytemically to treat candidiasis, and orally for the intestinal tract (it is not absorbed.
Nystatin™ ➡ **nystatin.**
Nytol™ ➡ **diphenhydramine.**

O

obidoxime chloride [INN, USAN] (HS-3) is an oxime CHOLINESTERASE REACTIVATOR. It can be used parenterally as an ANTIDOTE adjunct to **atropine** in treating human or animal (organophosphate group) ANTICHOLINESTERASE pesticide toxicity.

Occlusal™ ➡ salicylic acid.

ociltide [INN] (Hoe 825) is an enkephalin peptide derivative, a peripheral-acting mixed μ/δ OPIOID RECEPTOR AGONIST, which is reported to have (paradoxical) gut and GASTRIC MOTILITY STIMULANT actions.

ocrase [INN] is a proteolytic ENZYME with FIBRINOLYTIC activity, thus acting as a THROMBOLYTIC. Chemically, it is isolated from the mould *Aspergillus ochraceus*. Therapeutically, it can be used to treat thrombolytic disease.

octabenzone [INN, USAN] is a benzophenone, a SUNSCREEN AGENT.

octacaine [INN] is a LOCAL ANAESTHETIC which has been used by topical application for local pain relief. It has ANTIARRHYTHMIC properties.

octacosactrin [BAN] (tosactide [INN]) is a synthetic peptide, a structural CORTICOTROPHIN ANALOGUE (the first 28 amino acids of human **corticotrophin**), which has been used clinically.

octastatin ➡ vapreotide.

octatropine methylbromide [BAN, INN] (anisotropine methylbromide [JAN, USAN]) is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as a visceral ANTISPASMODIC AGENT and as an adjunct in the treatment of peptic ulcer.

octenidine [BAN, INN] (octenidine hydrochloride [USAN]) is a quaternary ammonium compound with ANTIFUNGAL and ANTIBACTERIAL activity. It can be used as a topical antiinfective and dental plaque inhibitor.

octenidine hydrochloride ➡ octenidine.

octocog alfa [BAN] (Kogenate™; Recombinate™) is a recombinant form of blood coagulation **factor VIII**. It is used in the treatment of haemophilia A.

octocrilene [INN] (octocrylene [USAN]) is a cinnamic acid derivative. It can be used in topical SUNSCREEN preparations.

octocrylene ➡ octocrilene.

octodecactide ➡ codactide.

octodrine [INN, USAN] is a VASOCONSTRICTOR that formerly was used in the treatment of hypotensive states.

octopamine [INN] (norsynephrine; noroxedrine) is a phenylethylamine alkaloid from *Capsicum frutescens, Citrus* spp., *Cyperus* spp. (Solanaceae, Rutaceae, Cyperaceae). It occurs in many animal tissues; found in high concentrations in the posterior salivary gland of *Octopus vulgaris*. It serves as an invertebrate neurotransmitter. It is predominantly an α-ADRENOCEPTOR AGONIST, and has been used as a hypertensive to treat hypotensive states.

Octopressin™ ➡ felypressin.

octotiamine [INN, JAN] is a long-acting oral **thiamine** VITAMIN analogue (vitamin B_1 source).

Octreoscan™ ➡ pentetreotide.

octreotide [BAN, INN, USAN] (octreotide acetate [USAN]; SMS 201-995; Sandostatin™) is a long-lasting analogue of the HYPOTHALAMIC HORMONE **somatostatin** (hypothalamic release-inhibiting hormone), and is a SOMATOSTATIN RECEPTOR AGONIST. It is a growth hormone secretion inhibitor and can be used in the short-term treatment of acromegaly. It is used by injection as an adjunct in ANTICANCER treatment for the relief of symptoms caused by the release of hormones from carcinoid tumours of the endocrine system, including VIPomas and glucagonomas.

octreotide acetate ➡ octreotide.

Ocufen™ ➡ flurbiprofen.

Ocusert Pilo™ ➡ pilocarpine.

ODA 914 ➡ demoxytocin.

Odrik™ ➡ trandolapril.

oestradiol [BAN] (estradiol [INN, USAN]; oestradiol benzoate [BAN]; estradiol benzoate [INN]; estradiol hexahydrobenzoate [INN]; ostradiol dipropionate [BAN]; estradiol cypionate [INN]; estradiol valerate [INN, USAN]; oestradiol valerate [BAN]; estradiol enanthate [INN, USAN]; Climaval™; Elleste-Solo™; Estraderm™; Estring™; Evorel™; Fematrix™; Menorest™; Oestrogel™; Progynova™; Vagifem™; Zumenon™) was originally isolated from ovaries and pregnancy urine, and is the most potent of the natural OESTROGENS. Oestradiol and its semisynthetic esters are used extensively in oestrogen replacement therapy, often in combination with PROGESTOGENS.

oestradiol benzoate ➡ oestradiol.

oestradiol valerate ➡ oestradiol.

Oestrifen™ ➡ tamoxifen.

oestriol (estriol; NSC 12169; oestriol succinate [BAN]; estriol succinate [INN]; estriol acetate benzoate [JAN]; NSC 12169; Ortho-Gynest™; Ovestin™ and many other names) is a naturally occurring steroid, an OESTROGEN that is used orally or topically in oestrogen replacement therapy (sometimes in combination with a PROGESTOGEN) to treat menstrual, menopausal or other gynaecological problems (including infertility).

oestriol succinate ➡ oestriol.

Oestrogel™ ➡ oestradiol.

oestrogens (estrogens, USA) is the name given to the group of steroid sex hormones that promote the growth and functioning of the female sex organs and the development of female sexual characteristics. In their natural forms they are produced and secreted mainly by the ovary, and to a small extent by the placenta of pregnant women, the adrenal cortex and in men the testes. The three main natural oestrogens are **oestradiol**, **oestrone** and **oestriol**. Natural and synthesized oestrogens are used therapeutically, sometimes in combination with PROGESTOGENS, to treat menstrual, menopausal (e.g. HRT) or other gynaecological problems. Some synthetic oestrogens are also used to treat certain cancers (e.g. prostate and breast cancer), and also post-menopausal osteoporosis (see ANTICANCER AGENTS). A major use of oestrogens is as oral CONTRACEPTIVES (nomally in combination with progesterones).

Oestrogens work by binding at intracellular receptors, and the interaction of the resultant complexes with nuclear sites results in genomic effects. These effects may be gene transcription (DNA-directed RNA and protein synthesis), or gene repression (inhibition of transcription). Oestrogen receptors are found at many sites, but notably in the reproductive system (e.g. breasts, uterus, vagina). One effect of oestrogens on DNA is the induction of synthesis of

progesterone receptors on tissues, such as uterus and vagina, and posterior pituitary and hypothalamus. Best-known and most-used oestrogens are estradiol, estriol, **ethinyloestradiol**, **mestranol** and **stilbestrol** (stilboestrol).

ANTIOESTROGENS include **tamoxifen** which binds to oestrogen receptors with little stimulation, so acts as an antagonist; used to treat oestrogen-dependent breast cancer.

Chaudhury, R.R. (1981) Pharmacology of estrogens, in *International Encyclopedia of Pharmacology and Therapeutics*. Pergamon Press, Oxford, section 106.

Jacobs, H.S. *et al.* (1992) Postmenopausal hormone replacement therapy. *Br. Med. J.*, **305**, 1403-1408.

Whitcroft, S.I.J. *et al.* (1992) Hormone replacement therapy: risks and benefits. *Clin. Endocrinol.*, **36**, 15-20.

Belchetz, P.E. (1994) Hormonal treatment of postmenopausal women. *N. Engl. J. Med.*, **330**, 1062-1071.

oestrone [BAN] (estrone [INN]; follicular hormone; oxohydroxyoestrin; Kestrin™ and many other names) is a natural steroid OESTROGEN, obtained from pregnant women's urine and pregnant mares' urine. It is used therapeutically in combination with other natural oestrogens mainly in HRT. Its O-sulphate piperazine salt is **estropipate**.

ofloxacin [BAN, INN, JAN, USAN] (Exocin™, Floxin™; Tarivid™ etc.) the racemate is ofloxacin; the (*S*)-form is levofloxacin [BAN, INN, USAN]. It is an ANTIMICROBIAL, one of a 4-quinolone family related to **nalidixic acid**, which, though synthetic agents, are sometimes regarded as ANTIBIOTICS. It can be used as a wide-spectrum ANTIBACTERIAL used orally or systemically against Gram-positive and -negative bacterial infections.

Ogen™ ➡ estropipate.

ohmefentanyl (RTI 4614-4) is one of the phenylpiperidine series and a **fentanyl** analogue, a (μ) OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

oil of wintergreen ➡ methyl salicylate.

okadaic acid is a polyether derivative of a 38-carbon fatty acid elaborated by marine dinoflagellates and accumulated in sponges and in mussels (*Halichondria okadai*). It acts as a selective inhibitor of protein phosphatase-1 and -2A, and is used as a pharmacological and biochemical tool.

OKT3 ➡ muromonab-CD3.

OL 1 ➡ thioxolone.

OL 110 ➡ thioxolone.

olanzapine [BAN, INN, USAN] (LY 170053; Zyprexa™) is a [1,5]benzodiazepine, a ($5HT_2$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST and a (D_2) DOPAMINE RECEPTOR ANTAGONIST, recently introduced as an ANTIPSYCHOTIC, used orally to tranquillize patients suffering from schizophrenia and other acute and chronic psychotic disorders.

Olbetam™ ➡ acipimox.

oleandomycin [BAN, INN] is a (macrolide) ANTIBIOTIC with broad-spectrum ANTIBACTERIAL and ANTIMICROBIAL activity.

oleovitamin D_2 ➡ ergocalciferol.

olopatadine [INN] (olopatadine hydrochloride [USAN]; KW 4679; AL 4943A) is a dibenzoxepin acetic acid, a novel mediator release inhibitor and HISTAMINE H_1-RECEPTOR ANTAGONIST. It can potentially be used as an ANTIALLERGIC AGENT in the treatment of allergic rhinitis, urticaria, allergic conjunctivitis and asthma.

olopatadine hydrochloride ➡ olopatadine.

olsalazine [BAN, INN] (olsalazine sodium [BAN, USAN]; sodium azodisalicylate; Dipentum™) is metabolized *in vivo* to **5-aminosalicylic acid (5-ASA)**, one of the aminosalicylate group of ANTIINFLAMMATORY and ANTICOLITIS AGENTS used for ulcerative colitis. It is also a dye, mordant yellow.

olsalazine sodium ➡ olsalazine.

olvanil [INN, USAN] (*N*-vanillyloleamide) is a **capsaicin** analogue regarded as a VANILLOID RECEPTOR AGONIST. It can be used as an ANTIINFLAMMATORY, antinociceptive agent and non-narcotic ANALGESIC. Strictly, the name olvanil applies to the (*Z*)-form.

OM 1563 ➡ pyrithione zinc.

omadine ➡ pyrithione zinc.

omadine disulfide ➡ dipyrithione.

omadine MDS ➡ bispyrithione magsulfex.

omega-3 marine triglycerides [BAN] (Maxepa™) is a mixture of fatty acid triglycerides (from marine fish), containing 18% of 5,8,11,14,17-eicosapentaenoic acid (EPA) and 12% of 4,7,10,13,16,19-docosahexaenoic acid (DHA; deconexent; cervonic acid). Omega-3 fatty acids are long-chain polyunsaturated fatty acids, and the parent fatty acid of this group, alpha-linolenic acid, an essential fatty acid that the body is unable to synthesize, can be converted in the body to EPA and DHA. The triglycerides act as ANTIHYPERLIPIDAEMICS that reduce plasma triglycerides and are used as a dietary supplement. It is a component of many preparations.

7-omen ➡ menogaril.

omeprazole [BAN, INN, JAN, USAN] (omeprazole sodium [USAN]; Losec™; Prilosec™) is a substituted benzimidazole, a GASTRIC PROTON PUMP INHIBITOR, a (H^+/K^+) ATPASE INHIBITOR. It can be used as an ANTIULCEROGENIC in the treatment of gastric ulcers and other gastric acid-related gastrointestinal disorders. It can be used in combination with **amoxicillin** for eradication of gastric *Helicobacter pylori* infection.

omeprazole sodium ➡ omeprazole.

Omnipen™ ➡ ampicillin.

omoconazole [INN] is an (imidazole group) ANTIFUNGAL, which can be used systemically or orally to treat a range of fungal infections.

onapristone [INN] is a synthetic steroid derivative, which acts as a progestogen hormone antagonist and is used as an ABORTIFACIENT; also has antiglucocorticoid activity.

Oncaspar™ ➡ pegaspargase.

Oncovin™ ➡ vincristine.

ondansetron [BAN, INN] (ondansetron hydrochloride [BAN]; Zofran™) is a substituted imidazolylcarbazolone, a selective ($5\text{-}HT_3$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It shows ANTIEMETIC and antinauseant activity against anticancer radiotherapy or chemotherapy induced emesis.

ondansetron hydrochloride ➡ ondansetron.

One-Alpha™ ➡ alfacalcidol.

ONO 802 ➡ gemeprost.

ONO 995 ➡ froxiprost.

ONO 1052 ➡ delprostenate.

ONO 3708 is a prostaglandin derivative, a (thromboxane; TP) PROSTANOID RECEPTOR ANTAGONIST. It has experimental hepatoprotective properties.

ontazolast [USAN] (BIRM 270) is a pyridinyl-benzoxazolamine derivative, a LIPOXYGENASE INHIBITOR with potential ANTIASTHMATIC activity.

OPC 21268 is a quinolinone derivative, a selective (V_1 subtype) VASOPRESSIN RECEPTOR ANTAGONIST, with ANTIHYPERTENSIVE properties.

OPC 12759 ➡ rebamipide.

Opilon™ ➡ thymoxamine.

OPIOID ANALGESICS (narcotic analgesics) are ANALGESICS typified by **morphine**. They have powerful actions on the CNS, and act to alter the perception of pain. Because of the numerous possible side-effects, the most important of which is dependence, such agents are usually used under strict medical supervision and are normally only available on prescription. Other notable side-effects include depression of respiration, nausea and vomiting, sometimes

hypotension, constipation (see ANTIDIARRHOEAL AGENTS), inhibition of coughing (see ANTITUSSIVES) and constriction of the pupils (miosis). See also NSAID ANALGESICS.

Opiates, as a group, are derived from opium, an exudate from the ripe poppy *Papaver somniferum*. It contains many pharmacologically active alkaloids, of which there are two main chemical types: the benzylisoquinoline series (e.g. **papaverine**); and the phenanthrene series. The original opiate analgesics isolated from opium are phenanthrenes, including, along with morphine itself, **codeine** and **thebaine**. The only remaining medically used opium preparation is **papaveretum** (Omnopon™), which is a mixture of alkaloids. Tens-of-thousands of semisynthetic opiate derivatives have been tested in an attempt to improve the pharmacological profile and reduce propensity to drug-dependence. The first, **diamorphine** (heroin), was originally introduced in 1898, but though marginally more potent than morphine, it is dangerously habituating. Chemically, more distantly related synthetic opiates have been developed, such as the phenylpiperidine series (**pethidine** and **fentanyl**), and the methadone series (e.g. **methadone** and **dextropropoxyphene**) – both of which are regularly used in medicine, though they are less potent than morphine. The thebaine series (e.g. **buprenorphine**) is more closely related to morphine, and some members are a great deal more potent than morphine itself. The benzomorphan series (e.g. **pentazocine**) has rather different properties (see below).

These heterocyclic opioid agents, with a diverse structure, act by binding to one or more of the opioid receptor sites which are to be found on neural (and some other sites) in the central and peripheral nervous systems. It is now recognized that these are the natural receptor sites for recognition of the endogenous members of the peptide opioid neurotransmitters families, which are found in neuronal tissue of the brain and elsewhere.

There are three families of peptides (which are products of different genes): the enkephalins (principally from preproenkephalin); endorphins (from preproopiomelanocortin; POMC); and dynorphins (from preprodynorphin or preproenkephalin B). There are also at least three receptor types, μ (mu), κ (kappa) and δ (delta), again each controlled by a distinct gene. The receptors are all of the seven-transmembrane G-protein-coupled receptor superfamily, and have largely inhibitory effects on neuronal excitability – by means of opening potassium channels or closing calcium-channels – via a G-protein component negative-coupled to adenylyl cyclase pathway (see OPIOID RECEPTOR AGONISTS; POTASSIUM-CHANNEL ACTIVATORS; POTASSIUM-CHANNEL BLOCKERS). Each of these three receptor subtypes can cause analgesia, and there is no exclusive relationship between peptide family and the receptor subtype activated. In terms of medicinal chemistry, development of bioassay systems capable of independently measuring potency, or affinity, at each of the receptor subtypes, has facilitated a number of initiatives designed to find desirable combinations of agonist, partial agonist or competitive antagonist activities (in one molecule). The main objectives have been to improve on the potency and pharmacological profile of morphine, whilst minimizing the habituating liability. This has not been entirely successful, but some mixes of activity at μ and κ receptors – of agonist, partial agonist or even antagonist activity – seem useful. Such mixed analgesics (e.g. **buprenorphine**, **cyclazocine**, **meptazinol** and pentazocine) have entered medicine as analgesics with limited tendency to cause drug-dependence or abuse potential. However, some opioids, including the benzomorphans (e.g. pentazocine and cyclazocine), bind appreciably to a further site, the σ (sigma) receptors that, unlike the opioid receptors detailed, have psychotomimetic potential, so patients may experience hallucinations. The σ-site is best not classed as an opioid receptor site, as it is not blocked by normal opioid antagonists such as **naloxone** – a fact of clinical importance. Also, recently, an 'orphan' receptor (ORL_1) of a further form has been demonstrated, and it binds a dynorphin-like heptapeptide sequence termed nociceptin (or orphanin-FQ). The applications of this finding remain to be seen. A number of potent antagonists acting at μ, κ or δ receptors are available, and are useful for reversing opioid effects in medicine or in abuse overdose (e.g. naloxone), or in treating drug dependence (**naltrexone**): see OPIOID RECEPTOR ANTAGONISTS. Some weaker opioids are used as ANTITUSSIVES (e.g. codeine, **dextromethorphan** and **pholcodine**) or as ANTIDIARRHOEAL AGENTS (e.g. **loperamide**). Several peptide opioids have been developed as analgesics or antitussives (e.g. **BW 443C81**), but none has proved strikingly successful.

There have been attempts to develop analgesic agents that work indirectly, through interfering with the breakdown of natural opioids in the body. Experimentally, some peptidase inhibitors have been shown to have analgesic actions; mainly a combination of **thiorphan** (an inhibitor of NEP ('enkephalinase') and **bestatin** (an inhibitor of aminopeptidase B: see AMINOPEPTIDASE INHIBITORS; NEUTRAL ENDOPEPTIDASE INHIBITORS.

There have been extensive searches for alternative analgesics acting on the nervous system without addictive and other side-effects, and there are some areas of promise. One initiative is to target the same cellular mechanism of action as the opioids (an inhibitory effect on neuronal excitability by opening potassium channels or closing calcium channels, through receptors negatively coupled to adenylyl cyclase), but with non-opioids. Here compounds which enhance actions at α_2-adrenoceptor, or certain 5-HT receptors, show promise. The α_2-adrenoceptor agonist **clonidine** is used as an analgesic in veterinary practice. **Tramadol** is a novel analgesic, used clinically as a racemic combination of two enantiomers, with a mix of μ-opioid and central monoaminergic activities (5-HT and noradrenaline reuptake inhibitor).

Herman, N.L. *et al.* (1990) Extradural opioids in labour. *Br. J. Anaesth.*, **64**, 528-529.
Millan, M.J. (1990) κ-Opioid receptors and analgesia. *Trends Pharmacol. Sci.*, **11**, 70-76.
Hoskin, P.J. *et al.* (1991) Opioid agonist-antagonist drugs in acute and chronic pain states. *Drugs*, **41**, 326-344.
Schug, S.A. *et al.* (1992) Pharmacological management of cancer pain. *Drugs*, **43**, 44-53.
Takemori, A.E. *et al.* (1992) Selective naltrexone-derived opioid receptor antagonists. *Annu. Rev. Pharmacol. Toxicol.*, **32**, 239-269.
Pasternak, G.W. (1993) Pharmacological mechanisms of opioid analgesics. *Clin. Neuropharmacol.*, **16**, 1-18.

OPIOID RECEPTOR AGONISTS bind at, and activate, one or more of the subtypes of receptor that recognize the endogenous peptide opioids. Agonist ligands notably include plant alkaloids, such as **morphine**, and also diverse synthetic heterocyclic derivatives. These are used for a number of purposes, principally as narcotic analgesics. Their use is discussed in more detail under other headings: see ANTIDIARRHOEAL AGENTS; ANTITUSSIVES; OPIOID ANALGESICS.

Very large numbers of synthetic heterocyclic opioid receptor agonists have now been synthesized, and there is a considerable body of evidence about structure-activity relationships. Opiates, as a group, are derived from opium,

an exudate from the ripe poppy *Papaver somniferum*. It contains many pharmacologically active alkaloids, of which the phenanthrene series includes, along with morphine itself, **codeine** and **thebaine**. Tens-of-thousands of semisynthetic opiate derivatives have been tested in an attempt to improve the pharmacological profile and reduce propensity to drug-dependence. These include **diamorphine** (heroin) and chemically more distantly related synthetic opiates, such as the phenylpiperidine series (**pethidine** and **fentanyl**) and the methadone series (e.g. **methadone** and **dextropropoxyphene**); both of which are regularly used in medicine. The thebaine series (e.g. **buprenorphine**) is more closely related to morphine, and some members are a great deal more potent than morphine itself. The benzomorphan series (e.g. **pentazocine**) has rather different properties (*vide infra*).

These heterocyclic opioid agents, of a diverse structure, act by binding to one or more of the opioid receptor sites which are to be found on neural (and some other sites) in the central and peripheral nervous systems. The opioid receptors are the natural binding sites for recognition of the endogenous members of the peptide opioid neurotransmitters families which are found in neural tissue. There are three families, which are the products of different genes: the enkephalins (principally from preproenkephalin); endorphins (from preproopiomelanocortin; POMC); and dynorphins (from preprodynorphin; preproenkephalin B). Recently, a dynorphin-like heptapeptide sequence termed **nociceptin** (or orphanin-FQ) has been identified which apparently is the endogenous ligand for a novel 'orphan' receptor (ORL_1).

There are also at least three receptor types, μ (mu), κ (kappa) and δ (delta), again each controlled by a distinct gene. [It might be noted that it has been recommended that the nomenclature for these three receptor subtypes may change, and they are expected to become known as: δ = OP_1, κ = OP_2, μ = OP_3].The receptors are all of the seven-transmembrane G-protein-coupled receptor superfamily and have largely inhibitory effects on neuronal excitability – by means of opening potassium channels or closing calcium channels, via a G-protein component in the negative-coupling to adenylyl cyclase pathway: see **POTASSIUM-CHANNEL ACTIVATORS**; **POTASSIUM-CHANNEL BLOCKERS**. Each of these three receptor subtypes can cause analgesia, and there is no exclusive relationship between the peptide family and the receptor subtype activated. However, β-endorphin is commonly most potent at μ- and δ-receptors, whereas dynorphin A is most potent at κ-receptors. The two forms of enkephalin pentapeptides – leucine- and methionine-enkephalin – are potent mostly at the δ-receptors.

Some opioids, including the benzomorphans (e.g. **cyclazocine** and pentazocine), bind appreciably to a further site, the (sigma) σ-receptors that, unlike the opioid receptors detailed, have psychotomimetic potential, and patients may experience hallucinations. The σ-site is best not classed as an opioid receptor site, in as much as it is not blocked by normal opioid receptor antagonists, such as naloxone – a fact of clinical importance. On the other hand, it is now clear that the ORL_1 receptors are not sensitive to naloxone, though receptor activation can sometimes cause analgesia.

The μ-, δ- and κ-receptors have been cloned, and the first three show >50% identity. Subtypes and species-dependent variants within each of these receptors have been demonstrated, but there is >90% sequence homology. The recently cloned 'orphan' receptor (ORL_1) binds a dynorphin-like heptapeptide sequence. The physiological role of this novel receptor is not yet apparent.

Recently, gene-deletion ('knockout') experiments in mice have shown that in animals without specific opioid receptor subtypes, the effects of opioid agonists are abolished in much the expected way (e.g. μ-knockout animals do not respond to morphine). However, pain thresholds in unstressed knockout animals are unchanged, and there is no upregulation in the parallel systems (e.g. there is little upregulation of δ- and κ-receptors in μ-receptor knockout animals). The experiments have been interpreted as showing that there is little tonic modulation mediated through opioid receptors (i.e. mediated by the enkephalin/dynorphin/endorphin systems) in normal animals that are not stressed or hyperalgesic.

Relative potencies of endogenous ligands, and agents selective for each of the receptor subtypes, and valuable for experimental studies, are as follows:

At μ-receptors: β-endorphin > dynorphin A > [met]enkephalin = [leu]enkephalin: selective agonists include the peptides, **DAMGO** (also known as **DAMGOL**; formerly DAGO); PLO 17; and the nonpeptide sufentanyl.

At δ-receptors: β-endorphin = [met]enkephalin = [leu]enkephalin > dynorphin A >: selective agonists include the peptides, **DPDPE**, **DSBULET**; **DADLE**; **TIPP** and [DAla^2]-deltorphin I or II.

At κ-receptors: dynorphin A >> β-endorphin > [leu]enkephalin > [met]enkephalin: selective agonists include the nonpeptides, **U 69593**; **U 50488**; **CI 977**; **ICI 197067**. At ORL_1 receptors: nociceptin > dynorphin A >> [leu]enkephalin = [met]enkephalin. The synthetic opioid non-selective agonists **etorphine** is active at relatively high concentrations. See **OPIOID RECEPTOR ANTAGONISTS**.

Reisine, T. *et al.* (1993) Molecular biology of opioid receptors. *Trends Neurosci.*, **16**, 506-510.

Kieffer, B.L. (1995) Recent advances in molecular recognition and signal transduction of active peptides: receptors for opioid peptides. *Cell Mol. Neurobiol.*, **15**, 615-635.

Mansour, A. *et al.* (1995) Opioid receptors: Past, present and future. *Trends Neurosci.*, **18**, 69-70.

Zaki, P.A. *et al.* (1996) Opioid receptor types and subtypes: the delta receptor as a model. *Annu. Rev. Pharmacol. Toxicol.*, **36**, 379-401.

Henderson, G. *et al.* (1997) The orphan opioid receptor and its endogenous ligand – nociceptin/orphanin FQ. *Trends Pharmacol. Sci.*, **18**, 293-300.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

OPIOID RECEPTOR ANTAGONISTS bind at, and block, one or more of the subtypes of receptor that recognize the endogenous peptide opioids. Clinically used antagonist ligands are mostly heterocyclic derivatives of plant alkaloids related to **morphine**, with high affinity but low efficacy. A number of potent antagonists acting at μ-, δ- or κ-receptors are available for clinical use, and are mostly active at all three receptors. They are invaluable for reversing opioid effects in routine medicine or in abuse overdose (e.g. **naloxone**), or in treating drug dependence (**naltrexone**). Naloxone is not active at (sigma) σ-receptors or at ORL_1 receptors. Antagonists showing some selection for each of the receptor subtypes, and valuable for experimental studies, are as follows. At μ-receptors: the peptides **CTOP**, **CTAP** and the non-peptide **β-FNA** (β-funaltrexamine; irreversible). At δ-receptors: the peptide ICI 174864 and the nonpeptide **naltrindole**. At κ-receptors: nor-BNI (nor-binaltorphinine). At the recently recognized novel 'orphan' receptor, ORL_1, nociceptin (or orphanin-FQ) is not antagonized by nalorphine, naloxone or any 'classsical' opioid antagonists. Some relatively subtype-nonselective experimental (nonpeptide) antagonists include: **β-CNA** (**β-chlornaltrexamine**: irreversible), naltrexone or cyprodime.

opipramol [BAN, INN] (opipramol hydrochloride [JAN, USAN]) is a tricyclic oral ANTIDEPRESSANT.
opipramol hydrochloride ➡ **opipramol**.
oprelvekin [INN] is more fully termed 2-178-interleukin 2 (human clone pXM/IL-11), and is a recombinant version of **interleukin-2**, a peptide cytokine inflammatory mediator, acting as a CHEMOKINE RECEPTOR AGONIST. It can be used clinically as an IMMUNOMODULATOR, proposed for use in the prevention and treatment of cytopenia and morbid obesity. It is a derivative of human adipogenesis inhibitory factor.
Opren™ ➡ **benoxaprofen**.
Opthaine™ ➡ **proxymetacaine**.
Opticrom™ ➡ **sodium cromoglycate**.
Optimax™ ➡ **tryptophan**.
Optimine™ ➡ **azatadine**.
Opus™ ➡ **tamoxifen**.
Oramorph™ ➡ **morphine**.
orange crush ➡ **bisantrene**.
Orap™ ➡ **pimozide**.
Orasone™ ➡ **prednisone**.
Orbenin™ ➡ **cloxacillin**.
orciprenaline [BAN, INN] (metaproterenol sulfate [USAN]; Alupent™) is a β-ADRENOCEPTOR AGONIST and is mainly used in its racemic form, which therapeutically can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.
Ordrine™ ➡ **caramiphen**; **phenylpropanolamine hydrochloride**.
Orelox™ ➡ **cefpodoxime proxetil**.
Oretin Methyl™ ➡ **methyltestosterone**.
ORF 10131 ➡ **norgestimate**.
ORF 15244 ➡ **thymopentin**.
ORF 17070 ➡ **histrelin**.
ORF 20485 ➡ **tepoxalin**.
ORF 22164 ➡ **atosiban**.
Org 483 ➡ **ethyloestrenol**.
Org 817 ➡ **epimestrol**.
Org 2969 ➡ **desogestrel**.
Org 3770 ➡ **mirtazapine**.
Org 32763 ➡ **3-methoxyiminoquinuclidinium chloride**.
Organidin™ ➡ **guaiphenesin**.
Org OD 14 ➡ **tibolone**.
orgotein ➡ **superoxide dismutase**.
Orimeten™ ➡ **aminoglutethimide**.
oripavine is a thebaine alkaloid derivative from *Papaver somniferum* and other *Papaver* spp. It is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.
OR K 242 ➡ **vadocaine**.
Orlaam™ ➡ **levacetylmethadol**.
ormetein A ➡ **superoxide dismutase**.
ornidazole [INN, USAN] is an (imidazole group) ANTIPROTOZOAL which is also used as an ANTIBACTERIAL against anaerobic bacteria.
ornipressin [INN] ([Orn^8]vasopressin) is a HAEMOSTATIC AGENT used as a VASOCONSTRICTOR antihaemorrhagic agent. See also **argiprestocin**.
ornoprostil [INN, JAN] (OU 1308) is a synthetic prostaglandin, a PROSTANOID RECEPTOR AGONIST reported to have potential as a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC. It is also a **dopamine** release inhibitor.
orotic acid [INN] (vitamin B_{13}; whey factor; uracil-6-carboxylic acid) occurs naturally in the body and is found in milk. It is a key compound involved in the biosynthesis of nucleic acid pyrimidine bases. In the form of metal salts it has been used as an ANTIHYPERLIPIDAEMIC in treating hypercholesterolaemia and liver disorders. It can be used to treat hyperuricaemia and is an antigout and URICOSURIC AGENT. Also, it shows bacteriostatic and cytostatic properties.
orphanin-FQ ➡ **nociceptin**.
orphenadrine [BAN, INN] (orphenadrine citrate [USAN]; orphenadrine hydrochloride; Biorphen™; Disipal™; Norflex™) is a phenylmethoxyethanamine derivative, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST used as an ANTIPARKINSONIAN AGENT in controlling tremor and rigidity.
orphenadrine citrate ➡ **orphenadrine**.
orphenadrine hydrochloride ➡ **orphenadrine**.
Orthoclone OKT3™ ➡ **muromonab-CD3**.
Ortho-Cream™ ➡ **nonoxinol 9**.
Ortho-Dienestrol™ ➡ **dienoestrol**.
Ortho-Est™ ➡ **estropipate**.
Ortho-Gynest™ ➡ **oestriol**.
Orudis™ ➡ **ketoprofen**.
osalmid [INN, JAN] (L 1718 and many other names) is a benzamide and has been used as a CHOLERETIC AGENT.
osanetant [INN] (SR 142801) is a substituted piperidinyl-methylacetamide, a TACHYKININ RECEPTOR ANTAGONIST selective for the NK_3-receptor subtype.
Osteocalcin™ ➡ **calcitonin**.
ostradiol dipropionate ➡ **oestradiol**.
otilonium bromide [BAN, INN] is a quaternary ammonium compound, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST which can be used as a visceral ANTISPASMODIC.
Otrivine-Antistin™ ➡ **antazoline**.
Otrivine™ ➡ **xylometazoline**.
OU 1308 ➡ **ornoprostil**.
ouabain [BAN] (strophanthin-G; strophanthoside-G and many other names) is a CARDIAC GLYCOSIDE, a constituent of the wood of *Acokanthera oubaio* and other *Acokanthera* spp., and seeds of several *Strophanthus* spp. It is a (Na/K) ATPASE INHIBITOR with ANTIARRHYTHMIC, CARDIAC STIMULANT, VASOCONSTRICTOR, HYPERTENSIVE and natriuretic activity.
Ovestin™ ➡ **oestriol**.
ovine prolactin ➡ **prolactin**.
ovoflavine ➡ **riboflavine**.
OVULATION-INDUCING AGENTS are used in women as part of fertility treatment. Depending on the cause, there are four main treatments.

Gonadothrophin-releasing hormone (gonadorelin; GnRH; luteinizing hormone-releasing hormone; LH-RH; or LH-FSH-RH) is a linear decapeptide, one of the hypothalamic factors that travel in a specialized system of portal blood vessels the short distance from the brain area of the hypothalamus to the adjacent anterior pituitary. Its action on the pituitary gland is to release the **gonadotrophins**, which are comprised of **follicle-stimulating hormone** (FSH) and **luteinizing hormone** (LH). The alternative name of GnRH used in synthetic form as a drug, is **gonadorelin**: it is used as an infertility treatment to treat infertility (and also for amenorrhoea and diagnostic purposes – for assessing pituitary function). As explained in more detail under LH-RH RECEPTOR AGONISTS, synthetic analogues of gonadorelin (**buserelin**, **goserelin**, **leuprorelin** and **nafarelin**) can also be used to treat infertility, when they are administered by pulsatile administration (including subcutaneous or intravenous infusion and as a nasal spray). They can also be used to induce pituitary desensitization before induction of ovulation for *in vitro* fertilization. When used on a chronic basis they down-regulate the release system and can be used for the reverse effects, to treat endometriosis, and for breast and prostate cancer.

The gonadotrophins may be used directly for infertility treatment in women, when they are injected. The pituitary gonadotrophins follicle-stimulating hormone (FSH) and luteinizing hormone (LH) cause the monthly ripening in one ovary of a follicle and stimulates ovulation. These are available in several forms, e.g. menotrophin, a mix of FSH/LH, or **urofollitrophin** (FSH). **Chorionic gonadotrophin** (human chorionic gonadotrophin; HCG) is secreted by the placenta, and is prepared from the urine of pregnant women. Its main actions are those of luteinizing hormone (LH), and can be used as an infertility treatment, when it is given by intramuscular injection.

The synthetic agent **clomiphene** is a weak antioestrogen (an 'impeded' oestrogen; structurally related to **stilboestrol**) It is used in infertility treatment in women whose condition is linked to the persistent presence of oestrogens and a consequent failure to ovulate. Clomiphene blocks hypothalamic oestrogen receptors, so that the negative feedback of the natural oestrogen is prevented and the pituitary responds by increased secretion of gonadotrophins, which may induce ovulation. Administration is oral. See ANTIOESTROGENS.

Much the same principles and agents are used in the management of fertility problems, and in manipulation of early or late seasonal pregnancy in livestock.

Fraser, H.M. *et al.* (1989) Gonadotrophin-releasing hormone analogues for gynaecological disorders and infertility: a real advance. *Br. Med. J.*, **298**, 475-476.
Hodgen, G.D. (1989) General applications of GNRH agonists in gynecology: past, present and future. *Obst. Gynecol. Surv.*, **44**, 293-296.
Conn, P.M. *et al.* (1991) Gonadotrophin-releasing hormone and its analogues. *N. Engl. J. Med.*, **324**, 93-103.
Editorial (1992) New gonadotrophins for old? *Lancet*, **340**, 1442-1443.

oxabolone cipionate [INN, JAN] (FI 5852) is a steroid with ANDROGENIC and ANABOLIC properties.

oxacillin [BAN, INN] (oxacillin sodium [USAN]; Bactocill™) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat certain infections.

oxacillin sodium ➡ **oxacillin**.

oxaflozane [INN] is a non-tricyclic oral ANTIDEPRESSANT.

oxagrelate [INN, USAN] is a phthalazinecarboxylate, a (cyclic AMP) PHOSPHODIESTERASE INHIBITOR. It has PLATELET AGGREGATION INHIBITOR and SMOOTH MUSCLE RELAXANT properties.

oxaliplatin [INN] is an organic platinum compound similar to **cisplatin**. It is an alkylating ANTICANCER AGENT that has been used for colorectal and ovarian cancer.

oxaminozoline ➡ **rilmenidine**.

oxamisole [INN] (oxamisole hydrochloride [USAN]) is a substituted imidazopyridine, with IMMUNOMODULATOR and ANTIVIRAL properties.

oxamisole hydrochloride ➡ **oxamisole**.

oxamniquine [BAN, INN, USAN] (Vansil™) is a tetrahydroquinoline, used as an oral ANTISCHISTOMAL AGENT.

Oxandrin™ ➡ **oxandrolone**.

oxandrolone [BAN, INN, JAN, USAN] (CB 8075; NSC 67068; SC 11585; Oxandrin™ and many other names) is a steroid, with ANDROGENIC and ANABOLIC properties. It is used orally to promote weight gain after disease or surgery.

oxantel [BAN, INN] (oxantel pamoate [USAN]) is an ANTHELMINTIC that was never marketed.

oxantel pamoate ➡ **oxantel**.

oxanthrazole ➡ **piroxantrone**.

oxantrazole ➡ **piroxantrone**.

oxapium iodide [INN, JAN] is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST which can be used as an ANTISPASMODIC AGENT.

oxaprotiline [INN] (oxaprotiline hydrochloride [USAN]) is an ethanoanthracene derivative, a hydroxylated derivative of **maprotiline**, a tetracyclic ANTIDEPRESSANT. It acts as an (α_1-subtype) α-ADRENOCEPTOR ANTAGONIST, and can be used as an antidepressant. The (*S*)-form is a noradrenaline UPTAKE INHIBITOR and the (*R*)-form is levoprotiline [INN] (levoxaprotiline), which lacks this action. Oxaprotiline hydrochloride [USAN] is the racemate.

oxaprotiline hydrochloride ➡ **oxaprotiline**.

oxaprozin [BAN, INN, USAN] (Wy 21743) is an oxazolepropanoic acid derivative, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

oxazepam [BAN, INN, JAN, USAN] (Serax™) is one of the [1,4]benzodiazepines and closely related to **temazepam**. It is a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It is used orally for anxiety and insomnia, and to ease alcohol withdrawal.

oxazidione [INN] is an (oral) ANTICOAGULANT, a synthetic agent chemically related to the coumarin group. It can be used therapeutically to prevent the formation of clots in thromboembolytic disease.

oxazolam [INN, JAN] (CS 300; EMD 33400) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST, with most of its properties similar to **diazepam.** It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It is used orally for anxiety.

oxcarbazepine [INN] (GP 47680) is a derivative of **carbamazepine** and with similar properties. It has been used as an ANTICONVULSANT in ANTIEPILEPTIC therapy.

oxedrine [BAN] (synephrine) is a phenylethanolamine derivative, a SYMPATHOMIMETIC with VASOCONSTRICTOR, hypertensive and DECONGESTANT properties.

oxetacaine ➡ **oxethazaine**.

oxetacillin [INN] (methoxymethyl ester: sarmoxicillin [INN]) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat certain infections.

oxethazaine [BAN, USAN] (oxetacaine [INN]; Wy 806) is an amide series LOCAL ANAESTHETIC, which has been used by topical application for local pain relief. It is also available combined in an ANTACID mixture (Mucaine™).

oxfendazole [BAN, INN, USAN] is a carbamate ANTHELMINTIC.

oxibendazole [BAN, INN, USAN] is a carbamate ANTHELMINTIC.

oxiconazole [BAN, INN] (oxiconazole nitrate [JAN, USAN]; Oxistat™) is an imidazole ANTIFUNGAL, which can be used systemically to treat a range of fungal infections.

oxiconazole nitrate ➡ **oxiconazole**.

oxidopamine ➡ **6-hydroxydopamine**.

oxidronic acid [BAN, INN, USAN] is one of the bisphosphonate series of CALCIUM METABOLISM MODIFIERS used to treat disorders of bone metabolism, reducing calcium-resorption from the bone. It has been used as a diagnostic agent for bone visualization. It is a weak inhibitor of AMV reverse transcriptase and DNA-polymerase.

oxiglumide ➡ **loxiglumide**.

oxilofrine [INN] is an **ephedrine**-like indirect-acting SYMPATHOMIMETIC, formerly used as an ANTIHYPOTENSIVE.

oximonam [INN, USAN] (oximonam sodium [USAN]; ester = gloximonam [INN, USAN]) is a (monobactam/β-lactam) ANTIBIOTIC which shows ANTIBACTERIAL activity.

oximonam sodium ➡ **oximonam**.

oxindanac [INN] (CGP 6258) is an indenecarboxylic acid, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC,

ANTIINFLAMMATORY and ANTIPYRETIC activity. It is used as a veterinary antiinflammatory agent.

oxipurinol ➡ **oxypurinol**.

oxiracetam [BAN, INN] (4-hydroxypiracetam; CGP 21690E; ISF 2522) is one of the piroxicam group, and has been used as a NOOTROPIC AGENT (cognition enhancer) and investigated for the treatment of senile dementia.

Oxistat™ ➡ **oxiconazole**.

oxitriptan ➡ **5-hydroxytryptophan**.

oxitropium bromide [BAN, INN, JAN, USAN] (scopolamine ethobromide) is a quaternary ammonium derivative of **hyoscine**, and is a MUSCARINIC CHOLINOCEPTOR ANTAGONIST which can be used by inhalation as a BRONCHODILATOR.

oxmetidine [BAN, INN] (oxmetidine hydrochloride [USAN]; oxmetidine mesylate [USAN]; SKF 92994) is an imidazolylpiperonylpyrimidone, a HISTAMINE H_2-RECEPTOR ANTAGONIST, GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC AGENT.

oxmetidine hydrochloride ➡ **oxmetidine**.

oxmetidine mesylate ➡ **oxmetidine**.

oxoallopurinol ➡ **oxypurinol**.

oxocorticosterone ➡ **aldosterone**.

oxohydroxyoestrin ➡ **oestrone**.

oxomemazine [INN] (RP 6847) is one of the phenothiazine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS. It has SEDATIVE/TRANQUILLIZER properties, and is used as an ANTITUSSIVE, ANTIALLERGIC and antipruritic.

oxophenarsine [INN] is an organic arsenical, an ANTITRYPANOSOMAL, ANTIBACTERIAL, ANTHELMINTIC and ANTICANCER AGENT. It inhibits HIV-1 protein synthesis and is a sulphydryl inhibitor.

γ-oxophenylbutazone ➡ **kebuzone**.

6-oxoprostaglandin E_1 (6-ketoprostaglandin E_1) is a vasoactive *metabolite* of **prostacyclin**. It is a PROSTANOID RECEPTOR AGONIST and a PLATELET AGGREGATION INHIBITOR.

oxoprostol [BAN, INN] (MB 33153) is a synthetic prostaglandin, a PROSTANOID RECEPTOR AGONIST with potential as a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.

oxotremorine is a pyrrolidinone tertiary amine derivative, a MUSCARINIC CHOLINOCEPTOR AGONIST and PARASYMPATHOMIMETIC, which gains access to the CNS and is important as a convulsive pharmacological tool in the study of Parkinsonism. It is the active metabolite of **tremorine**.

oxpentifylline [BAN] (pentoxifylline [INN, JAN, USAN]; Trental™) is a theobromine derivative, a VASODILATOR that can be used orally to treat peripheral vascular disease.

oxpheneridine [INN] is one of the phenylpiperidine series and is a fentanyl analogue. It is a (μ) OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC and ANTISPASMODIC activity.

oxprenolol [BAN, INN] (oxprenolol hydrochloride [JAN, USAN]; Trasicor™) is a (subtype-non-selective) β-ADRENOCEPTOR ANTAGONIST, which is relatively lipophilic. Therapeutically, it can be used as an ANTIHYPERTENSIVE, ANTIANGINA, ANTIARRHYTHMIC and ANXIOLYTIC AGENT.

oxprenolol hydrochloride ➡ **oxprenolol**.

ox somatotropin ➡ **bovine pituitary growth hormone**.

Oxsoralen™ ➡ **methoxsalen**.

oxybenzone [INN, USAN] (MOB; NSC 7778) is a benzophenone which is used along with other constituents in a number of topical SUNSCREEN preparations.

oxybuprocaine [BAN, INN] (benoxinate hydrochloride [USAN]; Minims Benoxinate™) is an ester series LOCAL ANAESTHETIC used by topical application mainly for ophthalmic use (including with fluorescein in Fluress™).

oxybutynin [BAN, INN] (oxybutynin hydrochloride [USAN]; Cystrin™; Ditropan™; Urotrol™) is a tertiary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as an oral ANTISPASMODIC, especially to treat urinary frequency, incontinence and bladder spasms.

oxycinchophen [BPC, INN] (Astra 1410) is an analogue of **cinchophen** and is a URICOSURIC and ANTIDIURETIC AGENT.

oxyclozanide [BAN, INN] is a veterinary ANTHELMINTIC.

oxycodone [BAN, INN, USAN] (NSC 19043; Roxicodone™) is one of the phenanthrene series, and is an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC. It is used orally or by injection to treat moderately severe pain.

oxyfedrine [BAN, INN] (oxyfedrine hydrochloride [JAN]) is a methoxypropiophenone derivative, a coronary VASODILATOR which can be used for ischaemic heart disease.

oxyfedrine hydrochloride ➡ **oxyfedrine**.

oxymetazoline [BAN, INN] (oxymetazoline hydrochloride [JAN, USAN]; Afrazine™; Dristan™) is an imidazoline derivative with (α_1-subtype) α-ADRENOCEPTOR AGONIST activity. It is a VASOCONSTRICTOR that can be used as a topical nasal DECONGESTANT.

oxymetazoline hydrochloride ➡ **oxymetazoline**.

oxymetebanol ➡ **drotebanol**.

oxymetholone [BAN, INN, USAN] (NSC 26198) is a steroid with ANDROGENIC and ANABOLIC properties. It is used orally to treat anaemias, including aplastic anaemias.

oxymorphone [BAN, INN] (Numorphan™) is one of the phenanthrene series, an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC. It is used by injection to treat moderate to severe pain, particularly in preoperative medication.

oxypertine [BAN, INN, JAN, USAN] (Win 18501; Oxypertine™) is an indole derivative with general properties similar to **chlorpromazine**. It is an ANTIPSYCHOTIC AGENT, used orally to treat and tranquillize patients with psychotic disorders, such as schizophrenia. The drug may also be used in the short-term treatment of severe anxiety.

Oxypertine™ ➡ **oxypertine**.

oxyphenbutazone [BAN, INN] (Tanderil™ and many other names) is one of the pyrazolone series, and a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. As an antiinflammatory its use is restricted due to risk of severe haematological adverse effects.

oxyphencyclimine [BAN, INN] (oxyphencyclimine hydrochloride [USAN]) is a tertiary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST used as a visceral ANTISPASMODIC and as an adjunct in the treatment of ulcers.

oxyphencyclimine hydrochloride ➡ **oxyphencyclimine**.

oxyphenisatin [BAN, INN] (oxyphenisatin acetate [USAN]) is a (stimulant) LAXATIVE, chemically a *bis*hydroxyphenylindolinone related to **phenolphthalein**.

oxyphenisatin acetate ➡ **oxyphenisatin**.

oxyphenonium bromide [BAN, INN] is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST. It can be used as a visceral ANTISPASMODIC, as an adjunct in the treatment of ulcers.

oxypurinol [BAN, USAN] (oxipurinol [INN]; alloxanthine; oxoallopurinol; BW 55-5; NSC 76239) is a XANTHINE-OXIDASE INHIBITOR, formerly used as an antigout agent.

oxytetracycline [BAN, NSI, INN, JMAF] (Terramycin™) is a semisynthetic (tetracycline) ANTIBIOTIC. It can be used clinically as a broad-spectrum semisynthetic oral ANTIBACTERIAL to treat certain infections.

OXYTOCIC AGENTS hasten childbirth, generally by contracting the uterus. Many therapeutically useful agents do

so by acting as VASOPRESSIN RECEPTOR AGONISTS at the oxytocin (OT) subtype of receptors. Many analogues have been developed that are more active, or more selective than oxytocin itself, but few of these have entered therapeutics. One that has been used is **demoxytocin**. Some of these agents are discussed under another heading: see vasopressin receptor agonist. Oxytocin is used in its natural, but synthetic, form (Syntocinon™) for the induction of labour, when it is given by intravenous infusion, or sublingually.

The other main class of agent used for contractile actions on the uterus are the prostanoids. They may be used together with oxytocin for the induction of labour. Some are also used for therapeutic abortion: e.g. **gemeprost**. See PROSTANOID RECEPTOR AGONISTS.

Many other agents have actions on the uterus, including MUSCARINIC CHOLINOCEPTOR AGONISTS; 5-hydroxytryptamine (5-HT_2) agonists (see 5-HYDROXYTRYPTAMINE RECEPTOR AGONISTS); α-ADRENOCEPTOR AGONISTS (which can contract the uterus); BRADYKININ RECEPTOR AGONISTS (B_2-receptors). However, these actions are not selective and so are not harnessed therapeutically.

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oxytocin [BAN, INN, USAN] (α-hypophamine; Syntocinon™; Vasotocin™) is a cyclic nonapeptide hormone that can be obtained from posterior lobe of mammalian posterior pituitary (neurohypophysis), though the material used therapeutically is now synthetic. It is the principal uterus-contracting and milk-ejecting hormone, and can be used as an OXYTOCIC AGENT. It is agonist at oxytocin receptors ((OT) VASOPRESSIN RECEPTOR AGONIST). Clinically, it is used parenterally in the induction and augmentation of labour. The following analogues, which have been proved to be more active and more selective than oxytocin, have separate entries: **desaminooxytocin**; **hydroxyoxytocin**; **nacartocin**; **[Δ^3-Pro^7]oxytocin**; **[Thr^{4}Gly^7]oxytocin**; **[Thz^7]oxytocin**; **[Hse^4]oxytocin**; **treoxytocin**.

Arg^8-oxytocin ➡ **argiprestocin**.

deamino-oxytocin ➡ **demoxytocin**.

[homoserine^4]oxytocin ➡ **[Hse^4]oxytocin**.

[Hse^4]oxytocin ([homoserine^4]oxytocin) is a synthetic analogue of **oxytocin** and an agonist at oxytocin receptors (i.e. an (OT) VASOPRESSIN RECEPTOR AGONIST), that has oxytocic activity and is more potent than oxytocin. See also **argiprestocin**.

[Ile^8]oxytocin ➡ **mesotocin**.

[Δ^3-Pro^7]oxytocin ➡ **didehydroproline oxytocin**.

[Ser^4,Ile^8]oxytocin ➡ **isotocin**.

[Thr^4]oxytocin ➡ **treoxytocin**.

[Thr^{4}Gly^7]oxytocin is a *synthetic analogue* of **oxytocin** and agonist at oxytocin receptors (i.e. an (OT) VASOPRESSIN RECEPTOR AGONIST) that has OXYTOCIC activity and is more potent than oxytocin.

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[valine^8]oxytocin ➡ **valitocin**.

ozagrel [INN] is an imidazolyl derivative, a THROMBOXANE SYNTHETASE INHIBITOR, used in ANTIASTHMATIC treatment and as an ANTITHROMBOTIC.

P

P2S ➡ **pralidoxime**.

P83 6029A ➡ **velnacrine**.

P 638 ➡ **puromycin**.

P 652 ➡ **fomocaine**.

P 1133 ➡ **nialamide**.

P 1888 ➡ **sulphan blue**.

P 4125 ➡ **sulphan blue**.

P 5048 ➡ **dimethisterone**.

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paclitaxel [BAN, INN, USAN] (BMS 181339-01; NSC 125973; Taxol™) is a taxane ANTICANCER AGENT originally isolated from the stem bark of certain species of yew tree (*Taxus brevifolia* and *Taxus cuspidata* (Taxaceae)), but now manufactured semisynthetically. The taxoids have a unique mode of action, and interfere with mitotic cell division. This depends on the actions of microtubules, protein polymers in continuous formation and disassembly. The taxoids promote further assembly of the polymers and inhibit depolymerization, and this disturbs mitosis in both susceptible normal and malignant cells. Paclitaxel is used by intravenous infusion as an oral anticancer treatment of ovarian and sometimes breast cancer (usually in combination with **cisplatin**) It has also been shown to be active against oomycete fungi. As a biochemical tool, it is extensively used to study cellular shape and function.

pacrinolol [INN] is a β-ADRENOCEPTOR ANTAGONIST; never marketed.

padimate O [USAN] is a benzoic acid ester, used extensively in SUNSCREEN preparations.

Padutin™ ➡ **kallidinogenase**.

pafenolol [INN] is a β-ADRENOCEPTOR ANTAGONIST.

PAHA ➡ **aminohippuric acid**.

PALA ➡ **sparfosic acid**.

Palfium™ ➡ **dextromoramide**.

palmidrol [INN] is a lipid compound isolated from soya-bean lecithin, egg yolk and peanut meal. It has IMMUNOMODULATOR and ANTIINFLAMMATORY properties.

palonosetron [INN] (palonosetron hydrochloride [USAN]; RS 42358) is a benzisoquinolinone derivative, a selective (5-HT_3) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST, with ANTIEMETIC and ANXIOLYTIC activity.

palonosetron hydrochloride ➡ **palonosetron**.

Paludrine™ ➡ **proguanil**.

PAM ➡ **pralidoxime**.

2-PAM ➡ **pralidoxime**.

2-PAMCl ➡ **pralidoxime**.

L-PAM ➡ **melphalan**.

pamaquine [INN] is an 8-aminoquinolone ANTIMALARIAL, which is no longer in extensive use.

pamatolol [INN] (pamatolol sulfate [USAN]) is a β-ADRENOCEPTOR ANTAGONIST.

pamatolol sulfate ➡ **pamatolol**.

Pamelor™ ➡ **nortriptyline**.

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pamatolol sulfate ➡ **pamatolol**.

Pamelor™ ➡ **nortriptyline**.

Pamergan™ ➡ **pethidine**.

pamicogrel is a thiazolylpyrrole derivative, a CYCLOOXYGENASE INHIBITOR and PLATELET AGGREGATION INHIBITOR.

pamidronate disodium ➡ **pamidronic acid**.

pamidronic acid [BAN, INN] (pamidronate disodium [USAN]; APD; CGP 23339; Aredia™) is one of the bisphosphonate series of CALCIUM METABOLISM MODIFIERS used to treat disorders of bone metabolism, reducing calcium-resorption from the bone. It is used by injection in the treatment of hypercalcaemia, including Paget's disease and bone metastases.

Pamine™ ➡ **hyoscine methobromide**.

pamisyl sodium ➡ **aminosalicylate sodium**.

Panadol™ ➡ **paracetamol**.

pancopride [INN, USAN] (LAS 30451) is a quinuclidinyl derivative, a (5-HT_3) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It shows ANTIEMETIC, ANXIOLYTIC and peristaltic stimulant activity.

Pancrease™ ➡ **pancreatin**; **rizolipase**.

pancreatic polypeptide (PP) is an amidated peptide with a sequence that differs in human, rat, avian, frog and salmon forms. PP belongs to a family of peptides with a number of emerging members, including **neuropeptide Y** (NPY) and **peptide YY** (PYY). These peptides appear to share a number of receptors. PP is a NEUROPEPTIDE Y RECEPTOR AGONIST.

pancreatin [BAN, JAN, USAN] (Creon™; Nutrizym™; Pancrease™; Pancrex™) is an enzyme isolated from the pancreas of pigs and cows. It is used as a DIGESTIVE AGENT in replacement therapy, given by mouth in enteric-coated forms, to treat deficiencies due to impaired natural secretion by the pancreas, such as in cystic fibrosis, and also following operations involving removal of pancreatic tissue, such as panreatectomy and gastrectomy.

pancrelipase ➡ **rizolipase**.

pancreozymin ➡ **cholecystokinin**.

Pancrex™ ➡ **pancreatin**.

pancuronium bromide [BAN, INN, JAN, USAN] (Pavulon™) is a bisquaternary ammonium heterocyclic compound, a (competitive) NICOTINIC CHOLINOCEPTOR ANTAGONIST, and a (competitive) NEUROMUSCULAR BLOCKING AGENT which can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia.

Panoxyl™ ➡ **benzoyl peroxide**.

pantherine ➡ **muscimol**.

pantoprazole [BAN, INN, USAN] (Propium™) is a benzimidazole, a GASTRIC PROTON PUMP INHIBITOR, a (H^+/K^+) ATPASE INHIBITOR. It can be used as an ANTIULCEROGENIC AGENT in the treatment of gastric ulcers and other gastric acid-related gastrointestinal disorders.

pantothenic acid [BAN] (calcium pantothenate [INN, USAN]; vitamin B_5; pantothermic acid) is a growth-promoting, antidermatitic factor, and 'liver filtrate factor' of vitamin B complex, present in living cells, particularly of the liver. It is a component of coenzyme A which is essential in the metabolism of carbohydrate, fat and protein, and is traditionally considered to be a VITAMIN. Deficiency is rare given its widespread distribution, but it is incorporated into many mixed vitamin preparations.

pantothermic acid ➡ **pantothenic acid**.

papain [USAN] (caroid; papayotin; vegetable pepsin) is a purified proteolytic ENZYME derived from *Carica papaya* (papaya). As a proteolytic, it is used topically to prevent adhesions, taken by mouth as a DIGESTIVE AGENT, a protein digestant and ANTHELMINTIC. Also, it is used in commercial deproteinizing tablets for cleaning contact lenses.

papaverine [BAN] (papaverine hydrochloride [USAN]) is a benzylisoquinoline alkaloid from *Papaver somniferum* and *Rauwolfia serpentina* (Papaveraceae, Apocynaceae). It is a constituent of opium not related to phenanthrenes, such as morphine. It is a PHOSPHODIESTERASE INHIBITOR, has direct SMOOTH MUSCLE RELAXANT activity and can be used as a VASODILATOR for circulatory disorders; also used as a visceral ANTISPASMODIC.

papaverine hydrochloride ➡ **papaverine**.

papayotin ➡ **papain**.

paraacetaldehyde ➡ **paraldehyde**.

para-aminobenzoic acid ➡ **aminobenzoic acid**.

parabromdylamine ➡ **brompheniramine**.

paracetamol [BAN, INN] (acetaminophen [USAN]; Panadol™ (UK); Tylenol™ (USA) and many other names) is one of the para-aminophenol series and is a weak CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC and ANTIPYRETIC activity. It is widely used therapeutically as an antipyretic and analgesic with negligible activity as an ANTIINFLAMMATORY. It is extensively used as both a prescription and an OTC drug (often in compound preparations).

paracetamol acetylsalicylate ➡ **benorylate**.

parachlorophenol [USAN] is a topical ANTBACTERIAL.

Paradione™ ➡ **paramethadione**.

Paraflex™ ➡ **chlorzoxazone**.

paraflutizide [INN] is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.

Parake™ ➡ **codeine**.

paraldehyde (paraacetaldehyde) is a colourless liquid soluble in water. It was used as a HYPNOTIC but is now used as an ANTICONVULSANT in status epilepticus.

paramaleic acid ➡ **fumaric acid**.

Paramax™ ➡ **metoclopramide**.

paramethadione [BAN, INN] (Paradione™) is an oxazolidinedione. It has ANTICONVULSANT activity but only has restricted use as an ANTIEPILEPTIC (for absence seizures, petit mal) due to potential toxicity.

paramethasone [BAN, INN] (paramethasone acetate [USAN]) is a CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It has beeen used sytemically for a variety of inflammatory disorders.

paramethasone acetate ➡ **paramethasone**.

paramorphine ➡ **thebaine**.

parapenzolate bromide [INN, USAN] (parapenzolone) is a quaternary ammonium dimethylpiperidinium derivative, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST, formerly used as an ANTISPASMODIC.

parapenzolone ➡ **parapenzolate bromide**.

Paraplatin™ ➡ **carboplatin**.

Parathar™ ➡ **teriparatide**.

parathormone ➡ **parathyroid hormone**.

1-34 parathormone (human) ➡ **teriparatide**.

parathyrin ➡ **parathyroid hormone**.

parathyroid hormone (parathyrin; parathormone; PTH) is a single-chain polypeptide of 84 amino acid residues (MW *c.* 9500) whose structural sequence varies slightly among mammalian species. It is a CALCIUM METABOLISM MODIFIER, a regulatory factor in the homeostatic control of calcium and phosphate metabolism, its principal sites of activity being the bones, kidneys and gastrointestinal tract. Its prime function is to raise plasma calcium concentrations. It is used as a diagnostic agent in distinguishing pseudohypoparathyroidism from hypoparathyroidism. A synthetic preparation of the first 34 amino acids in sequence (teriparatide) is being investigated for osteoporosis.

parbendazole [BAN, INN, USAN] is a carbamate veterinary ANTHELMINTIC.
parenogen ➡ **fibrinogen**.
parethoxycaine [INN] is an ester series LOCAL ANAESTHETIC, which has been used by topical application mainly for the mouth and throat.
pargolol [INN] is a β-ADRENOCEPTOR ANTAGONIST.
pargyline [BAN, INN] (pargyline hydrochloride [USAN]; Eutonyl™) is a benzylamine analogue that acts as a MONOAMINE-OXIDASE INHIBITOR and was used in ANTIHYPERTENSIVE therapy.
Parlodel™ ➡ **bromocriptine**.
Parmid™ ➡ **metoclopramide**.
parnaparin sodium [BAN, INN] is a (parenteral) ANTICOAGULANT, chemically a low-molecular weight form of **heparin**, used in the treatment of deep-vein thrombosis.
Parnate™ ➡ **tranylcypromine**.
paromomycin [BAN, INN] (paromomycin sulfate [JAN, USAN]; Humatin™) is an (aminoglycoside) ANTIBIOTIC with a broad spectrum of activity. It has AMOEBICIDAL, ANTITUBERCULAR and anticryptosporidial activity. Clinically, it can be used in treating leishmaniasis and in AIDS patients.
paromomycin sulfate ➡ **paromomycin**.
paroxetine [BAN, INN, USAN] (BRL 29060; FG 7051; Paxil™; Seroxat™) is a tetracyclic compound unrelated to other classes of selective SSRIs, tricyclics or MAOI agents. It is a SSRI, a selective serotonin (re-)UPTAKE INHIBITOR, widely used orally as an ANTIDEPRESSANT with minimal SEDATIVE actions.
parthenolide is an epoxygermacradienolide, a constituent of *Chrysanthemum parthenium* (feverfew) and *Michelia champaca*. It appears to act as a 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST and inhibits smooth muscle contractility. It is an active ingredient in folk remedies used to treat migraine, and has been subjected to clinical trials. It has reported anticancer activity.
parvaquone [BAN, INN] is a naphthoquinone ANTIMALARIAL.
Parvolex™ ➡ **acetylcysteine**.
PAS ➡ **aminosalicylic acid**.
pasiniazid [INN] is an isonicotinoylhydrazide derivative of 4-aminosalicylic acid. It is an ANTIBACTERIAL and ANTITUBERCULAR AGENT.
Pavulon™ ➡ **pancuronium bromide**.
Paxil™ ➡ **paroxetine**.
Paxipam™ ➡ **halazepam**.
PB 89 ➡ **fominoben**.
PB 806 ➡ **benperidol**.
PC ➡ **factor XIV**.
PC 603 ➡ **iproclozide**.
PCA ➡ **phenylcyclohexanamine**.
PCAP ➡ **pituitary adenylate cyclase-activating peptide**.
PCAP(6-38) (pituitary adenylate cyclase-activating peptide (6-38)(human, ovine, rat)) is an antagonist of PCAP, a VASOACTIVE INTESTINAL PEPTIDE RECEPTOR ANTAGONIST with highest affinity at the PACAP subtype.
PCAP-27 ➡ **pituitary adenylate cyclase-activating peptide**.
PCAP-38 ➡ **pituitary adenylate cyclase-activating peptide**.
PCE ➡ **eticyclidine**.
***p*-chlorophenylalanine** ➡ **fenclonine**.
PCP ➡ **phencyclidine**.
PCPA ➡ **fenclonine**.
PCPGABA ➡ **α-baclofen**.
PD 105587 ➡ **rolziracetam**.
PD 110843 ➡ **zonisamide**.
PD 111815 ➡ **piroxantrone**.
PD 116948 ➡ **DPCPX**.
PD 123177 (EXP 655; WL13) is an imidazopyridine derivative, an ANGIOTENSIN RECEPTOR ANTAGONIST useful as a pharmacological tool in the study of angiotensin receptor subtypes. Its dimethyl derivative is PD 123319, which is also useful as a pharmacological tool.
PD 123319 ➡ **PD 123177**.
PD 125944 ➡ **DPMA**.
PD 129290 ➡ **enadoline**.
PD 155080 is a substituted benzodioxole, which acts as an orally active subtype-selective (ETA) ENDOTHELIN RECEPTOR ANTAGONIST. It shows antiischaemic properties in an animal model of stroke. It is used as a pharmacological tool.
PDN 21 ➡ **katacalcin**.
PDX chloride ➡ **polidexide**.
PEDICULICIDALS are used to kill lice of the genus *Pediculus*, which infest either the body or the scalp, or both, and cause intense itching. Scratching tends to damage the skin surface and may eventually cause weeping lesions with bacterial infection as well. The best-known and most-used topical pediculicides (also used as general INSECTICIDES) include **benzyl benzoate**, **carbaryl** and **malathion**. The agent **lindane** (a form of **gamma benzene hexachloride**) was once commonly administered, but is now seldom used for lice on the scalp because resistant strains have developed.
pefloxacin [BAN, INN, USAN] (pefloxacin mesylate [USAN]) is a prodrug of **norfloxacin**, a fluorinated 4-quinolone. It is an ANTIBACTERIAL, used especially for urinary tract infections.
pefloxacin mesylate ➡ **pefloxacin**.
PEG-ADA ➡ **pegademase**.
pegademase [INN] (pegademase bovine [USAN]; PEG-ADA; PEG-adenosine deaminase; Adagen™) is an ENZYME, a polyethylene glycol-modified bovine adenosine deaminase, which is the enzyme that converts adenosine to inosine. It is used by injection in enzyme replacement therapy for treating severe combined immunodeficiency disease (SCID) associated with a deficiency of adenosine deaminase.
pegademase bovine ➡ **pegademase**.
PEG-adenosine deaminase ➡ **pegademase**.
peganine is a plant alkaloid with a pyrroloquinoline structure. It is reported to show RESPIRATORY STIMULANT, BRONCHODILATOR, EXPECTORANT, ANTIHYPERTENSIVE, UTERINE STIMULANT and ABORTIFACIENT properties.
pegaspargase [INN, USAN] (PEG-L-asparaginase; Oncaspar™) is a modified version of the enzyme L-asparaginase. It is used in combination anticancer therapy for patients with lymphoblastic leukaemia. It lacks the incidence of hypersensitivity reactions associated with asparaginase.
PEG-L-asparaginase ➡ **pegaspargase**.
pellidol ➡ **diacetazotol**.
pemoline [BAN, INN, USAN] (phenylisohydantoin; NSC 25159; Cylert™; Volital™) has some structural similarities to **amphetamine**. It is a CNS STIMULANT with minimal SYMPATHOMIMETIC actions. It can be used orally for hyperkinesis or attention-deficit hyperactivity disorder in children, and also in antinarcolepsy treatment.
pempidine [BAN, INN] is a tertiary amine compound that acts as a GANGLION BLOCKING AGENT and was used as an ANTIHYPERTENSIVE AGENT.
penamecillin [BAN, INN, USAN] is a semisynthetic (penicillin) ANTIBIOTIC. It can be used as an ANTIBACTERIAL to treat certain infections.
Penbritin™ ➡ **ampicillin**.
penbutolol [BAN, INN] (penbutolol sulfate [JAN, USAN];

Levatol™) is a (subtype-non-selective) β-ADRENOCEPTOR ANTAGONIST. It can be used as an ANTIHYPERTENSIVE.

penbutolol sulfate ➡ **penbutolol**.

penciclovir [BAN, INN] (Vectavir™) is a synthetic nucleoside analogue ANTIVIRAL, used topically as a treatment for herpes infections. It can also be used orally in the form of its prodrug **famciclovir**. It is active as an ANTI-HIV AGENT.

Pendramine™ ➡ **penicillamine**.

Penetrex™ ➡ **enoxacin**.

penflutizide [INN, JAN] is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.

penicillamine [BAN, INN, JAN, USAN] (D-penicillamine; 3-mercaptovaline; β-dimethylcysteine; Cuprimine™; Depren™; Distamine™; Pendramine™ and many other names) is a characteristic degradation product of the penicillins ((*S*)-(D)-form). It binds metal ions *in vivo*, so facilitating their excretion. It can be used as an ANTIDOTE to various types of metallic poisoning (e.g. Cu, Pb) and to reduce copper levels in Wilson's disease. It is also used orally in the long-term treatment of severe rheumatoid arthritis or juvenile chronic arthritis, where it has ANTIINFLAMMATORY and antirheumatic actions. Administration is oral.

D-penicillamine ➡ **penicillamine**.

penicillanic acid sulphone ➡ **sulbactam**.

penicillin G ➡ **benzylpenicillin**.

penicillin G benzathine ➡ **benzathine penicillin**.

penicillin G potassium ➡ **benzylpenicillin**.

penicillin G procaine ➡ **benzylpenicillin**.

penicillin G sodium ➡ **benzylpenicillin**.

penicillin N ➡ **adicillin**.

penicillin O ➡ **almecillin**.

penicillin V potassium ➡ **phenoxymethylpenicillin**.

penimepicycline ➡ **phenoxymethylpenicillin**.

penimocycline [INN] is a synthetic (penicillin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat certain infections.

penirolol [INN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIHYPERTENSIVE properties (never marketed).

Pentacarinat™ ➡ **pentamidine**.

pentacosactride [BAN] (norleusactide [INN, USAN]; DW 75) is a synthetic peptide, a structural CORTICOTROPHIN ANALOGUE, which has been used clinically. Its *in vivo* steroidogenic activity is significantly greater than that of native ACTH. See also **corticotrophin**.

pentaerithrityl tetranitrate ➡ **pentaerythritol tetranitrate**.

pentaerythritol tetranitrate [BAN] (pentaerithrityl tetranitrate [INN]; PETN; Mycardol™) is tetranitrate of *bis*hydroxymethylpropanediol, a nitric oxide (NO) donor, that is a NITRERGIC STIMULANT. It is a VASODILATOR and SMOOTH MUSCLE RELAXANT that can be used in ANTIANGINAL prophylaxis.

pentaerythritol trinitrate ➡ **pentrinitrol**.

pentagastrin [BAN, INN, JAN, USAN] (AY 6608; ICI 50123) is a truncated analogue of gastrin, a (CCK_B/gastrin receptor subtype) CHOLECYSTOKININ RECEPTOR AGONIST (but with some additional properties). It is a gastric acid secretion stimulant used as a diagnostic agent.

Pentam™ ➡ **pentamidine**.

pentamethonium bromide [BAN, INN] (pentamethonium iodide [BAN]) is a quaternary ammonium compound that acts as a GANGLION BLOCKING AGENT and was formerly used as an ANTIHYPERTENSIVE.

pentamethonium iodide ➡ **pentamethonium bromide**.

pentamethylenetetrazole ➡ **pentetrazol**.

pentamidine [BAN, INN] (Pentacarinat™; Pentam™) is an aromatic diamidine ANTIPROTOZOAL, originally used as an antitrypanosomal and ANTILEISHMANIAL AGENT, and now can also be used in the treatment of rare pneumonias associated with AIDS, parenterally or by inhalation.

pentamorphone [INN, USAN] (A 4492; RX 77989) is one of the phenanthrene series, an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC.

pentapiperide [BAN, INN] (pentapiperium methylsulfate [INN, USAN]) is a tertiary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as a visceral ANTISPASMODIC and as an adjunct in the treatment of peptic ulcers.

pentapiperium methylsulfate ➡ **pentapiperide**.

pentapyrrolidine ➡ **pentolinium tartrate**.

pentaquine [BAN, INN] is an 8-aminoquinoline, formerly used as an ANTIMALARIAL.

Pentasa™ ➡ **mesalazine**.

pentazocine [BAN, INN, JAN, USAN] (pentazocine hydrochloride [USAN]; pentazocine lactate [USAN]; NSC 107430; Fortagesic™; Fortral™; Talwin™) is one of the benzomorphan series and is a (mixed partial μ and full κ) OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity. It is used orally or by injection to treat moderate to severe pain.

pentazocine hydrochloride ➡ **pentazocine**.

pentazocine lactate ➡ **pentazocine**.

pentetrazol [BAN, INN] (pentylenetetrazole; pentamethylenetetrazole) has similar properties to **doxapram** as a CNS STIMULANT and RESPIRATORY STIMULANT. It was previously used intramuscularly to treat barbiturate and other CNS depressants in overdose, and orally for bronchial disorders.

pentetreotide [BAN, INN] (SDZ 215-811; Octreoscan™) is a cyclic peptide, an analogue of **somatostatin** and a SOMATOSTATIN RECEPTOR AGONIST. It is a ^{111}In-labelled compound used as a diagnostic agent for detection of somatostatin receptor positive tumours.

penthienate [BAN] is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST. It can be used as a visceral ANTISPASMODIC as an adjunct in the treatment of peptic ulcers.

penthiobarbital ➡ **thiopentone**.

Penthrane™ ➡ **methoxyflurane**.

pentifylline [BAN, INN] (hexyltheobromine) is similar to theobromine. It has DIURETIC, BRONCHODILATOR, CARDIAC STIMULANT and VASODILATOR properties.

pentisomide [INN] is an amide LOCAL ANAESTHETIC and (class I) ANTIARRHYTHMIC under investigation.

pentobarbital ➡ **pentobarbitone**.

pentobarbital sodium ➡ **pentobarbitone**.

pentobarbitone [BAN] (pentobarbital [INN, USAN]; pentobarbitone sodium [BAN]; pentobarbital sodium [JAN, USAN]; Nembutal™; Nembutal sodium™ and many other names) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone**. It is used to treat insomnia and as an ANTICONVULSANT in status epilepticus etc. It is used as a veterinary general anaesthetic.

pentobarbitone sodium ➡ **pentobarbitone**.

pentolinium tartrate [BAN] (pentolonium tartrate [INN]; pentapyrrolidine) is a pentamethylene*bis*pyrrolidinium compound. It acts as a GANGLION BLOCKING AGENT and was formerly used as an ANTIHYPERTENSIVE.

pentolonium tartrate ➡ **pentolinium tartrate**.

pentopril [INN, USAN] is the ethyl ester prodrug of pentoprilat, an indole derivative that acts as an ACE INHIBITOR with ANTIHYPERTENSIVE actions.

pentoprilat ➡ **pentopril.**
Pentostam™ ➡ **sodium stibogluconate.**
pentostatin [BAN, INN, USAN] (deoxycoformycin; DCF; Nipent™) is a nucleoside ANTIBIOTIC produced by *Streptomyces antibioticus* and *Aspergillus nidulans*. It is a potent ENZYME INHIBITOR of adenosine deaminase. As a cytotoxic ANTICANCER AGENT it is used in chemotherapy to treat hairy cell leukaemia and lymphoid neoplasms.
Pentothal™ ➡ **thiopentone.**
Pentothal Sodium™ ➡ **thiopentone.**
pentoxifylline ➡ **oxpentifylline.**
Pentran™ ➡ **phenytoin.**
pentrinitrol [INN, USAN] (pentaerythritol trinitrate) is the active metabolite of pentaerithrityl tetranitrate, a coronary VASODILATOR. It has been used for constitation.
pentylenetetrazole ➡ **pentetrazol.**
Pen-Vee™ ➡ **phenoxymethylpenicillin.**
Pepcid™ ➡ **famotidine.**
peplomycin [INN] (peplomycin sulfate [JAN, USAN]) is a semisynthetic ANTIBIOTIC derived from **bleomycin**. It can be used as a cytotoxic ANTICANCER AGENT in chemotherapy, and has been tried for neoplasms of the lung and prostate.
peplomycin sulfate ➡ **peplomycin.**
peppermint camphor ➡ **menthol.**
pepsin inhibitor ➡ **pepstatin.**
pepsin inhibitor S 735A ➡ **pepstatin.**
pepstatin [INN, USAN] (pepsin inhibitor S 735A; pepsin inhibitor; WK 142) is one of the polypeptide pepstatin group of ANTIBIOTICS from *Streptomyces* spp. It has activity as an ANTICANCER AGENT and inhibits HIV-1 protease.
peptide YY (PYY) is a 36 amino acid residue amidated peptide, where the sequence in the human form differs slightly from that in rat and pig. PYY belongs to a family of peptides with a number of emerging members, including neuropeptide Y (NPY) and pancreatic polypeptide (PP). These peptides appear to share a group of receptors, so PYY is an agonist at NEUROPEPTIDE Y RECEPTOR AGONIST.
perchloroethylene ➡ **tetrachloroethylene.**
Perdix™ ➡ **moexipril.**
perflubron [INN, USAN] (perfluoroctyl bromide) is a synthetic blood-oxygen carrier, also used as an imaging agent for X-ray, ultrasound and magnetic resonance imaging.
perfluoroctyl bromide ➡ **perflubron.**
pergolide [BAN, INN] (pergolide mesylate [USAN]; Celance™; Permax™) is a semisynthetic ergotamide derivative, with (both D_1 and D_2) DOPAMINE RECEPTOR AGONIST activity, and is under evaluation as an ANTIPARKINSONIAN AGENT and for treating hyperprolactinaemia (as a PROLACTIN RELEASE INHIBITOR), acromegaly and other pituitary oversecretion states. Also claimed to be a NEUROPROTECTIVE AGENT, possibly via induction of striatal superoxide dismutase.
pergolide mesylate ➡ **pergolide.**
Pergonal™ ➡ **menotrophin.**
perhexiline [BAN, INN] (perhexiline maleate [BAN, USAN]) is a dicyclohexylperidine derivative, with VASODILATOR properties and can be used as an ANTIANGINAL; also has DIURETIC properties. It has been discontinued.
perhexiline maleate ➡ **perhexiline.**
Periactin™ ➡ **cyproheptadine.**
periciazine ➡ **pericyazine.**
pericyazine [BAN] (periciazine [INN, JAN]; Neulactil™) is a phenothiazine, an ANTIPSYCHOTIC used orally to treat patients suffering from schizophrenia and other psychoses, particularly during behavioural disturbances. It can also be used in the short-term treatment of severe anxiety.
perindopril ➡ **perindoprilat.**
perindoprilat [BAN, INN] is an ACE INHIBITOR similar to **captopril**. It can be used as an ANTIHYPERTENSIVE and can be given in the form of prodrugs: the ethyl ester, perindopril [BAN, INN, USAN] or tertiary butylamine salt, perindopril erbumine [USAN] (Coversyl™).
perindopril erbumine ➡ **perindoprilat.**
Permax™ ➡ **pergolide.**
permethrin [ANSI, BAN, BSI, INN, ISO, USAN] (Elimite™; Lyclear™) is a pyrethroid INSECTICIDE and general agricultural pesticide which acts as a NEUROTOXIN through being a SODIUM-CHANNEL ACTIVATOR. It is commonly used for the treatment of head lice and scabies.
perphenazine [BAN, INN] (Fentazin™; Trilafon™ and many other names) is a phenothiazine, and is used as an ANTIPSYCHOTIC in patients suffering from schizophrenia and other psychoses, in the short-term treatment of severe anxiety, and as an antinauseant and ANTIEMETIC.
Persantin™ ➡ **dipyridamole.**
Pertofran™ ➡ **desipramine.**
pertussis toxin (PTX) is elaborated by a bacterium (*Bordetella pertussis*) and is a hexameric protein (4–5 subunits from A–B complex). It is a G-protein inactivator that binds to the ADP-ribosylation regulatory site of the G_i/G_o family of subunits which couple negatively to adenylyl cyclase. The cellular responses blocked by PTX are varied, and typically include those due to α_2 and opioid receptor type activation. The inactivation of this key regulatory unit explains some of the side-effects of whooping cough (caused by *Bordetella pertussis*) where production of this TOXIN is a main pathological factor. This toxin is an important pharmacological tool.
pethidine [BAN, INN] (meperidine hydrochloride [USAN]; Demerol™; Pamergan™ and many other names) is one of the phenylpiperidine series and an OPIOID RECEPTOR AGONIST which has OPIOID ANALGESIC activity. It is used orally or by injection to treat moderate to severe pain.
PETN ➡ **pentaerythritol tetranitrate.**
Pevaryl™ ➡ **econazole nitrate.**
Peyrone's chloride ➡ **cisplatin.**
Peyrone's salt ➡ **cisplatin.**
PGD_2 ➡ **prostaglandin D_2.**
PGD_3 ➡ **prostaglandin D_3.**
PGE_1 ➡ **alprostadil.**
PGE_2 ➡ **dinoprostone.**
$PGF_{1\alpha}$ ➡ **prostaglandin F1α.**
$PGF_{2\alpha}$ ➡ **dinoprost.**
PGG_2 ➡ **prostaglandin G_2.**
PGH_2 ➡ **prostaglandin H_2.**
PGH_3 ➡ **prostaglandin H_3.**
PGI_2 ➡ **epoprostenol.**
PGI_3 ➡ **prostaglandin I_3.**
PGR_2 ➡ **prostaglandin H_2.**
PGT/1A ➡ **pidotimod.**
PGX ➡ **epoprostenol.**
Ph 3753 ➡ **bremazocine.**
phaclofen (phosphonobaclofen) is chemically related to **saclofen**, and is a ($GABA_B$) GABA RECEPTOR ANTAGONIST. It is used as a pharmacological tool.
phalloidin is a phallotoxin, a toxin from *Amanita phalloides* and *Amanita virosa*. It is hepatotoxic and is reported to be a (Kv) POTASSIUM-CHANNEL BLOCKER.
phallotoxin ➡ **phalloidin.**
phanquone [BAN] is a phenanthroline ANTIPROTOZOAL.
Pharmorubicin™ ➡ **epirubicin.**

phelypressin ➡ **felypressin**.

phenacaine [INN] (phenacaine hydrochloride [USAN]) is an ester series LOCAL ANAESTHETIC, which has been used by topical application.

phenacyl pivalate ➡ **pibecarb**.

phenacaine hydrochloride ➡ **phenacaine**.

phenacetin [INN] (acetophetidin; *p*-acetophenetidide and many other names) is one of the original para-aminophenol series ('coal tar analgesics'), and is a weak CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC and ANTIPYRETIC activity. It has relatively poor activity as an ANTIINFLAMMATORY but was once used extensively therapeutically as an antipyretic and analgesic (generally as 'powders' in combination with other agents; e.g. **aspirin**, **caffeine**, **codeine** etc.). Its use is now very limited due to toxicity, mainly adverse haematological (methaemoglobinaemia, haemolytic anaemia etc.) and renal papillary necrosis after high doses.

phenadoxone [BAN, INN] is a methadone series analogue, an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC.

phenampromide [BAN, INN] (fenampromide; NIH 7602) is a methadone/pethidine series hybrid, an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC.

phenarsazine chloride ➡ **Adamsite**.

phenazocine [BAN, INN] (phenazocine hydrobromide; phenobenzorphan; NIH 7519; Narphen™) is a benzomorphan series analogue, an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC. It is used orally or sublingually primarily for the relief of severe pain, especially pain arising from disorders of the bile ducts.

phenazocine hydrobromide ➡ **phenazocine**.

phenazoline antazoline ➡ **antazoline**.

phenazone [BAN, INN] (antipyrine [USAN]) is an original member of the pyrazolone series of CYCLOOXYGENASE INHIBITORS, with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It has been used orally for musculoskeletal and connective tissue disorders, though is now rarely used because of adverse side-effects. It is still used topically combined with the local anaesthetic **benzocaine** (e.g. Aulalgan™) to treat pain and inflammation of the ear.

phenazopyridine [BAN, INN] (phenazopyridine hydrochloride [USAN]; NSC 1879; Pyridium™; Pyridiate™; Viridium™ and many other names) is a NSAID ANALGESIC used to exert a local analgesic effect on the mucosa of the urinary tract on excretion of the parent drug (through an unknown mechanism). It is used to relieve the pain of cystitis, prostatitis and urethritis. It is also an azo-dye. It was claimed to be a urinary tract disinfectant, but this is disputed. It is used in certain preparations together with SULPHONAMIDES.

phenazopyridine hydrochloride ➡ **phenazopyridine**.

phenbutazone ➡ **phenylbutazone**.

phenbutrazate [BAN] (fenbutrazate [INN]) is a phenylmorpholinoethylphenylbutyrate derivative with CNS STIMULANT properties. It can be used as an APPETITE SUPPRESANT.

phencyclidine [BAN, INN] (phencyclidine hydrochloride [USAN]; PCP; CI 395; NSC 40902; Sernyl™; Sernylan™; 'Angel Dust'; 'Hog'; 'Rocket Fuel' (also eticyclidine)) is one of the benzomorphans, a **ketamine** analogue with some properties in common. It is an OPIOID RECEPTOR AGONIST, including at the atypical σ-site, and is a GLUTAMATE RECEPTOR ANTAGONIST (channel-blocking at NMDA receptors), and is also a (votage-activated) POTASSIUM-CHANNEL BLOCKER. It is an OPIOID ANALGESIC, (dissociate) GENERAL ANAESTHETIC, PSYCHOTROPIC, and also a veterinary immobilizing agent. It is a drug of abuse, largely withdrawn from human clinical use.

phencyclidine hydrochloride ➡ **phencyclidine**.

phenelzine [BAN, INN] (phenelzine sulfate [USAN]; Nardil™) is one of the hydrazine class and is an irreversible MONOAMINE-OXIDASE INHIBITOR (MAOI active against both A and B) used as an ANTIDEPRESSANT.

phenelzine sulfate ➡ **phenelzine**.

Phenergan™ ➡ **promethazine**.

phenethicillin [BAN] (pheneticillin [INN]; phenethicillin potassium [JAN]) is a semisynthetic (penicillin) ANTIBIOTIC, used as an ANTIBACTERIAL to treat certain infections.

phenethicillin potassium ➡ **phenethicillin**.

pheneticillin ➡ **phenethicillin**.

pheneturide [BAN, INN] (M 551; S 46) is an acylurea with ANTICONVULSANT properties that has been used in ANTIEPILEPTIC treatment. It also has ANTIPARKINSONIAN properties.

phenformin [BAN, INN] is one of the biguanide group of (oral) HYPOGLYCAEMICS that (unlike the sulphonylureas) act mainly by decreasing gluconeogenesis and by increasing peripheral utilization of glucose, and is only effective in diabetics with some residual functioning pancreatic islet cells. It can be used as an ANTIDIABETIC in Type 2 diabetes mellitus.

phenglutarimide [BAN, INN] is a phenylglutarimide, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST and ANTIPARKINSONIAN AGENT.

phenicarbazide [INN] (phenylsemicarbazide) has been used as a NSAID ANALGESIC and ANTIPYRETIC.

phenindamine [BAN, INN] (phenindamine hydrogen tartrate; Nu 1504; PM 254) is an indenopyridine, a HISTAMINE H_1-RECEPTOR ANTAGONIST, atypically having slight stimulant rather than SEDATIVE side-effects. It can be used for allergic rhinitis, urticaria and allergic conjunctivitis.

phenindamine hydrogen tartrate ➡ **phenindamine**.

phenindione [BAN, INN] (2-phenyl-1,3-indanedione; Dindevan™) is an (oral) ANTICOAGULANT (acting through vitamin K antagonism to depress synthesis of coagulation factors). It is chemically one of the coumarin group, and can be used to prevent the formation of clots (e.g. after heart valve surgery). The onset of effect is delayed by several days.

2-phenyl-1,3-indanedione ➡ **phenindione**.

pheniramine [BAN, INN] (pheniramine maleate; propheniramine; Daneral SA™; Pyriton™) pyridinepropanamine, is a HISTAMINE H_1-RECEPTOR ANTAGONIST with MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity and SEDATIVE side-effects. It can be used orally for the symptomatic relief of allergic symptoms, such as hay fever and urticaria, to treat motion sickness and also as an ANTITUSSIVE in cough and 'cold-cure' preparations.

pheniramine maleate ➡ **pheniramine**.

phenobamate ➡ **febarbamate**.

phenobarbital ➡ **phenobarbitone**.

phenobarbital sodium ➡ **phenobarbitone**.

phenobarbitone [BAN] (phenobarbital [INN, USAN]; phenobarbital sodium [INN, USAN]; ethylphenylbarbituric acid; Luminal™; Solfoton™ and many other names) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone** but of longer duration. Though now rarely used for insomnia or as a sedative, it is still used as an ANTICONVULSANT in ANTIEPILEPTIC treatment.

phenobenzorphan ➡ **phenazocine**.

phenolphthalein [INN] is a (stimulant) LAXATIVE of the

diphenylmethane group. In therapeutic use it is contained in many proprietary preparations, often with other laxatives.

phenol red ➡ **phenolsulfonphthalein**.

phenolsulfonphthalein [USAN] (phenol red; sulfonphthal) is a dye used as a diagnostic agent for renal function determination.

phenoperidine [BAN, INN] (NIH 7591; R 1406; SC 9369) is one of the phenylpiperidine series and an **OPIOID RECEPTOR AGONIST** active as an **OPIOID ANALGESIC**.

phenothiazine [INN] has **ANTIBACTERIAL** and **ANTHELMINTIC** properties. It is used in veterinary practice.

phenothrin [BAN, BSI, INN, JAN] is an **INSECTICIDE** and pediculicide.

phenoxybenzamine [BAN, INN] (phenoxybenzamine hydrochloride [USAN]; Dibenzyline™) is a β-chloroalkylamine that acts as an irreversible (covalent) receptor alkylator. It acts as an (α_1) **α-ADRENOCEPTOR ANTAGONIST** (and also as a **MUSCARINIC CHOLINOCEPTOR ANTAGONIST** and **HISTAMINE H_1-RECEPTOR ANTAGONIST**) and also is a noradrenaline **UPTAKE INHIBITOR**. It has **ANTIHYPERTENSIVE** activity, and can be used in the treatment of phaeochromocytoma (concomitantly with **β-ADRENOCEPTOR ANTAGONISTS**). It is also used as a pharmacological analytical tool.

phenoxybenzamine hydrochloride ➡ **phenoxybenzamine**.

α-phenoxycarbonylbenzylpenicillin ➡ **carfecillin**.

phenoxymethylpenicillin [BAN, INN] (penicillin V potassium [USAN]; penimepicycline [INN]; Pen-Vee™; V-Cillin™) is a semisynthetic (penicillin) **ANTIBIOTIC**. It can be used clinically as a broad-spectrum semisynthetic oral **ANTIBACTERIAL** to treat certain infections.

phenozolane ➡ **fenozolone**.

phenprobamate [BAN, INN] is a carbamate with properties similar to **meprobamate**. It has **SEDATIVE/TRANQUILLIZER** action and can be used as an **ANXIOLYTIC** and also as a centrally acting **SKELETAL MUSCLE RELAXANT**.

phenprocoumon [BAN, INN, USAN] is an (oral) **ANTICOAGULANT**, a synthetic agent that is chemically of the coumarin group. It can be used therapeutically to prevent the formation of clots in thromboembolytic disease.

phensuximide (Milontin™) is a succinimide with **ANTICONVULSANT** activity and can be used as an **ANTIEPILEPTIC** for the control of absence seizures (petit mal).

phentermine [BAN, INN, USAN] (phentermine hydrochloride [USAN]; Duromine™; Ionamine™; Fastin™; Adipex-P™) is an (indirect-acting) **SYMPATHOMIMETIC** chemically and pharmacologically related to **amphetamine** (though it has sedative actions). Clinically, it is used as an **APPETITE SUPPRESSANT** that acts at the level of the CNS. (Some similar drugs of this class have recently been withdrawn because of proposed association with primary pulmonary hypertension.)

phentermine hydrochloride ➡ **phentermine**.

phentolamine [BAN, INN] (phentolamine mesylate [USAN]; Rogitine™) is an imidazolyl derivative that acts as an (α_1-subtype) **α-ADRENOCEPTOR ANTAGONIST**. It also is a **POTASSIUM-CHANNEL BLOCKER** ($I_{K(ATP)}$). Clinically, it is used as an **ANTIHYPERTENSIVE** to treat hypertensive crises and phaeochromocytoma.

phentolamine mesylate ➡ **phentolamine**.

phenylalanine lost ➡ **melphalan**.

phenylalanine-mustard ➡ **melphalan**.

phenyl aminosalicylate [BAN, USAN] is a 4-aminosalicylic acid phenyl ester, an **ANTIBACTERIAL** and **ANTITUBERCULAR AGENT**. See also **aminosalicylic acid**.

phenylbutazone [BAN, INN, USAN] (diphenylbutazone; phenbutazone; Butazolidin™) is one of the pyrazolone series, a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity. Human use is now limited due to nephrotoxicity and other adverse systemic effects.

phenylcyclohexanamine (PCA) is a phencyclidine analogue with similar properties as an (NMDA) **GLUTAMATE RECEPTOR ANTAGONIST** and other actions. Its *N*-ethyl derivative is **eticyclidine**.

phenylephrine [BAN, INN] (phenylephrine hydrochloride [USAN]) is a phenylethylamine, is an (α_1-selective) **α-ADRENOCEPTOR AGONIST** with **SYMPATHOMIMETIC** activity. It can be used as an oral **VASOCONSTRICTOR** (it is incorporated into many oral **DECONGESTANT** preparations), and its topical **MYDRIATIC** activity is used in ophthalmological procedures.

phenylephrine hydrochloride ➡ **phenylephrine**.

phenylisohydantoin ➡ **pemoline**.

phenylmethyl isothiocyanate ➡ **benzyl isothiocyanate**.

phenylpropanolamine [BAN, INN] (phenylpropanolamine hydrochloride [USAN]) is mainly an (indirect-acting) **SYMPATHOMIMETIC AGENT** with mainly peripheral stimulant actions (similar to **ephedrine**). It exists as four isomeric forms: *d*- and *l*-norephedrine, and *d*- and *l*-norpseudoephedrine. Of the four isomers *d*-norpseudoephedrine is the most potent **CNS STIMULANT**. The isomeric mix varies between countries according to pharmacopoeial description and source: this may explain differences in reports of side-effects and misuse. Phenylpropanolamine is incorporated into numerous compound preparations as an oral **DECONGESTANT**. It has also been advocated as an **APPETITE SUPPRESSANT**, and for the treatment of enuresis.

phenylpropanolamine hydrochloride ➡ **phenylpropanolamine**.

phenylsemicarbazide ➡ **phenicarbazide**.

phenyracillin [INN] is an **ANTIBIOTIC**, the 2,5-diphenylpiperazine salt of **benzylpenicillin**. Clinically, it is used as an **ANTIBACTERIAL**.

phenyramidol hydrochloride ➡ **fenyramidol**.

phenytoin [BAN, INN, USAN] (phenytoin sodium [USAN]; Dilantin™; Epanutin™; Pentran™) is one of the hydantoin series, and acts as a use-dependent **SODIUM-CHANNEL BLOCKER** that modulates opening in neurons and attenuating high-frequency action potential firing. It has **ANTICONVULSANT** properties and is extensively used as an **ANTIEPILEPTIC**, orally or by injection, to treat most forms of epilepsy (except absence seizures), including in veterinary use. It is an effective **ANALGESIC** for trigeminal neuralgia, and also has been used as an **ANTIARRHYTHMIC**.

phenytoin sodium ➡ **phenytoin**.

PhisoHex™ ➡ **hexachlorophane**.

pholcodine [BAN, INN] (homocodeine) is a phenanthrene series agent with actions as an **OPIOID RECEPTOR AGONIST** and **ANTITUSSIVE** agent; similar to dextromethorphan.

pholedrine [BAN, INN] is an **ephedrine**-like agent with **SYMPATHOMIMETIC** and hypertensive properties.

phosgene ($COCl_2$) is a colourless sensory irritant and reactive gas, which is heavier than air and is very poisonous. It was originally manufactured for chemical warfare during World War I. It is still widely used in the synthesis of chemicals and plastics.

PHOSPHODIESTERASE INHIBITORS act at the phosphodiesterase group of enzymes which are present within many cells. These enzymes hydrolyse phosphodiester

bonds, notably of cAMP (cyclic 3′,5′-adenosine monophosphate), but also cGMP (cyclic guanosine monophosphate). There are a number of isoenzymes that differ in substrate and certain characteristics, which have been divided into seven categories.

Type I is Ca^{2+}/calmodulin regulated, has different K_m values for cGMP and cAMP hydrolysis, it causes vasodilation and some central nervous system modulatory effects. It is inhibited selectively by **vinpocetine**.

Type II shows cGMP-stimulated cAMP hydrolysis with a high K_m for cAMP. No selective inhibitor is recognized.

Type III shows cGMP-stimulated cAMP hydrolysis with a low K_m for cAMP and for cGMP, causes positive inotropism, airways and blood vessel dilatation, inhibition of platelet aggregation, stimulation of lipolysis and possibly inhibition of cytokine production. It is inhibited selectively by **amrinone**, **cilostamide**, **enoximone**, **milrinone**, **peroxinone**, **pimobendan** and **vesnarinone**.

Type IV has a low K_m value for cAMP hydrolysis, causes airways dilatation, inhibition of inflammatory mediator release, gastric acid secretion and vasodilation and some central nervous system modulatory effects. It is inhibited selectively by **rolipram** and **Ro 20-1724**.

Type V shows high and low K_m isoforms for cGMP-specific hydrolases, and causes inhibition of platelet aggregation. It is inhibited selectively by **dipyridamole**, **sildenafil citrate** and **zaprinast**.

Type VI has activity regulated by interaction with transducin and is the photoreceptor phosphodiesterase. It has no recognized selective inhibitors.

Type VII has a low K_m for cAMP hydrolysis, it is abundant in skeletal muscle and is also found in heart and kidney. It has no recognized selective inhibitors.

Since cAMP is a ubiquitous intracellular chemical mediator, particularly important as a second messenger on receptor activation by many mediators, it follows that enhancement of concentrations or prolongation of action of cAMP will have marked actions. Since β-adrenoceptors signal through this route to directly elevate cAMP, whereas agents that inhibit phosphodiesterase indirectly elevate it, commonly the effects of these two drug classes are very similar (e.g. relaxation of smooth muscle, and positive inotropic actions on the heart).

Inhibitors of a heart-specific subtype (type III) phosphodiesterase, which are positive inotropics, may be used in the short-term treatment of severe congestive cardiac failure, e.g. amrinone, enoximone and milrinone. However, developments of oral formulations of drugs of this type have been halted by the results of the PROMISE trial (Prospective Randomised Milrinone Survival Evaluation trial) which documented a paradoxical increase in mortality in class IV heart failure patients randomised to receive milrinone. However, some benzimidazole derivatives with class III phosphodiesterase inhibitor actions seem to be beneficial in heart failure. The agent vesnarinone is an orally active compound that may act as a class III phosphodiesterase inhibitor but appears to be a vasodilator with multiple mechanisms. See **HEART FAILURE TREATMENT**; **INOTROPIC AGENTS**.

Several Type IV phosphodiesterase inhibitors are currently in trials for the treatment of asthma.

The type V inhibitor sildenafil citrate is a selective cGMP-specific inhibitor, which acts as a **SMOOTH MUSCLE RELAXANT** and **VASODILATOR**, probably through enhancing the action of **nitric oxide** (NO). It relaxes blood vessels of the corpus cavernosum of the penis, and is used in oral therapy for erectile dysfunction in men.

Some other drugs that appear to owe part of their action to phosphodiesterase inhibition include a number of naturally occurring methylxanthine drugs and their derivatives (e.g. **aminophylline**, **caffeine**, **theobromine**, **theophylline**), but they also have **ADENOSINE RECEPTOR ANTAGONIST** properties: see **BRONCHODILATORS**; **CENTRAL STIMULANTS**.

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Muller, T. *et al.* (1996) Subtypes of the type 4 cAMP phosphodiesterases: structure, regulation and selective inhibition. *Trends Pharmacol. Sci.*, **17**, 294-298.

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Phospholine Iodide™ ➡ ecothiopate iodide.

PHOSPHOLIPASE INHIBITORS act at sites on phospholipases, a large group of enzymes with many roles. There are two main groups of enzyme of particular interest in relation to receptor signalling, which makes them important drug targets: phospholipase A_2 and phospholipase C. These will be discussed in turn.

Phospholipase A_2: These are enzymes that are important components of the cellular machinery and respond to inflammatory stimuli, and maintain cell haemostasis, by means of membrane changes. Their role as the rate-limiting step in the production of proinflammatory lipid mediators (e.g. prostanoids) makes these enzymes an important therapeutic target for the treatment of inflammatory disorders. It is likely that their production of arachidonic acid is a rate-limiting stage in the production of prostanoids. There are two major groups of phospholipase A_2, the secretory ($sPLA_2$) and cytosolic ($cPLA_2$) forms, which are very different both structurally and enzymatically. Understanding the relative contributions of these different forms of phospholipase A_2 to physiological and pathological conditions, has prompted development of selective inhibitors. Secretory phospholipase A_2 ($sPLA_2$; 'pancreatic phospholipase') is found physiologically in extracellular fluid (including human synovial fluid) and is regulated by Ca^{2+} levels, and can be inhibited by *p*-bromophenacyl bromide. The family is extensive, and can be divided into the groups with homology of structure. Group I is secreted by the mammalian pancreas; Group II is found in a number of snake venoms, as well as in human synovial fluid, platelets and inflammatory exudates; and Group III is in **melittin** (bee venom phospholipase). Cytosolic phospholipase A_2 ($cPLA_2$; 'nonpancreatic phospholipase') is found in very small amounts within cells, so has been difficult to characterize. However, the properties of this form seem similar to that of the Group II $sPLA_2$ enzyme, but it is insensitive to the inhibitor *p*-bromophenacyl bromide. This enzyme can be induced, and is secreted from cytokine-stimulated cells – notably by interleukin-1β – and this involves mRNA and protein synthesis. Induction of $cPLA_2$ via this gene can be suppressed by corticosteroids (possibly via induction of formation of lipocortin-1, an annexin) and this may account in part for the antiinflammatory action of steroids (but they also inhibit induction of COX-2). The annexins are a group of endogenous calcium-regulated phospholipid-binding proteins. The $cPLA_2$ form of phospholipase A_2 is thought to be involved in the formation of the **leukotrienes**, lipoxins and **PAF**. Other *in vivo* endogenous inhibitors include the antiflammins, which are peptide fragments generated from a sequence of uteroglobin

resembling lipocortin and which might provide a model for peptidic mimicking in drug development. There are many physiological and pathological circumstances in which the phospholipases may be involved, thereby providing considerable incentive in terms of drug development. These include physiological actions, such as fat digestion, lung surfactant processes, haemostasis and blood clotting, and pathological states, such as rheumatoid arthritis, septic shock, psoriasis, inflammation, pancreatitis, inflammatory bowel disease and snake-bite. Receptor-mediated activation of phospholipase A_2 is an important pathway, normally involving G-proteins. The activation may be via a direct G-protein coupling (e.g. bradykinin B_2 receptors), or indirect via increased availability of arachidonic acid following activation of the phospholipase C pathway (*vide infra*). In terms of drug development rather more is known about the mechanisms of inhibition of $sPLA_2$. SB 203347 is an inhibitor of type II (14 kDa) phospholipase A_2, and alters human neutrophil arachidonic acid release and metabolism, and prolongs survival in murine endotoxin shock. Non-specific phospholipase A_2 inhibitors include **mepacrine** (quinacrine) and *p*-bromophenacyl bromide (4-BPB).

Phospholipase C (PLC): These are a family of enzymes playing a major role in receptor coupling within the body. The hydrolysis of a minor membrane phospholipid, phosphatidylinositol-4,5-bisphosphate (PIP_2), by a specific phospholipase C (PLC) is one of the earliest key events through which more than 100 extracellular signalling molecules are known to regulate functions within their target cells. Thus hydrolysis produces two main intracellular messengers, inositol triphosphate ($InsP_3$) and diacylglycerol (DAG). $InsP_3$ releases Ca^{2+} from storage sites within the cell, which can then produce a wide variety of effects, including secretion, muscle contraction and cell growth. DAG activates protein kinase C which also has a variety of effects, and which on degradation yields arachidonic acid. This source of arachidonic acid may, according to cell type, then pass into the phospholipase A_2 mediator system (*vide supra*). The phospholipase C family can be divided into three subfamilies: PLC-β, PLC-γ and PLC-δ, on the basis of structures they also have rather different roles. The first, PLC-β, has in turn, a number of isoforms (PLC-β1, -β2, -β3 and -β4), all with the same unique carboxyterminal region of about 400 residues. This class of PLC is activated, normally via the α-subunit of the G_q class of G-proteins, on activation of a very wide range of the seven-transmembrane G-protein-coupled superfamily of receptors, including α_1-adrenoceptors, M_1 and M_3 cholinoceptors, bradykinin B_1 and B_2 receptors, angiotensin AT_1 receptors, histamine H_1 receptors etc. In some instances the βγ-subunit of the G-protein seems to be involved (e.g. M_2 cholinoceptors in the heart). Inhibitors of PLC-β include: vinaxanthone, U 73122 and ET-18-OCH_3. The second, PLC-γ, can be divided into two subfamilies: PLC-γ1 and PLC-γ2, both of which have so-called SH2 and SH3 domains. This family couples to tyrosine kinase receptors, which are activated largely by peptide growth factors, including platelet-derived growth factor (PDGF), epidermal growth factor (EGF), nerve growth factor (NGF) and fibroblast growth factor colony-stimulating factor. Inhibitors of PLC-γ include vinaxanthone, U 73122 and ET-18-OCH_3. The third, PLC-δ (divided into PLC-δ1, -δ2 , -δ3 and -δ4), is characterized by a common short carboxyl-terminal region. Their coupling is not known.

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phosphonoacetylaspartic acid ➡ **sparfosic acid**.

phosphonobaclofen ➡ **phaclofen**.

phosphoramidon is a microbial product, an **ENZYME INHIBITOR** with some (metallo) **PROTEASE INHIBITOR** activity, particularly as a (NELP) **NEUTRAL ENDOPEPTIDASE** inhibitor, an inhibitor of endothelin-converting enzyme (ECE) and of thermolysin.

Photofrin II™ ➡ **porfimer sodium**.

phthalofyne ➡ **ftalofyne**.

phthalylsulfathiazole ➡ **phthalylsulphathiazole**.

phthalylsulphathiazole [BAN] (phthalylsulfathiazole [INN]) is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity. It is insoluble in water so is used as an intestinal **ANTIMICROBIAL**.

Phyllocontin™ ➡ **aminophylline**.

phylloquinone ➡ **phytomenadione**.

physalaemin is a naturally occurring 12 amino acid residue C-terminally amidated peptide. It is a tachykinin from the skin of the South American amphibian *Physalaemus fuscumaculatus*. It acts as a **TACHYKININ RECEPTOR AGONIST** (showing greatest activity at NK_1 receptors). It stimulates extravascular smooth muscle, is a powerful **VASODILATOR** and transient **HYPOTENSIVE AGENT**, increases capillary permeability and causes salivation. It is used as a pharmacological tool.

Physeptone™ ➡ **methadone**.

Physiotens™ ➡ **moxonidine**.

physostigmine [BAN, USAN] (eserine; Fysostigmin™) is a naturally occurring alkaloid isolated from the calabar bean, *Physostigma venenosum* (Leguminosae). It is an **ANTICHOLINESTERASE** and a **PARASYMPATHOMIMETIC** that therapeutically can be used as a **MIOTIC AGENT**, especially in **ANTIGLAUCOMA TREATMENT**. Also, it is used for postoperative reversal of paralysis by (competitive) **NEUROMUSCULAR BLOCKING AGENTS**, and is claimed to have activity as a **NOOTROPIC AGENT** (cognition enhancer).

physovenine is a naturally occurring alkaloid isolated from the calabar bean, *Physostigma venenosum* (Leguminosae). It is an **ANTICHOLINESTERASE** and a **PARASYMPATHOMIMETIC** that can be used as a **MIOTIC AGENT**.

phytomenadione [BAN, INN] (phytonadione [USAN]; vitamin K_1; phylloquinone) is a **VITAMIN**, a natural fat-soluble member of the vitamin K group, normally obtained from meat, vegetable and dairy products. It is a fat-soluble naphthoquinone, a prothrombogenic essential for the blood coagulation process. Therapeutically, it can be used to treat vitamin K deficiency (though water-soluble forms, e.g. **menadiol** salts, must be used in malabsorption syndromes), as a **HAEMOSTATIC AGENT** and also as an **ANTIDOTE** in overdose with **ANTICOAGULANTS** of the coumarin group.

phytonadione ➡ **phytomenadione**.

pibecarb [INN, JAN] (phenacyl pivalate) was formerly used as a **HAEMOSTATIC AGENT** and an antihaemorrhagic thought to be a capillary protective.

picartamide [INN] (RP 40749) is a thiophenecarbothioamide, a **GASTRIC SECRETION INHIBITOR** and **ANTIULCEROGENIC**.

picenadol [INN] (picenadol hydrochloride [USAN]; LY 150720) is one of the phenylpiperidine series, and is a mixed **OPIOID RECEPTOR AGONIST** and **OPIOID RECEPTOR ANTAGONIST**, with **OPIOID ANALGESIC** activity.

picenadol hydrochloride ➡ **picenadol**.

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picloxydine [BAN, INN] is a bisguanidine **ANTIFUNGAL** and **ANTIBACTERIAL AGENT**.

picoprazole [INN] is a benzimidazole derivative, a **GASTRIC PROTON PUMP INHIBITOR**, a (H^+/K^+) **ATPASE INHIBITOR**. It can be used as an **ANTIULCEROGENIC** for gastric ulcers and other gastric acid-related gastrointestinal disorders.

picrotin ➡ **picrotoxin**.

picrotoxin (cocculin) is an ichthyotoxin, a bitter principle from 'fishberries' of the shrubs *Anamirta cocculus* native to the East Indies, and berries of *Menispermum cocculus* and other spp. It is a powerful **CNS STIMULANT** and convulsant **NEUROTOXIN**, formerly used as a **RESPIRATORY STIMULANT**. It acts as a noncompetitive ($GABA_A$) **GABA RECEPTOR ANTAGONIST**, and also as an (ionotropic) **GLYCINE RECEPTOR ANTAGONIST**. Picrotoxin is a compound (1:1) of picrotoxinin with picrotin, where the former is the more active principle.

picumast [BAN, INN] is a benzopyranone, a mediator release inhibitor and **HISTAMINE H_1-RECEPTOR ANTAGONIST**. It has potential as an **ANTIINFLAMMATORY** and **ANTIALLERGIC**.

picumeterol [BAN, INN] (picumeterol fumarate [USAN]) is a **β-ADRENOCEPTOR AGONIST** selective for the β_2-subtype, which therapeutically can be used as a **BRONCHODILATOR** in **ANTIASTHMATIC** treatment.

picumeterol fumarate ➡ **picumeterol**.

pidotimod [INN] (PGT/1A) is a thiazolidinecarboxylic acid derivative, an (immunomostimulant) **IMMUNOMODULATOR** that induces activation of T-lymphocytes and stimulation of granulocytes and macrophages. It has been investigated for treatment of recurrent respiratory infections.

PIF ➡ **prolactin-release inhibiting factor**.

pig somatotropin ➡ **porcine pituitary growth hormone**.

PIH (pyridoxal isonicotinoylhydrazone) is an orally effective iron **CHELATING AGENT**. It inhibits lipid peroxidation, and analogues are potential antiproliferative agents.

piketoprofen [INN] is a member of the propionic acid series, and is a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity.

pildralazine [INN] is a hydrazone derivative, which acts as a **MONOAMINE-OXIDASE INHIBITOR** with **ANTIHYPERTENSIVE** activity.

Pilocar™ ➡ **pilocarpine**.

pilocarpine [BAN, USAN] (pilocarpine hydrochloride [USAN]; Isopto Carpine™; Pilocar™; Ocusert Pilo™) is an imidazolfuranone alkaloid from *Pilocarpus microphyllus* and several other *Pilocarpus* spp. (Rutaceae). It is a **MUSCARINIC CHOLINOCEPTOR AGONIST**, a **PARASYMPATHOMIMETIC** that can be used as a **MIOTIC**, especially topically in antiglaucoma treatment.

pilocarpine hydrochloride ➡ **pilocarpine**.

pilsicainide [INN] (pilsicainide hydrochloride [JAN]) is an amide, a **LOCAL ANAESTHETIC**/(class I) **ANTIARRHYTHMIC**.

pilsicainide hydrochloride ➡ **pilsicainide**.

pimagedine [INN] (pimagedine hydrochloride [USAN]; aminoguanidine; guanylhydrazine; carbamimidic hydrazide; hydrazinecarboximidamide; GER 11) is a **DIAMINE OXIDASE INHIBITOR** and **NITRIC OXIDE SYNTHASE INHIBITOR**. It is used as a pharmacological tool.

pimagedine hydrochloride ➡ **pimagedine**.

pimilprost [INN] (SM 10902) is a synthetic prostaglandin, a **prostacyclin** analogue and a **PROSTANOID RECEPTOR AGONIST**, which has **PLATELET AGGREGATION INHIBITOR** properties.

piminodine [BAN, INN] (NIH 7590; Win 14098) is one of the phenylpiperidine series, and is an **OPIOID RECEPTOR AGONIST** active as an **OPIOID ANALGESIC**.

pimobendan [INN, USAN] is a pyridazinone derivative acting as a (type III) **PHOSPHODIESTERASE INHIBITOR**, which shows positive **INOTROPIC** and **VASODILATOR** properties. It can be used in congestive **HEART FAILURE TREATMENT**.

pimozide [BAN, INN, JAN, USAN] (McN JR 6238; R 6238;. SM 7354; Orap™ and many other names) is a **CALCIUM-CHANNEL BLOCKER**, (D_2) **DOPAMINE RECEPTOR ANTAGONIST** and dopamine **UPTAKE INHIBITOR**. It has **ANTIPSYCHOTIC** properties and can be used to treat patients suffering from psychotic disorders, such as schizophrenia, paranoia and mania, and as an anxiolytic in the short-term treatment of severe anxiety. It is also used to treat Gilles de la Tourette syndrome.

pinacidil [INN, USAN] (Pindac™) is a cyanopyridinylguanidine derivative, which acts as a **POTASSIUM-CHANNEL ACTIVATOR** with **SMOOTH MUSCLE RELAXANT, VASODILATOR** and **ANTIHYPERTENSIVE** actions.

pinane thromboxane A_2 (PTA_2) is a prostaglandin derivative, a (thromboxane; TP) **PROSTANOID RECEPTOR ANTAGONIST** and **THROMBOXANE SYNTHETASE INHIBITOR**, which antagonizes coronary artery contraction and is a **PLATELET AGGREGATION INHIBITOR**, and protects the ischaemic myocardium.

pinaverium bromide [INN] is a quaternary ammonium compound with **SMOOTH MUSCLE RELAXANT, MUSCARINIC CHOLINOCEPTOR ANTAGONIST** and **CALCIUM-CHANNEL BLOCKER** activity. It can be used as an **ANTISPASMODIC** in the treatment of irritable bowel syndrome.

pinazepam [INN] (Z 905) is one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST** with most of its properties similar to **diazepam**. It has **HYPNOTIC, ANTICONVULSANT** and **ANXIOLYTIC** activity. It is used orally for anxiety disorders and insomnia, when it has a long duration of action.

Pindac™ ➡ **pinacidil**.

pindolol [BAN, INN, JAN, USAN] (Visken™) is a non-subtype-selective **β-ADRENOCEPTOR ANTAGONIST** with some intrinsic β_2-adrenoceptor parial agonist activity, as well as **5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST** activity, which is relatively lipophilic. Therapeutically, it can be used in **ANTIHYPERTENSIVE** and **ANTIANGINAL** treatment.

pipacycline [INN] is a semisynthetic (tetracycline) **ANTIBIOTIC**, with a broad-spectrum of **ANTIBACTERIAL** activity.

pipamperone [BAN, INN, USAN] (pipamperone hydrochloride [JAN]; McN-JR 3345; R 3345) is one of the butyrophenone group, with general properties similar to **haloperidol**, and was formerly used as an **ANTIPSYCHOTIC**. It has ($5\text{-}HT_2$) **5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST** properties.

pipamperone hydrochloride ➡ **pipamperone**.

pipecuronium bromide [BAN, INN, USAN] (Arduan™) is a bisquaternary ammonium heterocyclic compound, a (competitive) **NICOTINIC CHOLINOCEPTOR ANTAGONIST**, (competitive) **NEUROMUSCULAR BLOCKING AGENT** which can be used as a long-acting **SKELETAL MUSCLE RELAXANT** in anaesthesia.

pipemidic acid [INN, JAN] is a (4-quinolone) broad-spectrum **ANTIBACTERIAL AGENT**.

pipenzolate bromide [BAN, INN] is a quaternary ammonium dimethylpiperidinium derivative, a **MUSCARINIC CHOLINOCEPTOR ANTAGONIST**, which was formerly used as an **ANTISPASMODIC**.

pipequaline [INN] (PK 8165; RP 45319) is a quinoline derivative and is an **ANXIOLYTIC** under investigation.

piperacillin [INN, JAN] (piperacillin sodium [USAN]; Tazocin™; Pipracil™) is a semisynthetic (ureido-penicillin) **ANTIBIOTIC**. It can be used clinically as a broad-spectrum systemic **ANTIBACTERIAL** to treat certain infections.

piperacillin sodium ➡ **piperacillin**.
piperazine (piperazine calcium edetate [BAN, INN]; piperazine citrate [USAN]; Pripsen™ and many other names) is an **ANTHELMINTIC**, frequently administered as derivatives. It can be used to treat roundworm and threadworm infections.
piperazine calcium edetate ➡ **piperazine**.
piperazine citrate ➡ **piperazine**.
piperazine estrone sulfate ➡ **estropipate**.
piperazine oestrone sulphate ➡ **estropipate**.
piperidic acid ➡ **γ-aminobutyric acid**.
piperidinic acid ➡ **γ-aminobutyric acid**.
piperidolate [BAN, INN] is a tertiary amine **MUSCARINIC CHOLINOCEPTOR ANTAGONIST**, which can be used as a visceral **ANTISPASMODIC**.
piperocaine [BAN, INN] is an ester series **LOCAL ANAESTHETIC**, which has been used by topical application.
piperonyl butoxide [BAN, BSI, ISO] is a veterinary **ACARICIDE** and **INSECTICIDE**.
piperoxan [BAN, INN] is a benzodioxin derivative that is an (α_1-subtype) **α-ADRENOCEPTOR ANTAGONIST**. It is no longer marketed as an **ANTIHYPERTENSIVE** but can be used as a diagnostic agent in studies of hypertension, and as a pharmacological analytical tool.
pipethanate ethobromide ➡ **pipethanate hydrochloride**.
pipethanate hydrochloride [JAN] (pipethanate ethobromide [JAN]) is a tertiary amine derivative, a **MUSCARINIC CHOLINOCEPTOR ANTAGONIST**, formerly used parenterally as an **ANTISPASMODIC**.
pipobroman [INN, JAN, USAN] (A 8103; NSC 25154; Vercyte™) is a substituted piperazine, an alkylating cytotoxic **ANTICANCER AGENT**, which is used orally in the treatment of essential thrombocythaemia.
Piportil™ ➡ **pipothiazine**.
pipothiazine [BAN] (pipotiazine [INN]; pipotiazine palmitate [USAN]; RP 19366; Piportil™) is one of the phenothiazine group with general properties similar to **chlorpromazine**. It is a (D_2) **DOPAMINE RECEPTOR ANTAGONIST** which was used particularly as a depot injection of the palmitate in **ANTIPSYCHOTIC** maintenance therapy of patients with schizophrenia and other psychoses.
pipotiazine ➡ **pipothiazine**.
pipotiazine palmitate ➡ **pipothiazine**.
pipoxolan [BAN, INN] (pipoxolan hydrochloride [USAN]) is a tertiary amine **MUSCARINIC CHOLINOCEPTOR ANTAGONIST**, which can be used as a visceral **ANTISPASMODIC**.
pipoxolan hydrochloride ➡ **pipoxolan**.
Pipracil™ ➡ **piperacillin**.
pipradrol [BAN] is a piperidinemethanol derivative, which has been used orally as a **CNS STIMULANT**.
pipratecol [INN] is a piperazineethanol with **VASODILATOR** properties, and has been investigated for treating cerebrovascular disorders.
piprinhydrinate ➡ **diphenylpyraline**.
piprozolin [INN, USAN] (Go 919; W 3699) is a piperidinyl-thiazolidine derivative, used as a **CHOLERETIC AGENT**.
piquindone [INN] (piquindone hydrochloride [USAN]; Ro 22-1319) is an isoqinolinone with selective (D_2) **DOPAMINE RECEPTOR ANTAGONIST** under study as an **ANTIPSYCHOTIC**.
piquindone hydrochloride ➡ **piquindone**.
piracetam [BAN, INN, USAN] (Nootropil™ [historic]) is a pyrrolidineacetamide, a **CNS STIMULANT**, and is said to protect the cerebral cortex against anoxia. It is reported to improve mental function in tests by an unknown mechanism, and was formerly used for this purpose. It has stimulated development of analogues with activity as **NOOTROPIC AGENTS**.
pirazolac [BAN, INN, USAN] (ZK 76604) is a pyrazoleacetic acid, a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity.
pirbuterol [BAN, INN] (pirbuterol hydrochloride [JAN, USAN]; pirbuterol acetate [USAN]; Maxair™) is a **β-ADRENOCEPTOR AGONIST** selective for the β_2-subtype, usually used in its racemic form. Therapeutically, it can be used as a **BRONCHODILATOR** in **ANTIASTHMATIC** treatment.
pirbuterol acetate ➡ **pirbuterol**.
pirbuterol hydrochloride ➡ **pirbuterol**.
pirenperone [BAN, INN, USAN] is a pyridopyrimidine, a ($5\text{-}HT_2$) **5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST**. It has **TRANQUILLIZER** and **ANTIPSYCHOTIC** activity. It is used as a pharmacological tool in the study of serotonergic mechanisms.
pirenzepine [BAN, INN] (pirenzepine hydrochloride [JAN, USAN]; Gastrozepin™) is a piperazinylbenzodiazepinone, a selective M_1-subtype **MUSCARINIC CHOLINOCEPTOR ANTAGONIST**, which can be used as an **ANTIULCEROGENIC** and **ANTISPASMODIC** in gastric ulcer treatment.
pirenzepine hydrochloride ➡ **pirenzepine**.
pirepolol [INN] is a **β-ADRENOCEPTOR ANTAGONIST** with **ANTIHYPERTENSIVE** properties (never marketed).
piretanide [BAN, INN, JAN, USAN] is a (loop) **DIURETIC** with properties similar to **frusemide**. It has been used as an **ANTIHYPERTENSIVE**.
piribedil [INN] is a piperazinylpyrimidine, a non-ergot (D_2) **DOPAMINE RECEPTOR AGONIST**, which has been tried as an **ANTIPARKINSONIAN AGENT**. Also, it is a **VASODILATOR** tried for the treatment of peripheral vascular disease.
pirifibrate [INN] is one of the fibrate group, and has been used as an **ANTIHYPERLIPIDAEMIC**.
piriprost [INN, USAN] is a prostaglandin derivative, a leukotriene synthesis inhibitor and an **ANTIASTHMATIC** prostaglandin.
Piriton™ ➡ **chlorpheniramine**.
piritramide [BAN, INN] (R 3365) is one of the phenylpiperidine series, an **OPIOID RECEPTOR AGONIST** active as an **OPIOID ANALGESIC**.
piritrexim [INN] (piritrexim isethionate [USAN]; BW 301U; NSC 351521) is a **DIHYDROFOLATE REDUCTASE INHIBITOR** antimetabolite cytotoxic agent which has been tried as an **ANTICANCER AGENT**. It has also been used as an **ANTIMICROBIAL** and shows antipsoriatic activity.
piritrexim isethionate ➡ **piritrexim**.
pirlindole [INN] carbazole, is a RIMA, a reversible, selective type A, **MONOAMINE-OXIDASE INHIBITOR** (MAOI). It has been used as an **ANTIDEPRESSANT**.
pirmagrel [INN, USAN] (CGS 13080) is an imidazopyridine, a **THROMBOXANE SYNTHETASE INHIBITOR**. It has been investigated for treatment of thrombolytic and ischaemic disorders, and renal allograft recipients. Also shown to ameliorate cyclosporin-induced nephrotoxicity.
pirmenol [INN] (pirmenol hydrochloride [USAN]) is a pyridinemethanol derivative, a **SODIUM-CHANNEL BLOCKER/ LOCAL ANAESTHETIC/**(class 1) **ANTIARRHYTHMIC**.
pirmenol hydrochloride ➡ **pirmenol**.
piromidic acid [INN, JAN] is a 4-quinolone **ANTIBACTERIAL** effective against Gram-negative bacteria.
piroxantrone [INN] (piroxantrone hydrochloride [USAN]; oxanthrazole; oxantrazole; CI 942; PD 111815; NSC 349174) is a structural analogue of the (anthracycline group) **ANTIBIOTIC mitozantrone**. It has been tried as an **ANTICANCER AGENT** in the treatment of a number of neoplasms.

piroxantrone hydrochloride ➡ **piroxantrone.**

piroxicam [BAN, INN, JAN, USAN] (CP 16171; Feldene™; Flamatrol™; Larapam™ and many other names) is one of the oxicam series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC and ANTIINFLAMMATORY activity. It has a long duration of action and is used orally or by injection to treat pain and inflammation in rheumatic disease and other musculoskeletal disorders, including arthritis and gout. It is used topically as a COUNTER-IRRITANT (rubefacient or topical analgesic) for symptomatic relief of underlying pain. There are a number of derivatives that can be used, e.g. piroxicam cinnamate [USAN], piroxicam olamine [USAN] and piroxicam betadex [USAN].

piroxicam betadex ➡ **piroxicam.**

piroxicam cinnamate ➡ **piroxicam.**

piroxicam olamine ➡ **piroxicam.**

piroximone [BAN, INN, USAN] is a pyridinylcarbonyl-imidazole, a (type III) PHOSPHODIESTERASE INHIBITOR with VASODILATOR and CARDIAC STIMULANT activity. It can be used in congestive HEART FAILURE TREATMENT.

pirozadil [INN] (722 D) is a pyridine-trimethoxybenzoate derivative, which has been used as an ANTIHYPERLIPIDAEMIC and also is a PLATELET AGGREGATION INHIBITOR and coronary VASODILATOR.

pirprofen [BAN, INN, USAN] (SU 21524) is a member of the propionic acid series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

pitofenone [INN] is a tertiary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as a visceral ANTISPASMODIC.

pitrazepin is a dibenzotriazoloazepine, a ($GABA_A$) GABA RECEPTOR ANTAGONIST.

Pitressin™ ➡ **argipressin; lypressin.**

pituitary adenylate cyclase-activating peptide (PCAP) is a *N*-terminally amidated linear peptide originally isolated from ovine hypothalamus, but also found in rats, humans and frogs The human, rat and ovine sequences consist of 27 (PCAP-27) and 38 (PCAP-38) amino acid residue forms; and in the human is derived in a precursor peptide ProPACAP with 176 residues. It is a VASOACTIVE INTESTINAL PEPTIDE RECEPTOR AGONIST active at the VIP_1 and VIP_2 subtypes, as well as the PACAP subtype. It stimulates adenylate cyclase in rat anterior pituitary preparations.

pituitary adenylate cyclase-activating peptide (6-38)(human, ovine, rat) ➡ **PCAP(6-38).**

PITUITARY HORMONES are released from the pituitary gland, situated at the base of the brain. It secretes a number of peptide hormones vital to body function. There are two distinct classes of pituitary hormones – the posterior pituitary hormones and the anterior pituitary hormones.

Posterior pituitary hormones include **vasopressin** and **oxytocin**, which are formed as precursor molecules in the paraventricular nucleus of the hypothalamus, and transported down axons to be secreted into the portal capillaries. They are cyclic nonapeptides. Mammalian vasopressin has an Arg^8 residue (**arginine vasopressin**; **AVP**), except in the pig which has a Lys^8 residue (**lysine vasopressin**). Oxytocin differs from vasopressin in having leucine at position 8 and isoleucine at position 3. Vasopressin and oxytocin analogues with some degree of receptor subtype selectivity that have been synthesized have ANTIDIURETIC or vasoconstrictor or OXYTOCIC (uterine-contracting) activity. See VASOPRESSIN RECEPTOR AGONISTS; VASOPRESSIN RECEPTOR ANTAGONISTS.

Anterior pituitary hormones will be dealt with individually.

Corticotrophin (adrenocorticotrophic hormone; ACTH), a 39 residue peptide produced and secreted by the pituitary, controls the production and secretion of other hormones. Its major role is to control the release of CORTICOSTEROIDS from the adrenal glands, generally in response to stress. Therapeutically, synthetic corticotrophin analogues (e.g. **tetracosactrin**) may be administered to make up for hormonal deficiency in the pituitary gland, to cause the increased production of corticosteroids in the treatment of inflammatory conditions, such as rheumatoid arthritis and Crohn's disease, or to test the function of the adrenal glands. There are a number of further peptides with presumed hormone function that are derived from the same precursor molecule as adrenocorticotrophic hormone, which is pro-opiomelanocortin (POMC). These further peptides include **α-melanocyte-stimulating hormone** (α-MSH; 13 residues), **β-melanocyte-stimulating hormone** (β-MSH; 18 residues), **β-lipotropin** (β-LPH; 91 residues) and **γ-lipotropin** (γ-LPH; 58 residues). See CORTICOTROPHIN ANALOGUES; OPIOID RECEPTOR AGONISTS.

Somatotropin (growth hormone; GH) is a pituitary somatotrophic linear peptide hormone of 191 residues. The name somatotropin is used for human growth hormone (HGH), which was isolated from the pituitary glands of cadavers. This when used to treat short stature (dwarfism) brought with it the risk of acquiring Creutzfeldt-Jakob disease through contamination. It is now replaced in many countries by **somatropin**, which is a biosynthetic form of human growth hormone without this liability.

Prolactin is a single chain 198 residue somatotrophic peptide hormone secreted into the bloodstream by mammotrophic (lactotroph) cells situated in the anterior pituitary gland in both men and women, though its main role is in control of lactation. The peptide itself has no therapeutic application. Its release is influenced by the hypothalamus through a factor called prolactin-release inhibiting factor (PRIF), which is probably the neurotransmitter mediator **dopamine**. This fact is important, since it explains why the drug **bromocriptine** – which stimulates dopamine D_2 receptors – can be used to suppress prolactin secretion in normal pregnancy or in treating galactorrhea. Overproduction of prolactin may occur in pituitary tumours, or when patients are receiving therapy from dopamine receptor antagonist ANTIPSYCHOTIC drugs.

Thyrotrophin (thyroid-stimulating hormone, TSH), a double-chained peptide, controls the release of thyroid hormone from the thyroid gland, and is itself controlled by the hypothalamic hormone **protirelin** (thyroid-releasing hormone; TRH), and by high levels of thyroid hormone in the blood. In the case of clinical defects at any stage in this system of control, diagnostic tests are necessarily a matter for specialist clinics. Nowadays, it is thought less practical to make direct diagnosis using TSH itself in stimulation tests, since it is easier to chemically measure the concentrations of TSH and thyroid hormones (T_3 and T_4), in the blood.

Follicle-stimulating hormone (FSH) is one of the gonadotrophin hormones (with LH), secreted by the anterior pituitary gland and consists of double peptide chains. In women, in conjunction with LH, it causes the monthly ripening in one ovary of a follicle, and stimulates ovulation. In men it stimulates the production of sperm in the testes. It may be injected therapeutically in female infertility treatment to stimulate ovulation. It is available in several forms, e.g. **urofollitrophin** or **menotrophin** which is a 1:1 mix of FSH/LH.

Luteinizing hormone (LH) is one of the gonadotrophin hormones (with FSH), secreted by the anterior pituitary and consists of double peptide chains. It causes the monthly ripening in one ovary of a follicle and stimulates ovulation. In men it facilitates the production of sperm in the testes (hence its alternative name, interstitial cell stimulating hormone, ICSH). It is used therapeutically with FSH in female infertility treatment. It is available, in combination with FSH, in human menopausal gonadotrophin. See OVULATION-INDUCING AGENTS.

Chorionic gonadotrophin (human chorionic gonadotrophin; HCG) is actually mainly secreted by the chorion of the placenta, and is prepared from the urine of pregnant women. Its main actions are similar to LH.

Release of the anterior pituitary hormones is controlled, in turn, by factors that travel in a specialized system of portal blood vessels the short distance from the hypothalamus, an adjacent brain area to the anterior pituitary. These hypothalamic hormones include **corticotrophin-releasing hormone** (CRH; or corticotrophin-releasing factor, CRF); **gonadorelin** (gonadotrophin-releasing hormone GnRH; or gonadotrophin-releasing factor, GRF; LH-RH); **growth hormone-releasing hormone** (GHRH; growth hormone-releasing factor; GRF); **growth hormone release-inhibiting hormone** (GHRIH; somatostatin; SRIF; growth hormone-release-inhibiting factor; GHRIF); prolactin-release inhibiting factor (PRIF) and protirelin (thyrotrophin-releasing hormone; TRH). See also HYPOTHALAMIC HORMONES; LH-RH RECEPTOR AGONISTS; OVULATION-INDUCING AGENTS; SOMATOSTATIN RECEPTOR AGONISTS; SOMATOSTATIN RECEPTOR ANTAGONISTS.

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pivalopril ➡ **pivopril**.

pivampicillin [BAN] (pivampicillin hydrochloride [USAN]; pivampicillin pamoate [USAN]; pivampicillin probenate [USAN]; Pondocillin™) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as a broad-spectrum semisynthetic oral ANTIBACTERIAL to treat certain infections.

pivampicillin hydrochloride ➡ **pivampicillin**.

pivampicillin pamoate ➡ **pivampicillin**.

pivampicillin probenate ➡ **pivampicillin**.

pivmecillinam [BAN, INN] (amdinocillin pivoxil [USAN]; pivmecillinam hydrochloride [JAN]) is a semisynthetic (penicillin) ANTIBIOTIC, the pivaloyloxymethyl ester of **mecillinam**. It can be used clinically as an ANTIBACTERIAL to treat certain infections.

pivmecillinam hydrochloride ➡ **pivmecillinam**.

pivopril [INN, USAN] (pivalopril) is a pseudopeptide ACE INHIBITOR and ANTIHYPERTENSIVE.

pizotifen [BAN, INN] (pizotyline [USAN]; Sanomigran™) is a methylpiperidine, a (5-$HT_{1\&2}$) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST, which can be used in ANTIMIGRAINE TREATMENT as a prophylactic.

pizotyline ➡ **pizotifen**.

PK 8165 ➡ **pipequaline**.

PK 26124 ➡ **riluzole**.

Placidyl™ ➡ **ethchlorovynol**.

plafibride [INN] (ITA 104) is a fibric acid derivative, which has been used as an ANTIHYPERLIPIDAEMIC and also is a PLATELET AGGREGATION INHIBITOR.

Plaquenil™ ➡ **hydroxychloroquine**.

plasma thromboplastin component ➡ **factor IX**.

plasminogen activator inhibitor (proteinase inhibitor PAI) is a peptide containing 376-379 amino acid residues, found in 3 forms. It is an ENZYME INHIBITOR actively involved in the control of haemostatic blood clotting factors. Increased levels are found in metastases; it is a possible diagnostic agent and target for anticancer chemotherapy.

plasmin ➡ **fibrinolysin**.

platelet activating factor (PAF; acetyl glyceryl ether phosphorylcholine; AGEPC; antihypertensive polar renomedullary lipid; APRL) exists in two major forms: octadecyl and hexadecyl forms, according to the length of n in the structure; 1-O-alkyl-2-acetyl-S_n-glyceryl-3-phosphocholine. It can be isolated from the renal medulla and from basophils. It is an inflammatory mediator, and is powerful blood PLATELET AGGREGATION INDUCER and HYPOTENSIVE. It is a powerful chemotactic agent, activates polymorphonuclear leucocytes, monocytes and macrophages, stimulates glycogenolysis in perfused liver and causes uterine contractions. These actions are receptor-mediated, so it is a PLATELET-ACTIVATING FACTOR RECEPTOR AGONIST.

PLATELET-ACTIVATING FACTOR RECEPTOR AGONISTS act at receptors recognizing platelet-activating factor (PAF; acetyl glyceryl ether phosphorylcholine; AGEPC; antihypertensive polar renomedullary lipid; APRL), which is a potent biologically active lipid. PAF does not only activate platelets, but has a range of actions on different cell types, and is thought to be a mediator involved in the pathology of many acute and chronic inflammatory phenomena, including asthma. PAF is derived from its precursor, acetyl-PAF, by the action of the enzyme phospholipase A_2, releasing lyso-PAF which is converted to PAF by acetylation, which can then be deacetylated to give lyso-PAF once more. PAF is generated and released on stimulation of most types of inflammatory cell, notably neutrophils, macrophages, eosinophils, basophils and platelets. The specific receptor on which PAF acts is of the seven-transmembrane G-protein-coupled type, and is coupled to $InsP_3$/DAG (G_q/11). The receptor has been cloned, and that of the human contains 342 amino residues, and that of the rat 341. Agonists at this receptor include **PAF** and its metabolically stable analogue C-PAF. There is some evidence suggesting the presence of receptor subtypes, through binding studies and the use of antagonists such as **WEB 2086** (in guinea-pig eosinophils and macrophages).

The range of receptor-mediated effects caused by PAF in the body is wide. At very low doses, injection of PAF causes local vasodilation and also an increase in vascular permeability. At higher doses it causes hyperalgesia. It can activate phospholipase A_2 with generation of prostanoids. PAF is an active chemotactic agent, for instance recruiting eosinophils into the lining of the bronchioles in asthma (and is also a spasmogen in the lungs). It causes platelets to undergo a shape-change with release of granules, aggregation, release of thromboxane A_2, and is important in haemostasis. It is thought that the antiinflammatory actions of corticosteroids are due in part to inhibition of PAF synthesis, via the inhibitory action of lipocortin on phospholipase A_2: see CORTICOSTEROIDS.

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PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONISTS (PAF antagonists) act at a specific receptor. There is some evidence suggesting the presence of receptor subtypes, through binding studies and the use of antagonists. Antagonists are divided into four classes. (1) *Quaternary nitrogen compounds*, e.g. **CV 6209**; (2) *diaryl compounds*, e.g. **L 659989**; (3) *sp^2 nitrogen compounds*, e.g. **apafant**, **SR 27417** and **BB 823**; and (4) *miscellaneous compounds*, e.g. **ginkgolide B**. Antagonists at the PAF receptors may well be developed as useful antiinflammatory agents, and some are in clinical trials as antiasthmatic agents.

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PLATELET AGGREGATION INDUCERS are agents that have proaggregatory actions on platelets. Many natural mediators that are involved in haemostasis have this property. In particular, the damaged endothelium releases agents (e.g. the prostanoid **thromboxane A_2**) that affect both platelet aggregation and/or act on smooth muscle to constrict the vessel. Further, damage to the endothelium exposes collagen which powerfully promotes, and provides a substrate for platelet adhesion. Activated platelets release a number of vasoactive substances (e.g. **5-hydroxytryptamine**) that are proaggregatory and vasoconstrictive. However, therapeutic efforts are generally directed in the opposite direction, and considerable research effort has been directed to find **PLATELET AGGREGATION INHIBITING AGENTS**. There are very few therapeutic situations where a proaggregatory drug might find application, and formation of thrombi in the circulation is potentially lethal. Although excessive local bleeding can be treated by agents that promote blood coagulation, a fibrinogenic action leading to formation of a fibrin plug is probably more valuable than formation of platelet clumps alone. See **HAEMOSTATIC AGENTS**. A brief summary of the properties of some platelet aggregation inducers follows. **ADP (adenosine diphosphate)** was the first aggregating agent to be studied. On platelets its actions are mediated via $P2Y_{ADP}$ (formerly P_{2T} or ADP receptors), a subtype of purine P_2 receptors, which are found only at this site. Although this receptor couples negatively to adenylyl cyclase, there is calcium mobilization through an uncertain route which activates aggregation. Conversely, **adenosine**, which (along with ADP and other purines) is released on platelet disruption, acts at adenosine receptors (P_1-purinoceptors) to inhibit platelet aggregation and relax vascular smooth muscle. See **ADENOSINE RECEPTOR AGONISTS**; **PURINE RECEPTOR AGONISTS**. **Thromboxane A_2** (TBA_2) is formed mainly in platelets, and acts predominantly at TP prostanoid receptors to cause platelet aggregation and vasoconstriction. See **PROSTANOID RECEPTORS**. However, prostacyclin synthesis is predominant in the vascular endothelium, and forms prostacyclin which is a potent inhibitor of platelet aggregation, and can help disintegrate platelet clumps. In respect of its inhibition of platelet aggregation, it is thought to act by inhibiting the transduction mechanisms for the expression of membrane **glycoprotein receptors (GPIIb/IIIa)**, which are types of adhesion receptors. These receptors, which are normally expressed on the platelet surface, are critical for aggregation since aggregation involves links formed by fibrinogen binding to GPIIb/IIIa-receptors on adjacent platelets. Conversely, proaggregatory agents induce this mechanism of adhesion (e.g. thromboxane, ADP, 5-HT and PAF). **5-HT (serotonin)** stimulates platelet aggregation and is, as its name implies, a vasoconstrictor in many blood vessels. It is actively taken up into platelets, and released on insult. See **5-HYDROXYTRYPTAMINE RECEPTOR AGONISTS**.

PAF (platelet-activating factor) is a potent biologically active lipid that causes aggregation that is accompanied by release of thromboxane A_2 and the granular contents of the platelets. **Thrombin** is a powerful stimulant of platelet aggregation, and antithrombin agents can be considered alongside antiplatelet agents in terms of treatment. **Vasopressin** exerts a number of effects through V_1 receptors, including aggregation, degranulation of platelets and vasoconstriction. See **VASOPRESSIN RECEPTOR AGONISTS**.

Non-physiological aggregatory agents: A number of foreign natural and unnatural compounds can cause platelet aggregations. Notable amongst these are natural toxins, e.g. equinatoxin from *Actinia equina*, which is active at very low concentrations, and the potent marine toxin, **maitotoxin** isolated from a dinoflagellate (which enhances cytosolic Ca^{2+}-entry). See **NEUROTOXINS**; **TOXINS**.

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PLATELET AGGREGATION INHIBITING AGENTS (antiplatelet agents) are a collection of drugs able to reduce or prevent aggregation of platelets. Platelets (thrombocytes) are an essential component of the haemostatic plug formed in haemostasis, and are non-nucleated cells that have a number of roles in haemostasis, and are important for the healing of damaged blood vessels, as well as in the formation of blood thrombi (clots). In individuals where there is a shortage of platelets, there may be spontaneous bleeding giving a purple coloration in the skin (thrombocytopenic purpurea). Under these conditions, the blood clots normally (the clotting time is unchanged) but the bleeding time is increased, thus illustrating the importance of platelets in the formation of thrombi. This is essential for two reasons. Firstly, platelets are an important component of the haemostatic plug, where they are entangled and embedded within the network of fibrin fibres (see **ANTICOAGULANTS**). Secondly, they have an important active role, through release of many mediators and factors, in initiating and orchestrating the clotting process. In particular, they have an intimate relationship with the vessel wall, to both the endothelium, and to the underlying layers that become exposed in vascular damage.

Therapeutic agents: The number of potential ways that platelet aggregation can be affected by drugs is extensive because of the extremely complex and multiple roles of platelets in haemostasis. In view of this, the following account will deal only with agents that are currently used, or have the potential to be used, in antiplatelet therapy. Platelets contribute significantly to vaso-occlusive thrombosis, one of the major causes of death and disease throughout the world. Consequently, inhibiting platelet function is a potentially important therapeutic goal.

Aspirin is a relatively weak antiplatelet agent. Nevertheless, there is a battery of evidence from large-scale multicentre clinical trials that it has considerable value in the

prophylaxis and treatment of vascular disease. It works as an inhibitor of cyclooxygenase enzymes concerned with the synthesis in the body of prostanoids (see **CYCLOOXYGENASE INHIBITORS**). There are two forms of this enzyme. One, COX-1, is constitutively expressed; but the other, COX-2, is inducible. Individual NSAIDs have different ratios of activity against the two isoenzymes, and this accounts partly for their side-effects (see **NSAID ANALGESICS**). Aspirin is relatively active at COX-1, irreversibly alkylating its active site. This reduces **thromboxane A_2** (TXA_2) synthesis in platelets, but platelets cannot synthesize new enzyme, and activity does not return until new platelets are formed (which takes about a week). In contrast, the vascular endothelium is able to generate more of the enzyme; furthermore, a higher concentration of aspirin is required in these cells. Thus low doses of aspirin given intermittently (say 3-day intervals) decrease the synthesis of TXA_2 by platelets, without greatly reducing prostacyclin synthesis by the endothelium. These changes may be sufficient to account for the antiplatelet actions of aspirin, though there may well be other actions.

Thromboxane A_2 is thrombotic (and a vasoconstrictor), whereas prostacyclin inhibits platelet aggregation. Thus TXA_2-synthesis inhibitors (e.g. **dazoxiben**, an imidazole) and TXA_2-receptor antagonists (e.g. **vapiprost**) have been investigated with a view to their use as antiplatelet agents. Both these classes of drugs are, in fact, weak inhibitors of platelet action *in vivo*. Drugs that combine these activities (e.g. **ridogrel**) are under development.

Prostacyclin is a potent inhibitor of platelet aggregation, and can help disintegrate platelet clumps, but it is not fibrinolytic. In respect of its inhibition of platelet aggregation, it is thought to act by inhibiting the transduction mechanisms for the expression of membrane glycoprotein receptors (GPIIb/IIIa), which are types of adhesion receptor. These receptors which are normally expressed on the platelet surface, are critical for aggregation – since aggregation involves links formed by fibrinogen binding to GPIIb/IIIa-receptors on adjacent platelets. (Conversely, proaggregatory agents induce this mechanism of adhesion, e.g. thromboxane, ADP, 5-HT and PAF). Prostacyclin is available as **epoprostenol** for clinical use, but since it has a half-life of only about 3 minutes (and is very expensive) it is only suitable for use as a platelet aggregation agent under unusual circumstances; for instance, in blood circuits in renal dialysis or cardiac bypass surgery, and by intravenous injection as a vasodilator and antiplatelet agent for emergency use in intensive care. When stable analogues of prostacyclin become available, use may be extended.

Ticlopidine can be useful clinically. It inhibits expression of the platelet GPIIb/IIIa receptors into the high-affinity ligand-binding state, a process that takes some days to become fully effective. Although it may be as effective as aspirin in reducing stroke, this delay (and greater side-effects) limits usefulness.

Monoclonal antibodies to GPIIb/IIIa receptors are effective inhibitors of platelet function. Animal studies suggest that they may reduce both the dose, and the delay in onset of thrombolytic effect with streptokinase and similar agents when they are used in treating the sequelae of myocardial infarction. Early trials in humans suggest that these agents will be valuable for some specialist applications.

Antithrombin agents are not direct-acting platelet aggregation inhibiting agents, but since thrombin is a powerful stimulant of platelet aggregation, antithrombin drugs can be considered alongside antiplatelet drugs in terms of treatment. Trials designed to find the best treatment for myocardial infarction suggest that various combinations of antiplatelet (aspirin), anticoagulant or antithrombin agents (**heparin**) and fibrinolytic agents (**streptokinase, anistreplase** or **t-PA**) are very effective and halve mortality. See also **ANTITHROMBINS; HAEMOSTATICS; FIBRINOLYTIC AGENTS.**

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Platinol™ ➡ cisplatin.

plaunotol [INN, JAN] (CS 684) or 18-hydroxygeranylgeraniol, is isolated from leaves of *Croton sublyratus* (Plaunoi) and *Croton columnaris*. It is an **ANTIULCEROGENIC** used as a native drug. It is thought to stimulate release of endogenous secretin and gastric-mucosal prostaglandins (PGE_2 and PGI_2) synthesis.

Plendil™ ➡ felodipine.

plicamycin [BAN, INN, USAN] (mithramycin A; Mithramycin™) is an (anthracycline group) **ANTIBIOTIC** isolated from *Streptomyces* sp. It has cytotoxic properties and clinically may be used as an oral and parenteral **ANTICANCER AGENT**, particularly for testicular cancer.

plomestane [INN, USAN] (MDL 18962) is a steroid with **AROMATASE INHIBITOR** (oestrogen synthetase inhibitor) activity. It is under investigation for some anticancer applications, e.g. for treatment of breast cancer.

PLV2 ➡ felypressin.

PM 254 ➡ phenindamine.

PMD 387 ➡ crilvastatin.

PMSG ➡ serum gonadotrophin.

pobilukast [INN] (pobilukast edamine [USAN]) is a thiaheptanedioic acid derivative, a (D_4) **LEUKOTRIENE RECEPTOR ANTAGONIST.**

pobilukast edamine ➡ pobilukast.

podofilox ➡ podophyllotoxin.

podophyllotoxin [BAN] (podofilox [USAN]; NSC 24818; Condyline™; Condylox™; Warticon™) is a principal from podophyllum resin, a lignan abstracted from *Podophyllum emodi* rhizomes and a number of other plant species, including other *Podophyllum* spp., *Diphylleia grayi*, *Juniperus* spp. and *Linum flavum*. The resin is a potent cytotoxin, an antimitotic agent, an inhibitor of cell division and of human DNA topoisomerase II. It is used topically as a **KERATOLYTIC** for external ano-genital warts and plantar warts. It is highly irritant and toxic, and is no longer used as a cathartic or laxative. Derivatives are used as **ANTICANCER AGENTS** (e.g. **etoposide, teniposide**).

podophyllum ➡ podophyllotoxin.

poldine methylsulfate [BAN, USAN] (Nacton™) is a quaternary ammonium **MUSCARINIC CHOLINOCEPTOR ANTAGONIST**, which can be used as a visceral **ANTISPASMODIC** and for bladder hyperirritability.

policresulen [INN] is a polymeric **ANTISEPTIC** and **HAEMOSTATIC**, used topically often in vaginal preparations.

polidexide [BAN] (polidexide sulfate [INN]; PDX chloride)

is an ion exchange resin that has been used as an ANTIHYPERLIPIDAEMIC, and also has ANTISPASMODIC and antimuscarinic activity.

poliglusam [INN, USAN] (chitin) is a linear polymer of acetamidodeoxyglucose, and occurs in shells of crustacea, most fungi, mycelial yeast and algae. It is used as a HAEMOSTATIC, as an antihaemorrhagic and wound healant. The fully *N*-deacetylated product is called chitan.

polihexanide ➡ **polyhexanide**.

polisteskinin J_t (*N*-Arg,Thre-bradykinin; Arg,Thre-BK) is isolated from the wasp *Polistes jadwigae*, and is a *N*-terminally extended analogue of **bradykinin**. It is a (B_2) BRADYKININ RECEPTOR AGONIST and a HYPOTENSIVE active on a range of vascular and extravascular smooth muscle. It is used as a pharmacological tool.

Pollon-eze™ ➡ **astemizole**.

Polocaine™ ➡ **mepivacaine**.

poloxamer 188 is a polyoxyethylene-polyoxypropylene polymer that is a non-ionic surfactant with (faecal softener) and (stimulant) LAXATIVE properties. It can be used therapeutically alone or combined with other laxatives (e.g. with danthron as co-danthramer).

polycarbophil [BAN, INN] is a polyacrylic acid cross-linked with divinyl glycol. It is a mucoadhesive polymer and has been used in a similar way to (bulk) LAXATIVES. The calcium salt is **polycarbophil calcium**, which has similar properties.

polycarbophil calcium [BAN] (calcium polycarbophil [USAN]; AHR 3260B) is a polyacrylic acid cross-linked with divinyl glycol. It is a mucoadhesive polymer and has been used in a similar way to (bulk) LAXATIVES. It has been investigated for the treatment of irritable bowel syndrome.

polydimethyl siloxane ➡ **dimethicone**.

polyestradiol phosphate (Estradurin™) is an OESTROGEN that is used by injection as an ANTICANCER AGENT in the treatment of cancer of the prostate gland.

Polyferon™ ➡ **interferon γ**.

polyhexanide [BAN] (polihexanide [INN]) is an ANTIBACTERIAL and DISINFECTANT.

polymyxin B [INN] (polymyxin B sulfate [JAN, USAN]; sulfomyxin [INN]) is a cyclic peptide isolated from *Bacillus polymyxa*, and is a (polymyxin) ANTIBIOTIC used as soluble salts. It has ANTIBACTERIAL activity against certain Gram-negative organisms only and can be used by topical application (in combination with other types of antibiotics), but nephrotoxic and neurotoxic adverse effects limit its systemic use. It is also used as a PROTEIN KINASE INHIBITOR active against protein kinase C and also inhibits calmodulin.

polymyxin B sulfate ➡ **polymyxin B**.

polymyxin E ➡ **colistin**.

polynoxylin [BAN, INN] is a condensation product of formaldehyde and urea, which has ANTIBACTERIAL and ANTIFUNGAL properties and can be used as an ANTISEPTIC.

polythiazide [BAN, INN, USAN] (Nephril™; Renese™) is a (thiazide) DIURETIC, used in ANTIHYPERTENSIVE therapy.

Ponderax™ ➡ **fenfluramine hydrochloride**.

Pondimin™ ➡ **fenfluramine hydrochloride**.

Pondocillin™ ➡ **pivampicillin**.

Ponstan™ ➡ **mefenamic acid**.

Ponstel™ ➡ **mefenamic acid**.

Pontocaine™ ➡ **amethocaine**.

porcine pituitary growth hormone (pig somatotropin) is a naturally occurring porcine variant of the PITUITARY HORMONE **somatotropin**. It is a peptide consisting of 190 amino acid residues. There are a number of naturally occurring molecular variants, synthetic variants or recombinant products: somalapor [BAN, INN, USAN]; sometripor [BAN, INN, USAN]; somenopor [BAN, INN, USAN]; somfasepor [INN, USAN] (recombinant product). They are all veterinary forms of bovine growth hormone and can be used by injection as bovine growth enhancers.

porcine secretin ➡ **secretin**.

porfimer sodium [BAN, INN, USAN]; CL 184116;. Photofrin II™) is one of the psoralen group, a polyporphyrin oligomer containing ester and ether linkages. It is used as a photosensitizer in photodynamic therapy tumour ANTICANCER therapy (mainly at oesophagial sites).

Posiject™ ➡ **dobutamine**.

posorutin ➡ **troxerutin**.

Potaba™ ➡ **aminobenzoic acid**.

potassium canrenoate ➡ **canrenoic acid**.

POTASSIUM-CHANNEL ACTIVATORS are agents that modulate, activate or open one or other of the many types of potassium channels that are found in cell membranes. Certain types of these K^+-channels are discussed in more detail under POTASSIUM-CHANNEL BLOCKERS.

First, simple voltage-gated potassium channels seem to have no selective chemical activators, only blockers.

Second, the Ca^{2+}-sensitive K^+-channels – for which there are three recognized currents – are all activated by intracellular levels of Ca^{2+}. One, the high-conductance Ca^{2+}-activated K^+-channel ($I_{BK(Ca)}$) – also called maxi-K channel, or BK channel – has an open-state probability that increases with a rise in $[Ca^{2+}]_i$ over the range 0.1-10 μM, and can have quite a marked effect on excitability. There are experimental chemical activators for this channel (NS 004, NS 1619, DHS-1), but no clinically used drugs that work via this channel. A small-conductance Ca^{2+}-activated K^+-channel ($I_{SK(Ca)}$; apamin-sensitive K(Ca) which can be readily detected since it is selectively blocked by apamin and other agents, is important in mediating some of the membrane effects of agents that mobilize calcium within the cell (especially by the $InsP_3$/DAG pathway): for instance, relaxation in smooth muscle on α_1-adrenoceptor or bradykinin B_2 receptor activation.

A third family of K^+-channels contains a number of ligand-modulated K^+-channels. The muscarinic-inactivated K^+-channel ($I_{K(M)}$; 'M-current') is a time- and voltage-dependent channel seen particularly on cell-bodies of neurons, and provides a braking effect against depolarizing influences. This current can be inhibited – via a G-protein-mediated pathway – following occupation of certain types of receptors (e.g. muscarinic M_1, bradykinin B_2, LH-RH, substance P), and this can provide a quite powerful influence in allowing excitation. This channel can be directly blocked by Ba^{2+}, but apart from the receptor route, cannot be selectively pharmacologically manipulated. There is a similar channel, 5-HT-inactivated channel ($I_{K(5\text{-}HT)}$) inactivated by 5-HT via a G-protein-modulated process, which again results in depolarization and increased excitability. Conversely, activation of the atrial muscarinic-activated K^+-channel (K_{ACh}) is inhibitory in effect, since ligands lead to opening of the channel via a direct-coupled mechanism that is mediated via α- or β-γ-subunits of a G_i-like G-protein. This provides a rapid and powerful inhibitor effect whereby neuronally released **acetylcholine**, or applied cholinergic ligands (e.g. **methacholine**), can slow the heart via this muscarinic M_2-cholinoceptor mechanism. A very similar channel can be activated in many neurons, where a Pertussis-toxin-sensitive G_i-like G-protein can be activated via receptors for a wide-ranging assortment of inhibitory neurotransmitters (e.g. μ-,

κ- and δ-opioid receptors; α_2-adrenoceptors; somatostatin receptors). It should be noted that the G-protein seems to couple either to open the K^+-channel or to close a Ca^{2+}-channel, according to tissue-dependent factors; this seems to be the major mechanism of both presynaptic and postsynaptic inhibition. Clinically, opioid analgesics such as morphine, and sympathetic neuron inhibitors such as clonidine, appear to work by this mechanism.

Finally, a very important and interesting channel is the ATP-sensitive K^+-channel ($I_{K(ATP)}$) where $[ATP]_i$ physiologically inhibits channel opening. Whereas the therapeutically used hypoglycaemic agents **glibenclamide** and **tolbutamide** block this channel, it is activated by some inhibitory endogenous mediators (e.g. **calcitonin-gene related peptide**; CGRP) and by a new class of pharmacological agents that includes **cromakalim**, **diazoxide**, **pinacidil**, **nicorandil** and **minoxidil**. By activating K^+-channels, these agents hyperpolarize and stabilize membranes, and relax smooth muscle. These drugs are referred to as potassium-channel openers and are in use as VASODILATORS for heart failure, as ANTIANGINAL AGENTS, as ANTIHYPERTENSIVES and are being evaluated for use in the treatment of a wide variety of other conditions including asthma.

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POTASSIUM-CHANNEL BLOCKERS act to inhibit the function, not necessarily selectively, of one or more of the many potassium channels: see POTASSIUM-CHANNEL ACTIVATORS.

First, in the cell membrane, the simple voltage-gated potassium channels – of which there are several types, their currents being designated K_V, K_{VR}, K_{VS}, K_A, K_{IR} (and also K_{SR} in the sarcoplasmic reticulum) – which have various voltage sensitivities; and in excitable tissues, including cardiac, smooth and skeletal muscle, in neurons and in some glands, serve some sort of rectifier role. The majority of these are blocked by **tetraethylammonium bromide** (TEA) and **4-aminopyridine** (4AP). A variety of other agents show a degree of selectivity for one or another, including LOCAL ANAESTHETICS, **quinidine**, **9-aminoacridine**, imperator toxin, **dendrotoxin**, **margatoxin**, mast cell-degranulating peptide, **decamethonium iodide**, **hexamethonium bromide**, Cs^+, Ba^{2+}, Sr^{2+}. The main effect of blockade of these channels (e.g. with TEA) is to depolarize the membrane, prolong the action potential and cause spontaneous firing; and in neurons this may result in much enhanced neurotransmitter release. This sort of action seems not to have been much utilized, though in theory might be useful therapeutically in increasing excitability in neuromuscular disease, or multiple sclerosis.

A second family of K^+-channels comprises the Ca^{2+}-sensitive K^+-channels – there are three recognized currents of this type. One, the high-conductance Ca^{2+}-activated K^+-channel ($I_{BK(Ca)}$) – also called maxi-K channel, or BK channel – is blocked by **TEA**, **Ba^{2+}**, **quinine**, **tubocurarine**, **charybdotoxin**, **iberiotoxin**, **noxiustoxin**, soyasaponin and penitrem A. This channel shows voltage-dependence, and the open-state probability of this large conductance channel increases with a rise in $[Ca^{2+}]_i$ over the range 0.1–10μM, and can have quite a marked effect on excitability. There are also experimental chemical activators for this channel (see POTASSIUM-CHANNEL ACTIVATORS). However, as yet there are no clinically used drugs that work via blocking this channel. Another, the intermediate-conductance Ca^{2+}-activated K^+-channels ($I_{IK(Ca)}$) is blocked by a wide variety of agents, e.g. TEA, quinine, Cs^+, Ba^{2+}, carbocyanine dyes, **nitrendipine**, calmodulin antagonists (including, **pimozide**, **haloperidol**, **trifluoperazine**) and **charybdotoxin**. It is not clear whether the clinical effects of any of these agents results from blockade of this channel, but it is believed that metabolic exhaustion opens red blood cell channels (the 'Gardos effect') by increasing $[Ca^{2+}]_i$ and by modifying $[Ca^{2+}]_i$ sensitivity. Last, the low-conductance Ca^{2+}-activated K^+-channels ($I_{SK(Ca)}$; apamin-sensitive K_{Ca}) are blocked notably by **apamin**, but also by **tubocurarine chloride**, **gallamine**, **dequalinium chloride**, UCL 1530 (a bis-quinolinium cyclophane; a cyclized analogue of dequalinium), quinine, **mepacrine** and by TEA only at high concentrations. (There is a variant of this channel in the brain that is insensitive to apamin.) This channel is important in mediating some of the membrane effects of agents that mobilize calcium within the cell (especially by the $InsP_3$/DAG pathway), for instance, relaxation in smooth muscle on α_1-adrenoceptor, bradykinin B_2 or purinoceptor P2Y activation. Injection of apamin into the brain results in convulsions, suggesting there are important central inhibitor processes mediated via this channel.

A third family of K^+-channels serves to collect together the miscellaneous ligand-modulated K^+-channels. First, muscarinic-inactivated K^+-channels ($I_{K(M)}$; 'M-current') is a time- and voltage-dependent channel seen particularly on cell-bodies of neurons, and provides a braking effect against depolarizing influences. This current can be inhibited – via a G-protein-mediated pathway – following occupation of certain types of receptors (e.g. muscarinic M_1, bradykinin B_2, LH-RH, substance P), and this can provide a quite powerful influence in allowing excitation. This channel can be directly blocked by Ba^{2+}, but apart from the receptor route, cannot be selectively pharmacologically manipulated. There is a similar channel, 5-HT-inactivated channel ($I_{K(5\text{-}HT)}$) inactivated by 5-HT via a G-protein-modulated process, which again results in depolarization and increased excitability. Conversely, atrial muscarinic-activated K^+-channel (K_{ACh}) is inhibitory, since ligands lead to opening of the channel via a direct-coupled mechanism, being mediated via α- or β–γ-subunits of a G_i-like G-protein. This provides a rapid and powerful inhibitor effect whereby cholinergic ligands and neurons can slow the heart. A similar current can cause inhibition in many neurons.

Finally, a very important and interesting channel is the ATP-sensitive K^+-channel ($I_{K(ATP)}$), which is inhibited physiologically by $[ATP]_i$. Blocking of these channels by therapeutically used drugs, such as **glibenclamide** and **tolbutamide** (and others, including **lignocaine**, **amethocaine** (tetracaine), quinine, **phentolamine**) inhibits excitability of the membrane, and increases insulin secretion by the islets cells of the pancreas, thereby lowering blood glucose. Activators of these channels cause hyperpolarization and stabilization of excitable membranes, which in smooth muscle results in relaxation. Ligands include the endogenous ligand **CGRP**, and the synthetic agents **cromakalim**, **diazoxide**, **pinacidil**, **nicorandil** and **minoxidil**.

Given this extreme diversity of known K^+-channels with respect to electrophysiological characteristics, distribution between different tissues, and particularly recognition

properties for blockers and activators, there is clearly vast potential for drug development. See also **NEUROTOXINS**.

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potassium clavulanate ➡ **clavulanic acid**.

potassium guaiacolsulfonate [JAN, USAN] (sulfoguaiacol [INN]) is the mixed potassium salts of 4- and 5-guaiacolsulfonic acid, used orally as an **EXPECTORANT**.

potassium iodide [JAN, USAN] has **ANTIFUNGAL** and **EXPECTORANT** properties. It can be used as a topical **ANTISEPTIC**, to treat pulmonary oedema, incorporated into 'cough-mixtures' and as a **MINERAL SUPPLEMENT** for iodine.

potassium menaphthosulphate [BAN] (menadiol potassium sulfate [INN]; vitamin K_4 potassium) is the di-*O*-sulphate di-K salt of **menadiol**, and is a synthetic **VITAMIN**, an analogue of vitamin K, which can be used therapeutically as a **HAEMOSTATIC** prothrombogenic agent.

potassium phosphate dibasic [JAN, USAN] (dipotassium phosphate; dipotassium monohydrogenphosphate; potassium phosphate) is a calcium regulator and cathartic, used to treat hypophosphataemia.

povidone-iodine [BAN, USAN] (Betadine™ and many other names) is a complex of iodine on an organic carrier and is used as an **ANTISEPTIC**. It is topically applied to the skin, especially in sensitive areas, acne of the scalp and in treatment of burns, and also used as a mouthwash. It works by slowly releasing iodine.

PP ➡ **pancreatic polypeptide**.

P_1,P_5-diadenosine tetraphosphate ➡ **Ap4A**.

PP-factor ➡ **nicotinamide**.

PR 786-723 ➡ **anilopam**.

PR 879-317 ➡ **oxamisole**.

P 1496 ➡ **zeranol**.

practolol [BAN, INN, USAN] (Eraldin™) is a **β-ADRENOCEPTOR ANTAGONIST** showing β_1-selectivity. Therapeutically, it can be used in **ANTIHYPERTENSIVE** treatment, though it is now extremely restricted due to serious adverse effects (oculomucocutaneous syndrome).

pralidoxime [BAN] (pralidoxime chloride [USAN]; pralidoxime iodide [INN, USAN]; pralidoxime mesylate; RP 7676; NSC 7760; PAM; 2-PAM; 2-PAMCl; P2S; Protopam chloride™) is an oxime cholinesterase reactivator. It is used parenterally as an **ANTIDOTE** adjunct to **atropine** in treating human or animal (organophosphate group) **ANTICHOLINESTERASE** pesticide toxicity (e.g. **dichlorvos**, **malathion**) or clinical overdose (e.g. **TEPP**).

pralidoxime chloride ➡ **pralidoxime**.

pralidoxime iodide ➡ **pralidoxime**.

pralidoxime mesylate ➡ **pralidoxime**.

pramiracetam [INN] (pramiracetam hydrochloride [USAN]; pramiracetam sulfate [USAN]; CI 879) is one of the piroxicam group, and has been used as a **NOOTROPIC AGENT**.

pramiracetam hydrochloride ➡ **pramiracetam**.

pramiracetam sulfate ➡ **pramiracetam**.

pramiverine [BAN, INN] is a diphenylcyclohexanamine derivative, a **MUSCARINIC CHOLINOCEPTOR ANTAGONIST** that can be used as an **ANTISPASMODIC**.

pramocaine ➡ **pramoxine**.

pramoxine [BAN] (pramocaine [INN]; pramoxine hydrochloride [USAN]; proxazocaine hydrochloride; pramoxinium hydrochloride) is a **LOCAL ANAESTHETIC** without the usual ester or amide link. It is used by topical application, mainly in combination with corticosteroids (Anugesic-HC™, Proctofoam™).

pramoxine hydrochloride ➡ **pramoxine**.

pramoxinium hydrochloride ➡ **pramoxine**.

pranlukast [BAN, INN] is a tetrazolylbenzopyran derivative, a **LEUKOTRIENE RECEPTOR ANTAGONIST** with **ANTIASTHMATIC** and **ANTIALLERGIC** properties.

pranoprofen [INN, JAN] is a member of the propionic acid series, a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity.

prasterone [INN] (prasterone sodium sulphate; dehydroisoandrosterone; DHEAS; prasterone enanthate) is a natural constituent of human adrenal cortex and testicular tissue, and is found in urine. It is a relatively weak **ANDROGEN** and has been used by injection to treat menopausal disorders. It is reported to possess **ANTIDEPRESSANT** and psychotonic properties, and shows **ANTI-HIV** activity.

prasterone enanthate ➡ **prasterone**.

prasterone sodium sulphate ➡ **prasterone**.

Pravachol™ ➡ **pravastatin**.

pravastatin [BAN, INN] (pravastatin sodium [JAN, USAN]; CS 514; SQ 31000; Pravachol™) is isolated from *Absidia coerulea*, and is a **HMG-COA REDUCTASE INHIBITOR**. It is used as an antihypercholesterolaemic agent.

pravastatin sodium ➡ **pravastatin**.

Praxilene™ ➡ **naftidrofuryl**.

prazepam [BAN, INN, JAN, USAN] is one of the [1,4]benzodiazepines, a **BENZODIAZEPINE BINDING-SITE AGONIST** with most of its properties similar to **diazepam**. It has **HYPNOTIC, ANTICONVULSANT** and **ANXIOLYTIC** activity, and is used orally for anxiety disorders.

praziquantel [BAN, INN, USAN] (Biltricide™) is an **ANTHELMINTIC**, used orally as an **ANTISCHISTOSOMAL AGENT**.

prazosin [BAN, INN] (prazosin hydrochloride [JAN, USAN]; Hypovase™; Minipress™) is the archetype of a series containing the piperazinyl quinazolinyl nucleus, and is an (α_1-subtype) **α-ADRENOCEPTOR ANTAGONIST**. Clinically, it can be used as an oral **ANTIHYPERTENSIVE**, in congestive **HEART FAILURE TREATMENT**, in the treatment of benign prostatic hyperplasia and in peripheral vascular disease.

prazosin hydrochloride ➡ **prazosin**.

Precortisyl™ ➡ **prednisolone**.

Pred Forte™ ➡ **prednisolone**.

Prednesol™ ➡ **prednisolone**.

prednacinolone ➡ **desonide**.

prednicarbate [INN, USAN] (Hoe 777; S 770777) is a **CORTICOSTEROID**, a **GLUCOCORTICOID** with **ANTIINFLAMMATORY** and **ANTIALLERGIC** properties. It has beeen used topically for a variety of inflammatory disorders.

prednimustine [INN, USAN] (EORTC 1502; Leo 1031; NSC 134087) is the **prednisolone** ester of **chlorambucil**, used in **ANTICANCER** treatment of leukaemias and lymphomas.

prednisolamate ➡ **prednisolone**.

prednisolone [BAN, INN] (1-dehydrocortisol; Δ^1-cortisol; NSC 9120; prednisolone acetate [USAN]; prednisolone hemisuccinate [USAN]; prednisolone sodium succinate; prednisolamate [BAN, INN]; prednisolone tebutate [USAN]; Prednival [USAN]; Cotolone™; Deltacortril™; Deltastab™; Precortisyl™; Pred Forte™; Prednesol™; Predsol™; Prelone™ and many other names) is a **CORTICOSTEROID**, a **GLUCOCORTICOID** with **ANTIINFLAMMATORY** and **ANTIALLERGIC**

properties. It is used in the treatment of a number of rheumatic and allergic conditions and collagen disorders. It is also an effective treatment for ulcerative colitis, inflammatory bowel disease, Crohn's disease, rectal or anal inflammation, haemorrhoids and as an immunosuppressant in the treatment of myasthenia gravis. It may also be used for systemic corticosteroid therapy. Administration can be oral, by topical application or by injection.

prednisolone acetate ➡ **prednisolone**.

prednisolone hemisuccinate ➡ **prednisolone**.

prednisolone sodium succinate ➡ **prednisolone**.

prednisolone tebutate ➡ **prednisolone**.

prednisone [BAN, INN, USAN] (deltacortisone; metacortandracin; NSC 10023; prednisone acetate; prednisone succinate; prednisone palmitate; Orasone™; Deltasone™ and many other names) is a CORTICOSTEROID, a prodrug of **prednisolone** to which it is converted in the liver, when it has GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It can be used orally for a variety of inflammatory and allergic disorders.

prednisone acetate ➡ **prednisone**.

prednisone succinate ➡ **prednisone**.

prednisone palmitate ➡ **prednisone**.

Prednival ➡ **prednisolone**.

Predsol™ ➡ **prednisolone**.

Preferid™ ➡ **budesonide**.

pregnant mares' serum gonadotropin ➡ **serum gonadotrophin**.

pregnenedione ➡ **progesterone**.

Pregnyl™ ➡ **chorionic gonadotropin**.

Prelone™ ➡ **prednisolone**.

prenalterol [BAN, INN] (prenalterol hydrochloride [USAN]) is a (partial) β-ADRENOCEPTOR AGONIST showing (cardiac) β_1-selectivity. It can be used in HEART FAILURE TREATMENT.

prenalterol hydrochloride ➡ **prenalterol**.

prenylamine [BAN, INN, USAN] is a phenylpropylamine, a coronary VASODILATOR; its use in ANTIANGINAL treatment has diminished due to toxicity. It depletes catecholamines in the heart and has some CALCIUM-CHANNEL BLOCKER activity.

Prepadine™ ➡ **dothiepin**.

Prepidin™ ➡ **dinoprostone**.

preproendothelin I ➡ **endothelin-1**.

γ-preprotachykinin 72-92 ➡ **neuropeptide γ**.

Prepulsid™ ➡ **cisapride**.

Prescal™ ➡ **isradipine**.

Priadel™ ➡ **lithium carbonate**; **lithium citrate**.

pridinol [INN] (pridinol mesilate [JAN]) is a diphenylpiperidine derivative with anticholinergic activity. It can be used as a centrally acting SKELETAL MUSCLE RELAXANT and ANTIPARKINSONIAN AGENT.

pridinol mesilate [JAN] is a tertiary amine piperidine derivative, a MUSCARINIC CHOLINOCEPTOR ANTAGONIST. It has been proposed for use as a visceral ANTISPASMODIC, ANTIPARKINSONIAN, ANTIINFLAMMATORY and SKELETAL MUSCLE RELAXANT for symptomatic relief of spasm.

prifinium bromide [INN, JAN] is a quaternary ammonium compound with MUSCARINIC CHOLINOCEPTOR ANTAGONIST and SMOOTH MUSCLE RELAXANT activity. It was formerly used as an ANTISPASMODIC in the treatment of irritable bowel syndrome.

prilocaine [BAN, INN] (prilocaine hydrochloride [JAN, USAN]; Astra 1512; Citanest™) is an amide series LOCAL ANAESTHETIC with a rapid onset and intermediate duration of action, which is quite widely used by injection for infiltration, dental, regional and epidural pain relief and motor block. It can be used in combination with **felypressin** in preparations for injection to prolong its action (Citanest with Octapressin™).

prilocaine hydrochloride ➡ **prilocaine**.

Prilosec™ ➡ **omeprazole**.

Primacor™ ➡ **milrinone**.

Primalan™ ➡ **mequitazine**.

primaquine [BAN, INN, USAN] (Citanest™) is an 8-AMINOQUINOLINE, used as an ANTIMALARIAL AGENT.

primaquine phosphate ➡ **primaquine**.

Primaxin™ ➡ **cilastatin**; **imipenem**.

primidolol [BAN, INN, USAN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIHYPERTENSIVE, ANTIARRHYTHMIC and ANTIANGINAL properties.

primidone [BAN, INN, USAN] (Mysoline™) is a pyrimidinedione closely related to the barbiturates, and its actions are similar to **phenobarbitone**. It is an ANTICONVULSANT that can be used in oral ANTIEPILEPTIC treatment of all forms of epilepsy (except absence seizures) and of essential tremor.

Primolut™ ➡ **norethisterone**.

Primoteston Depot™ ➡ **testosterone**.

Primperan™ ➡ **metoclopramide**.

Prinivil™ ➡ **lisinopril**.

prinoxodan [INN, USAN] is a quinazolinone, a PHOSPHODIESTERASE INHIBITOR with CARDIAC STIMULANT activity.

Prioderm™ ➡ **malathion**.

Priscoline™ ➡ **tolazoline**.

prizidilol [BAN, INN] (prizidilol hydrochloride [USAN]) is a β-ADRENOCEPTOR ANTAGONIST with ANTIHYPERTENSIVE, ANTIARRHYTHMIC, ANTIANGINAL and VASODILATOR properties.

prizidilol hydrochloride ➡ **prizidilol**.

proaccelerin ➡ **factor V**.

proadifen [INN] (SKF 525A) is an ENZYME INHIBITOR, a non-specific cytochrome P-450 inhibitor. It can be used as a pharmacological analytical tool as an inhibitor of drug metabolism. It is not used therapeutically.

Pro-Banthine™ ➡ **propantheline bromide**.

probenecid [BAN, INN] (Benemid™) is a lipid-soluble sulphonyl derivative of benzoic acid. It inhibits the active transport of organic anions across the renal tubule, preventing both reabsorption from the tubular fluid and secretion into it. It can be used to inhibit the excretion of penicillin and cephalosporin antibiotics, so increasing their duration of action. As an inhibitor of urate absorption it increases its excretion in the urine, so can be used orally as an URICOSURIC AGENT to treat hyperuricaemia and as an antigout treatment against attacks in chronic gout.

probicromil calcium ➡ **ambicromil**.

probucol [BAN, INN, JAN, USAN] (DH 581) is a substituted mercaptole, an ANTIHYPERLIPIDAEMIC with ANTIOXIDANT properties, and has a protective effect in drug-induced cardiomyopathy and nephropathy though an adverse effect is to increase the cardiac action potential.

procainamide [BAN, INN] (procainamide hydrochloride [USAN]; Procan™; Pronestyl™ and many other names) is a benzamide, an ANTIARRHYTHMIC and CARDIAC DEPRESSANT, used for the management of ventricular and supraventricular arrhythmias. Long-term use is associated with systemic lupus erythematosus.

procainamide hydrochloride ➡ **procainamide**.

procaine [BAN, INN] (procaine hydrochloride [USAN]; Novocain™) is an ester series LOCAL ANAESTHETIC, which is now seldom used because it has been superseded by longer-lasting anaesthetics that are better absorbed through mucous

membranes. It cannot be used as a surface anaesthetic because it is poorly absorbed. However, it is still available and can be used by injection for regional anaesthesia or by infiltration. It is a pharmacological tool for studying intracellular calcium flux. It is used as a compound preparation, **procaine penicillin**, for depot injections.

procaine hydrochloride ➡ **procaine**.

procaine penicillin [BAN] (penicillin G procaine [USAN]; Wycillin™) is the relatively slow-release procaine salt of the (penicillin) ANTIBIOTIC **benzylpenicillin**, and is used as an ANTIBACTERIAL.

Procan™ ➡ **procainamide**.

procarbazine [BAN, INN] (procarbazine hydrochloride [INN, USAN]; ibenzmethyzin hydrochloride; NSC 77213; Ro 4-6467; Matulane™; Natulan™) is a cytotoxic ANTICANCER AGENT unrelated to other agents, and is used in the oral treatment for the lymphatic cancer Hodgkin's disease.

procarbazine hydrochloride ➡ **procarbazine**.

procaterol [BAN, INN] (procaterol hydrochloride [JAN, USAN]) is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype. Therapeutically, it can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.

procaterol hydrochloride ➡ **procaterol**.

prochlorpemazine ➡ **prochlorperazine**.

prochlorperazine [BAN, INN, USAN] (prochlorperazine edisylate [USAN]; proclorperazine; prochlorpemazine; Buccastem™; Compazine™; Stemetil™) is a phenothiazine which has tranquillizer properties. It is used as an ANTIPSYCHOTIC in the treatment of psychotic disorders, such as schizophrenia, as an ANXIOLYTIC in the short-term treatment of anxiety, and also as an ANTIEMETIC and antinauseant in the prevention of nausea caused by gastrointestinal disorder, chemotherapy, radiotherapy, motion sickness, or by the vertigo that results from infection of the middle or inner ear.

prochlorperazine edisylate ➡ **prochlorperazine**.

procinolol [INN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIARRHYTHMIC properties.

proclorperazine ➡ **prochlorperazine**.

procodazole [INN] (benzimidazolylpropionic acid) is reported to have (immunostimulant) IMMUNOMODULATOR properties.

proconvertin ➡ **factor VII**.

Procrit™ ➡ **epoetin alpha**.

procromil [BAN] is a chromone, an ANTIALLERGIC and mediator release inhibitor similar to **cromoglycic acid**, which potentially can be used for prophylaxis of allergic conditions, including asthma prophylaxis.

procyclidine [BAN, INN] (procyclidine hydrochloride [USAN]; Arpicolin™; Kemadrin™) is a tertiary amine MUSCARINIC CHOLINOCEPTOR ANTAGONIST which can be used as an ANTIPARKINSONIAN in controlling tremor and rigidity.

procyclidine hydrochloride ➡ **procyclidine**.

prodine is one of the phenylpiperidine series and resembles **pethidine**. It is an OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC, which can be used in the form of its diastereoisomers; both the (3*RS*,4*SR*)-(±)-form, alphaprodine [BAN, INN], and the (3*RS*,4*RS*)-(±)-form, betaprodine [BAN, INN], are analgesics.

prodynorphin 228-240DFP ➡ **dynorphin B**.

profadol [BAN, INN] (profadol hydrochloride [USAN] is one of the phenylpiperidine series, and is a mixed OPIOID RECEPTOR AGONIST and OPIOID RECEPTOR ANTAGONIST, with OPIOID ANALGESIC and ANTITUSSIVE activity.

profadol hydrochloride ➡ **profadol**.

Profasi™ ➡ **chorionic gonadotropin**.

Profenal™ ➡ **suprofen**.

profenamine ➡ **ethopropazine**.

progabide [BAN, INN, USAN] (SL 76002) is an aminobutanamide, a ($GABA_A$ and $GABA_B$) GABA RECEPTOR AGONIST which acts as an ANTICONVULSANT and can be used in ANTIEPILEPTIC treatment. It is also an epoxide hydrolase inhibitor.

Progesic™ ➡ **fenoprofen**.

Progest™ ➡ **progesterone**.

PROGESTOGENS are a group of steroid sex hormones formed and released by the ovaries and placenta in women, the adrenal gland and in small amounts by the testes in men. Physiologically, they prepare the endometrium of the uterus for pregnancy, and maintain it throughout pregnancy. They also prevent further ovulation in pregnancy. They include: the natural progestogen **progesterone** and chemically related compounds **dydrogesterone**, **hydroxyprogesterone** and **medroxyprogesterone**; also analogues of **testosterone**, e.g. **norgestrel**, **norethisterone** and recently introduced analogues **desogestrel**, **levonorgestrel**, **norgestimate** and **gestodene**. All are synthesized for therapeutic use and can be taken orally. They have many uses, including the treatment of menstrual disorders (menorrhagia and severe dysmenorrhoea), endometriosis (inflammation of the tissues normally lining the uterus), in HRT, recurrent (habitual) abortion and to relieve the symptoms of premenstrual syndrome; they are also used sometimes in breast, endometrial and prostate cancer. The most common use is as constituents (with or without OESTROGENS) in oral CONTRACEPTIVES.

Competitive progesterone receptor antagonists are available, and one such, **mifepristone**, is used to procure therapeutic abortion: see ABORTIFACIENTS.

Chez, R.A. (1989) Clinical aspects of three new progestogens: desogestrel, gestodene, and norgestimate. *Am. J. Obstet. Gynecol.*, **160**, 1296-1300.
Baird, D.T. *et al.* (1993) Hormonal contraception. *N. Engl. J. Med.*, **328**, 1543-1549.
Belchetz, P.E. (1994) Hormonal treatment of postmenopausal women. *N. Engl. J. Med.*, **330**, 1062-1071.

progesterone [BAN, INN, USAN] (pregnenedione; luteohormone; Cyclogest™; Gestone™; Progest™) is a steroid PROGESTOGEN hormone found predominantly in women, but also in men. In women, it is produced and secreted mainly by the ovaries (and also the corpus luteum of pregnant women and by the adrenal glands). It prepares the endometrium every menstrual cycle to receive a fertilized ovum. Clinically, progesterone is administered to women to treat various menstrual and gynaecological disorders. Administration is by topical application as suppositories, or by injection.

proglumetacin [BAN, INN] (proglumetacin maleate [JAN]; CR 604) is a substituted member of the indole acetic acid series, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

proglumetacin maleate ➡ **proglumetacin**.

proglumide [BAN, INN, JAN, USAN] (CR 242; W 5219) is a benzamidoglutaramic acid derivative, a subtype non-selective (CCK_A and CCK_B) CHOLECYSTOKININ RECEPTOR ANTAGONIST. It is a GASTRIC SECRETION INHIBITOR, and has been used clinically as an ANTIULCEROGENIC.

Prograf™ ➡ **tacrolimus**.

proguanil [BAN, INN] (bigumalum; chloroguanide; RP 3359; SN 12837; Paludrine™ and many other names) is a biguanide, an AMOEBICIDE used clinically as an ANTIMALARIAL in prophylaxis and treatment. It acts as a folate metabolism modifier, inhibiting the utilization of folate by acting as a DIHYDROFOLATE REDUCTASE INHIBITOR.

Progynova™ ➡ **oestradiol**.

proheptazine [BAN, INN] (Wy 757) is an azepin compound, and is an OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC.

prolactin (mammotropin; galactin; lactogen; LMTH; LTH; luteomammotropic hormone; luteotrophic hormone; luteotropin) is a water-soluble polypeptide hormone originally isolated from the anterior pituitary glands of a wide variety of vertebrates. Its structure varies with species. It regulates reproductive functions. In humans it has a definitive role, with **oxytocin**, in lactation and milk ejection. In animals, it has a wide range of roles in reproduction, electrolyte balance, growth and development of the young. Its release is inhibited by **prolactin release-inhibiting factor** (probably **dopamine**). It also shows immunoregulatory activity. Human prolactin is a single chain of 199 amino acid residues with three cystine crosslinks. Ovine prolactin has 199 residues; equine prolactin 199 residues and 2 disulphide links; mouse prolactin 197 residues and 3 disulphide linkages; rat prolactin 197 residues and 3 disulfide linkages; sea turtle prolactin 198 residues and 3 disulfide linkages; carp prolactin 186 residues and 2 disulphide linkages.

prolactin release-inhibiting factor (hypothalamic inhibitory factor; PIF; PRIF) is a factor released from the hypothalamus that inhibits release of **prolactin** from the pituitary gland. Unlike the other peptide release-modifying factors, it is an amine, thought to be the neurotransmitter **dopamine**.

PROLACTIN RELEASE INHIBITORS act to reduce release of **prolactin**. This hormone is a single-chain 198 residue somatotrophic peptide secreted into the bloodstream by mammotrophic (lactotroph) cells situated in the anterior pituitary gland in both men and women – though its main role is in control of lactation. The peptide itself has no therapeutic application. However, the release of prolactin is influenced by the hypothalamus via the tubero-infundibular system, by means of a neuroendocrine factor called **prolactin-release inhibiting factor** (PRIF), which is thought to be, unlike the other peptide release-modifying factors, an amine – the neurotransmitter **dopamine**. This important fact explains why drugs such as **bromocriptine** – which stimulates dopamine receptors – suppresses prolactin secretion in pregnancy. In fact, it has been known for some time that various ergot derivatives inhibit prolactin release, and it is now realized that they, and other drugs, do this by acting as agonists at dopamine D_2 receptors, and this also accounts for the side-effects of some dopamine agonists. Bromocriptine can be used to suppress prolactin secretion in normal pregnancy, in treating galactorrhea and in treating the overproduction of prolactin that may occur in pituitary tumours. Also, growth hormone secretion by the pituitary is increased by dopamine in normal subjects, but paradoxically inhibits it in acromegaly (a syndrome characterized by excessive growth in some parts of the body), and this syndrome can also be treated with bromocriptine. See DOPAMINE RECEPTOR AGONISTS; PITUITARY HORMONES.

Leong, D.A. *et al.* (1983) Neuroendocrine control of prolactin secretion. *Annu. Rev. Physiol.*, **45**, 109-127.

Hartog, M. *et al.* (1988) Hyperprolactinaemia: common and treatable. *Br. Med. J.*, **297**, 701.

Prolastin™ ➡ **alpha$_1$-antitrypsin**.

Proleukin™ ➡ **aldesleukin**.

prolintane [BAN, INN] (prolintane hydrochloride [USAN]; SP 732) is a mild CNS STIMULANT with properties similar to **amphetamine** incorporated into tonic preparations.

prolintane hydrochloride ➡ **prolintane**.

Prolixin™ ➡ **fluphenazine**.

Proluton™ ➡ **hydroxyprogesterone**.

prolylleucylglycinamide ➡ **melanostatin**.

prolylleucylproline is an analogue of thyrotrophin-releasing hormone, a PITUITARY HORMONE. It has dopamine receptor modulating activity.

promazine [BAN, INN] (promazine hydrochloride [USAN]; Sparine™) is a phenothiazine, used orally or by injection as an ANTIPSYCHOTIC to tranquillize agitated and restless patients, especially the elderly.

promazine hydrochloride ➡ **promazine**.

promegestone [INN] (R 5020) is a synthetic steroid PROGESTOGEN, formerly used for menstrual problems.

promestriene [INN] is a CORTICOSTEROID with GLUCOCORTICOID and OESTROGEN properties. It has ANTIINFLAMMATORY and ANTIALLERGIC properties, and has been used topically for atrophic vaginitis and as an antiseborrheic agent.

promethazine [BAN] (promethazine hydrochloride [USAN]; Phenergan™; Promethegan™; Sominex™ and many other names) is one of the phenothiazine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS. It has SEDATIVE/TRANQUILLIZER properties, and is used as an ANTITUSSIVE, ANTIALLERGIC and antipruritic. It is also occasionally used as a HYPNOTIC, a sedative in preoperative and postoperative medication, as an ANTIEMETIC (including for sugery) and as an adjunct to opioid analgesia. It is an antitussive and DECONGESTANT component of cough and 'cold-cure' preparations. The derivative promethazine theoclate [BAN] (Avomine™) has similar properties but a slightly longer duration of action.

promethazine hydrochloride ➡ **promethazine**.

promethazine theoclate ➡ **promethazine**.

Promethegan™ ➡ **promethazine**.

Prominal™ ➡ **methylphenobarbitone**.

Pronestyl™ ➡ **procainamide**.

pronetalol ➡ **pronethalol**.

pronethalol [BAN] (pronetalol [INN]; Alderlin™; Nethalide™) is a β-ADRENOCEPTOR ANTAGONIST with ANTIANGINAL, ANTIARRHYTHMIC and ANTIHYPERTENSIVE properties. It was the first β-blocker used clinically (ICI), though it was withdrawn at an early stage.

prontosil (diaminoazobenzenesulfoname) is a red-coloured sulphonamide with ANTIBACTERIAL activity, converted *in vivo* to **sulphanilamide** as active metabolite. It is of historical importance as the first agent of this type (Domagk, 1935). It is also a CARBONIC ANHYDRASE INHIBITOR, used experimentally.

Prontosil album™ ➡ **sulfanilamide**.

ProPACAP ➡ **pituitary adenylate cyclase-activating peptide**.

propacetamol [INN] (UP 34101) is a prodrug of **paracetamol**, and is a weak CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIPYRETIC and weak ANTIINFLAMMATORY activity.

propafenone [BAN, INN] (propafenone hydrochloride [JAN, USAN]; Arythmol™) is a (class Ic) ANTIARRHYTHMIC with weak β-ADRENOCEPTOR ANTAGONIST and (negative inotropic) CARDIAC DEPRESSANT activity.

propafenone hydrochloride ➡ **propafenone**.

propagermanium [INN] (carboxyethylgermanium sesquioxide; Ge 132) is a polymeric compound with (IMMUNOSTIMULANT) IMMUNOMODULATOR activity. It has been used as an ANTIVIRAL in the treatment of hepatitis B.

propamidine [BAN, INN] is an ANTIBACTERIAL, ANTIFUNGAL and ANTIPROTOZOAL AGENT (selective binds to DNA) active against *Acanthamoeba*.

propanidid [BAN, INN, JAN, USAN] (B 1420) is an intravenous GENERAL ANAESTHETIC. It is no longer marketed.

propanocaine [INN] is an ester series LOCAL ANAESTHETIC,

used by topical application.

propantheline bromide [BAN, INN, USAN] (Pro-Banthine™) is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST. It can be used as a visceral ANTISPASMODIC and as an adjunct in the treatment of ulcers.

proparacaine hydrochloride ➡ **proxymetacaine**.

propatyl nitrate [BAN, INN, USAN] (ettriol trinitrate) is an organic nitrate, a coronary VASODILATOR.

Propavan™ ➡ **propiomazine**.

propenidazole [INN] is a nitroimidazolyl ANTIPROTOZOAL AGENT, used to treat trichomoniasis.

propentofylline [BAN, INN, JAN] (HWA 285) is a xanthine derivative, with VASODILATOR activity, an adenosine UPTAKE INHIBITOR, a (P1 purinoceptor) ADENOSINE RECEPTOR ANTAGONIST active at the A_1 and A_2 subtypes, and a PHOSPHODIESTERASE INHIBITOR. It is neuroprotective in experimental cerebral ischaemia, and is a potential antidementia agent.

properidine [BAN, INN] (Nu 896) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

Propess-RS ➡ **dinoprostone**.

propheniramine ➡ **pheniramine**.

propicillin [BAN, INN] (levopropylcillin potassium [USAN] (α-(*S*)-form is levopropicillin [INN]) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used clinically as an ANTIBACTERIAL to treat certain infections.

Propine™ ➡ **dipivefrine**.

propiolactone [BAN, INN, USAN] is a DISINFECTANT with ANTIBACTERICAL, ANTIFUNGAL, antifungicide and ANTIVIRAL properties. It can be used as a vapour and is rather toxic.

propiomazine [BAN, INN, USAN] (propiomazine hydrochloride [USAN]; propiomazine maleate; Wy 1359; Propavan™) is a phenothiazine with HISTAMINE H_1-RECEPTOR ANTAGONIST properties, but is used as a SEDATIVE, a HYPNOTIC and in preoperative medication.

propiomazine hydrochloride ➡ **propiomazine**.

propiomazine maleate ➡ **propiomazine**.

propiram [BAN, INN] (propiram fumarate [USAN]; Bay 4503) is one of the phenylpiperidine series, an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

propiram fumarate ➡ **propiram**.

Propium™ ➡ **pantoprazole**.

propizepine [INN] is one of the tricyclic group and has been used as an ANTIDEPRESSANT.

propofol [BAN, INN, USAN] (diisopropylphenol; disoprofol (obsol.); ICI 35868; Deprivan™ and many other names) is an extensively used intravenous GENERAL ANAESTHETIC with rapid recovery.

propoxur [BSI, ISO] is a carbamate ANTICHOLINESTERASE which can be used as a nonsystemic INSECTICIDE against a wide range of insects, including mosquitoes and lice.

propoxycaine [INN] (propoxycaine hydrochloride [USAN]) is an ester series LOCAL ANAESTHETIC, which is used by topical application.

propoxycaine hydrochloride ➡ **propoxycaine**.

propoxyphene is one of the methadone series, and is an OPIOID RECEPTOR AGONIST, OPIOID ANALGESIC and ANTITUSSIVE. It can be used in the form of its diastereoisomers. The (2*S*,3*R*)-(+)-form is **dextropropoxyphene**, which is the form generally used; the (2*R*,3*S*)-(-)-form is **levopropoxyphene**.

propoxyphene hydrochloride ➡ **dextropropoxyphene**.

propoxyphene napsylate ➡ **dextropropoxyphene**.

propranolol [BAN, INN] (propranolol hydrochloride [JAN, USAN]; Inderal™) is a subtype non-selective β-ADRENOCEPTOR ANTAGONIST, which is relatively lipophilic. It can be used therapeutically in ANTIHYPERTENSIVE, ANTIANGINAL, ANTIARRHYTHMIC, ANTIMIGRAINE, ANXIOLYTIC and ANTITHYROID treatment. The racemate is usually used in medicine but the (*R*)-form is also available – dexpropranolol [BAN, INN]; dexpropranolol hydrochloride [USAN].

propranolol hydrochloride ➡ **propranolol**.

propylhexedrine [BAN, INN] (hexahydrodesoxyephedrine) is an (indirect-acting) SYMPATHOMIMETIC, a volatile liquid with properties similar to **dexedrine**. It is a CNS STIMULANT (with abuse potential) and has been used as a VASOCONSTRICTOR nasal DECONGESTANT.

2-propylthio-β,γ-difluoromethylene-ATP ➡ **ARL 66096**.

propylthiouracil [BAN, INN, JAN, USAN] is one of the thionamide (thioureylene) series ANTITHYROID AGENTS which acts on the thyroid gland to reduce the production of the THYROID HORMONES. It is used orally to treat hyperthyroidism (Graves' disease) and its detrimental effects (thyrotoxicosis).

3-propylxanthine ➡ **enprofylline**.

propyphenazone [BAN, INN] (isopropylphenazone) is one of the pyrazolone series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It has been incorporated into many compound preparations.

propyromazine bromide [INN] is a quaternary ammonium compound with MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity, and was formerly used as a visceral ANTISPASMODIC.

proquamezine [BAN] (aminopromazine [INN]) is a phenothiazine, an ANTISPASMODIC used in veterinary practice.

proquazone [BAN, INN, USAN] is one of the pyrazolone series, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

prorenoate (prorenoate potassium [BAN, INN, USAN]; SC 23992) is a steroid, an ALDOSTERONE-ANTAGONIST (potassium-sparing) DIURETIC, used in ANTIHYPERTENSIVE therapy.

prorenoate potassium ➡ **prorenoate**.

proscillaridin [BAN, INN, JAN, USAN] (proscillaridin A) is a glycoside isolated from *Scilla maritima* (*Drimia maritima*) (Liliaceae) with (inotropic) CARDIAC STIMULANT actions similar to **digoxin** and other CARDIAC GLYCOSIDES.

proscillaridin A ➡ **proscillaridin**.

ProSom™ ➡ **estazolam**.

prospidium chloride [INN] has reported ANTICANCER activity.

prostacyclin ➡ **epoprostenol**.

Δ^{17}-prostacyclin ➡ **prostaglandin I_3**.

prostaglandin D_2 (PGD_2) is a prostaglandin metabolite of PGH_2, and is a natural PROSTANOID RECEPTOR AGONIST. It is a bronchoconstrictor and PLATELET AGGREGATION INHIBITOR.

prostaglandin D_3 (PGD_3) is a prostaglandin metabolite of PGH_3, and is a natural PROSTANOID RECEPTOR AGONIST. It is a blood PLATELET AGGREGATION INHIBITOR.

prostaglandin E_1 ➡ **alprostadil**.

prostaglandin E_2 ➡ **dinoprostone**.

prostaglandin F_1 ➡ **prostaglandin $F_{1\alpha}$**.

prostaglandin $F_{2\alpha}$ ➡ **dinoprost**.

prostaglandin $F_{1\alpha}$ ($PGF1\alpha$; prostaglandin F_1) is a metabolite of **arachidonic acid** and natural prostaglandin, which is most active as a FP-subtype PROSTANOID RECEPTOR AGONIST. It causes contraction of many types of smooth muscle, especially the uterus as an OXYTOCIC AGENT.

prostaglandin G_2 (PGG_2) is a metabolite of **arachidonic**

acid and natural prostaglandin. It is a PROSTANOID RECEPTOR AGONIST that *in vitro* contracts vascular smooth muscle.

prostaglandin H_2 (prostaglandin R_2; PGH_2; PGR_2) is a metabolite of **arachidonic acid** and natural prostaglandin. It is a PROSTANOID RECEPTOR AGONIST that *in vitro* contracts vascular smooth muscle.

prostaglandin H_3 (PGH_3) is a prostaglandin formed *in vivo* from dietary eicosapentaenoic acid. It is a PROSTANOID RECEPTOR AGONIST which acts as a blood PLATELET AGGREGATION INHIBITOR.

prostaglandin I_1 (5,6-dihydroprostacyclin) is a synthetic stable analogue of **prostacyclin**, and is a PROSTANOID RECEPTOR AGONIST. It is a blood PLATELET AGGREGATION INHIBITOR and shows antilipolytic activity.

prostaglandin I_2 ➡ **epoprostenol**.

prostaglandin I_3 (PGI_3; Δ^{17}-prostacyclin) is an unstable prostaglandin formed *in vivo* from dietary eicosapentaenoic acid. It is a PROSTANOID RECEPTOR AGONIST that acts as a blood PLATELET AGGREGATION INHIBITOR.

prostaglandin R_2 ➡ **prostaglandin H_2**.

prostaglandin X ➡ **epoprostenol**.

prostalene [BAN, INN, USAN] (RS 9390) is a synthetic prostanoid and PROSTANOID RECEPTOR AGONIST, and is a veterinary LUTEOLYTIC AGENT.

PROSTANOID RECEPTOR AGONISTS act at receptors recognizing prostanoids, which are members of the eicosanoid family of phospholipid mediators. Prostanoids can be subdivided into the **thromboxanes** and the **prostaglandins**. Eicosanoids are mainly derived from arachidonic acid (5,8,11,14-eicosatetraenoic acid). The other members of the eicosanoid family are the **leukotrienes** – which are formed by the lipoxygenase system (see LIPOXYGENASE INHIBITORS). In contrast, the thromboxanes and the prostaglandins are formed by the cyclooxygenase system (see CYCLOOXYGENASE INHIBITORS). All these mediators are synthesized on demand, and in some cases their half-lives are short (e.g. **prostacyclin** about 3 minutes).

There are a number of thromboxanes and prostaglandins, each with different pharmacology, acting at a number of receptors. The receptors are all of the 7-transmembrane G-protein-coupled type, and a number have now been cloned. Their classification must be regarded as provisional since more selective agonists, and particularly antagonists, are awaited. **Thromboxane A_2** (TBA_2) is formed predominantly in platelets, and acts predominantly at TP-receptors to cause platelet aggregation and vasoconstriction. Prostacyclin (prostaglandin I_2; PGI_2) is formed predominantly by the vascular endothelium, and acts at IP-receptors to cause vasodilation and inhibit platelet aggregation. **Prostaglandin E_2** (PGE_2) acts at the various EP-receptors ($EP_{1,2,3,4}$) to cause, contraction of bronchial and gastrointestinal muscle (EP_1), relaxation of bronchial vasculature and gastrointestinal muscle (EP_2), inhibition of gastric secretion and increased gastric mucus secretion, contraction of pregnant uterus and gastrointestinal muscle, inhibition of lipolysis and of autonomic neurotransmitter release (EP_3). PGE_2 is also a mediator of fever, but the receptor type is not known. **Prostaglandin $F_{2\alpha}$** acts at FP-receptors in smooth muscle and the corpus luteum, and in humans causes contraction of the uterus. **Prostaglandin D_2**, which is released particularly from mast cells, acts at DP-receptors and causes vasodilation and inhibition of platelet aggregation. The order of potency properties of the receptors, may be summarized as follows.

DP-receptors: $PGD_2 >> PGE_2 >> PGF_{2\alpha} > PGI_2 \approx BA_2$. The receptor couples positively to adenylyl cyclase. Selective agonists include BW 245C, ZK 110841 and RS 93520.

FP-receptors: $PGF_{2\alpha} > PGD_2 > PGE_2 > PGI_2 \approx TBA_2$. The receptor couples to the IP_3/DAG system. Selective agonists include **fluprostenol** and **latanoprost**.

IP-receptors ('prostacyclin receptors'): $PGI_2 > PGF_{2\alpha} \approx PGD_2 \approx PGE_2 > TBA_2$. These receptors couple positively to adenylyl cyclase. Selective agonists include **cicaprost**. Other agonists that have been investigated include octimabate, EP 185 and BMY 45778.

TP-receptors ('thromboxane receptors'): $TBA_2 = PGH_2 >> PGD_2 \approx PGE_2 \approx PGF_{2\alpha} \approx PGI_2$. The receptor couples to the IP_3/DAG system. The receptor has two alternative splicing forms; $TP_{(a)}$ and $TP_{(b)}$. Selective agonists include **U 46619**, STA_2 and I-BOP.

EP_1-receptors: $PGE_2 > PGF_{2\alpha} \approx PGI_2 > PGD_2 \approx TBA_2$. The receptor couples to the IP_3/DAG system. Selective agonists include **iloprost** and 17-phenyl-ω-trinor-PGE_2 (but the latter also acts at EP_3 receptors).

EP_2-receptors: $PGE_2 > PGF_{2\alpha} \approx PGI_2 > PGD_2 \approx TBA_2$. The receptor couples positively to adenylyl cyclase. Selective agonists include **butaprost** and AH 13205.

EP_3-receptors: $PGE_2 > PGF_{2\alpha} \approx PGI_2 > TBA_2 \approx PGD_2$. The receptor shows two alternative splicing-isoforms with different *C*-terminus and affinity for G-proteins. They couple positively to adenylyl cyclase or to the IP_3/DAG system. Selective agonists include **sulprostone**, **remiprostol**, GR 63799 and SC 46275.

EP_4-receptors: $PGE_2 > PGF_{2\alpha} \approx PGI_2 > TBA_2 \approx PGD_2$. The receptor couples positively to adenylyl cyclase.

Clinical uses of prostanoid receptor agonists are diverse. In gynaecological and obstetric use, for the termination of pregnancy, **dinoprostone** (PGE_2) or **gemeprost** (an analogue of prostaglandin E_1) (see ABORTIFACIENTS); for induction of labour, dinoprostone (see OXYTOCIC AGENTS); or for postpartum haemorrhage (in the absence of response to standard agents) **carboprost**, a synthetic analogue related to $PGF_{2\alpha}$, is used. In the cardiovascular system, for the treatment of ductus arteriosis in neonates, **alprostadil** (a preparation of PGE_1), or to inhibit platelet aggregation in certain operative and surgical procedures, **epoprostenol** (a preparation of prostacyclin) (see HAEMOSTATIC AGENTS; PLATELET AGGREGATION INHIBITING AGENTS). In patients taking NSAIDs to offset the tendency of these to cause gastric and duodenal ulcers, **misoprostol** may be used. Lastly, **latanoprost** is a recently introduced prostaglandin analogue which increases uveoscleral outflow, and is used to treat open-angle glaucoma and ocular hypertension.

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PROSTANOID RECEPTOR ANTAGONISTS act at receptors recognizing prostanoids. Few antagonist agents are yet available with any great selectivity for each of the eight or so subtypes of receptor. Some antagonists that are used analytically include: at DP-receptors, BWA 868C; at TP-receptors, **vapiprost** and SQ 295448; at EP1-receptors SC 51089, SC 19220; at EP2-receptors AH 13205; at EP3-receptors **sulprostone**, SC 46275; and at EP4-receptors, **AH**

23848. Clinical uses of prostanoid receptor antagonists are yet to be realized. However, thromboxane receptor antagonists (TXA_2 antagonists; TP-receptor antagonists) such as vapiprost are being investigated with a view to their use as antiplatelet drugs: see **PLATELET AGGREGATION INHIBITING AGENTS**.

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Prostap™ ➡ **leuprorelin**.

Prostigmin™ ➡ **neostigmine bromide**.

Prostin E2™ ➡ **dinoprostone**.

Prostin F2 alpha™ ➡ **dinoprost**.

Prostin V™ ➡ **alprostadil**.

Prostin VR™ ➡ **alprostadil**.

prosurgatoxin is a complex heterocyclic structure isolated from the Japanese ivory shell mollusc *Babylonia japonica*. It is a **GANGLION BLOCKING AGENT**.

protamine sulfate ➡ **protamine sulphate**.

protamine sulphate [BAN] (protamine sulfate [INN, JAN, USAN]) is a mixture of basic peptides prepared from the sperm or testes of suitable species of fish (usually *Salmonidae* or *Clupeidae*). Therapeutically, it can be used by injection as an **ANTIDOTE**, an **ANTICOAGULANT ANTAGONIST** to **heparin**, but not to anticoagulants that differ chemically. However, it has a weak **ANTICOAGULANT** action itself and can cause rebound bleeding. It is a weak **CARBOXYPEPTIDASE INHIBITOR**, acting against the enzyme carboxypeptidase N (EC 3.4.17.3), which may explain some adverse reactions to this agent. It is also used in combination with active drugs to modify their solubility and other characteristics, e.g. **isophane insulin**.

PROTEASE INHIBITORS (proteinase inhibitors) are enzyme inhibitors that are conventionally divided into four main families on the basis of their normal classes of substrate, which in turn largely reflects their mechanism of action. These four classes are (**1**) aspartyl protease inhibitors, (**2**) metalloprotease inhibitors, (**3**) serine proteases inhibitors, and (**4**) thiol protease inhibitors. Some of the enzymes discussed are often described more accurately as proteinases – acting on a protein, rather than a smaller peptide substrate. The properties of some that are more exactly peptidases – arbitrarily defined as oligopeptides of less than 50 residues – are summarized.

(**1**) Aspartyl proteases (aspartic protease, aspartyl protease, acid protease or carbonyl protease) is an enzyme family well understood in mechanistic terms. The best understood member is **pepsin** (the principal proteolytic enzyme in gastric juice). Others are **renin** (which converts angiotensinogen to angiotensin I), **chymosin** (rennin; from the fourth stomach of the cow, used in cheese-making), **zhizopus pepsin** and **penicillopepsin** (which enable fungi to digest decaying plant matter), **HIV-1 protease** (which is essential to replication in the HIV virus). Mammalian proteolytic enzymes normally have their action balanced or limited by endogenous inhibitors which prevent unlimited proteolysis and these include the α_1-antitrypsin (α_1-antiproteinase). Most aspartyl proteases are inhibited by the well-established tool **pepstatin A** (a microbial peptide that acts as a transition state analogue because it contains a tetrahedral hydroxylamine unit). Whilst not all aspartyl proteases are necessarily important as therapeutic targets, in terms of inhibitors there has been a successful transference of structural information about the requirements at the enzyme's active site from one enzyme to another (*vide infra*). A major effort has gone into the design of site-directed inhibitors that are more active against HIV-1 protease than mammalian aspartyl proteases (see **HIV-1 PROTEASE INHIBITORS**). Agents clinically available include **saquinavir**, **indinavir** and ritinavir.

Renin inhibitors act as direct inhibitors of renin (a 340 amino acid glycoprotein) stored in the juxtaglomerular cells of the kidney, of which the only known substrate is angiotensinogen – an α_2-globulin of the blood. The renin–angiotensin system is a major contributor to the pathophysiology of cardiovascular diseases, such as congestive heart failure and hypertension. For this reason, attempts to specifically block this system at some level have been a pharmacological goal for over 25 years. A number of agents have now been tested in man. Enalkiren, a potent, dipeptide renin inhibitor, mimics the transition state of the human renin substrate, angiotensinogen. Zankiren is a potent renin inhibitor shown to have substantial bioavailability in several animal species and to produce dose-related reductions in blood pressure, plasma renin activity, and angiotensin II in salt-depleted dogs. Others include remikiren and ditekiren. See **RENIN INHIBITORS**.

(**2**) Metalloprotease inhibitors – also known as metalloproteases or zinc proteases – are proteolytic enzymes of which the activity depends on metal ions, normally bound Zn^{2+}. Examples of metalloproteases are the pancreatic enzymes **carboxypeptidase A** and **B**, **elastase**, the well-characterized bacterial enzyme **thermolysin** and the **collagenase** family (found in both bacterial and mammalian cells, fibroblast collagenase, neutrophil elastase, gelatinase).

First those that strictly are proteinases – acting on a protein, rather than a peptide, substrate, include carboxypeptidase A which has been studied in great detail, and was one of the earliest enzymes to have its three-dimensional structure determined at high resolution. Our knowledge of the role of zinc ions in metalloproteases, where it is found to be tucked into a groove near the surface of the enzyme, coordinated to glutamate and two histidine side chains, comes from this enzyme. The zinc ion near the enzyme surface increases reactivity with water; furthermore, the enzyme is capable of a conformational change giving an induced-fit with the substrate. In therapeutic terms, there is a major interest in relation to the inhibition of proteases that inappropriately proteolytically digest matrix proteins. These matrix components are degraded by extracellular proteolytic enzymes secreted locally by most cells. These can be metalloproteases and serine proteases, often working in concert, which degrade matrix protein – **collagen**, **laminin** and **fibronectin**. Normally, TIMs (tissue inhibitors of metalloproteases) and serpins (serine protease inhibitors), are secreted by cells to limit and control the action of endogenous proteases. Important proteases are collagenases (metalloproteinases) and proteases of the urokinase-type (serine proteases). It is thought that the balance of these systems could be upset in a wide variety of disease states where there is dissolution of tissue organization and concomitant overproduction of malignant replacement tissue, including many connective tissue diseases, and in some aspects of tumour growth. In the long term, there is hope of designing synthetic protease inhibitors by studying the mode of interaction of naturally occurring inhibitors with the enzyme. There is much interest in inhibitors both for this reason, and as experimental tools, from whatever source. The matrix metalloprotease enzyme family has been divided into a number of numbered subfamilies, each with a

preferred substrate. Under this scheme MMP-1, MMP-8 and MMP-13 are various types of collagenase, MMP-2 and MMP-9 represent gelatinase-A and gelatinase-B, MMP-3, MMP-10 and MMP-11 are various stromelysins and MMP-12 is metalloelastase. These are the main families and the objective in terms of the development of inhibitors, is to identify the key enzymes in a given pathology, and work towards the design of site-specific agents. A number of metalloprotease inhibitors have been developed to the point of therapeutic intervention. Matrix metalloproteinase inhibitors were originally developed by pharmaceutical companies as drugs to prevent cartilage and bone degradation in rheumatoid arthritis. However, as the role of metalloproteinases in the spread of cancer metastasis and tumour progession became clearer, attention turned to cancer. **Batimastat** is a synthetic low molecular weight peptide mimetic inhibitor of matrix metalloproteinase enzymes was the first drug to reach clinical trials. It is a wide-spectrum inhibitor of matrix metalloproteinases, but has little activity at more distantly related metalloproteinases such as angiotensin-converting enzyme. In spite of low bioavailability, and experimental animal models have indicated more promising results on intraperitoneal injection. Recent results with **marimastat**, which, like batimastat is a peptide mimetic containing a hydroxamate group, have indicated better oral bioavailability and has entered phase III trials. In animals, metalloproteinase inhibitors have been shown to inhibit tumour growth and tumour-induced angiogenesis. In brain injury, gelatinases and plasminogen activators work in concert to disrupt basement membranes proteolytically and are an important target. **Ilomastat** in animal models reverses development of immune encephalitis.

Other members of the metalloprotease family cleave oligopeptides (arbitrarily defined as having less than 50 amino acid residues) and do not necessarily act on proteins. These include a number of neuropeptidases of special interest and a number are discussed elsewhere. See **ACE INHIBITORS; AMINOPEPTIDASE INHIBITORS; CARBOXYPEPTIDASE INHIBITORS; ENDOPEPTIDASE INHIBITORS; NEUTRAL ENDOPEPTIDASE INHIBITORS.**

(**3**) Serine protease inhibitors (serine protease inhibitors) are a large and important group of proteases with serine and histidine residues involved in catalysis at the active site, and characterized by a sensitivity to inhibition by **dyflos**, which forms an irreversible bond with the reactive serine. Protease enzymes in this group include **trypsin**, **chymotrypsin A** and **B** (pancreatic digestive enzymes, also produced in other tissues) and the family of **elastases** (secreted by the pancreas, many other tissues and bacteria). Trypsin, chymotrypsin and elastase are about 40% identical in amino acid residues, rising to >60% if the interior of the enzyme is considered, and their active site (arranged around a catalytic triad) is very similar. Another important group of serine proteases is that of the various blood factors, including **thrombin**, **plasmin** (involved in blood clotting) and **kallikrein** (also a blood factor which forms kinins such as bradykinin from kininogen). There are also assorted enzymes of more obscure function, e.g. prostate-specific antigen.

Those that are strictly proteinases – acting on a protein, rather than a peptide substrate – are discussed first. Members of the serpin family – notably **α_1-antitrypsin** (also called α_1-antiproteinase), inhibit trypsin and similar proteases by binding to the active site. A deficiency of α_1-antitrypsin, such as is seen in some genetic disorders expressing mutant α_1-antitrypsin, allows relatively unrestrained activity of trypsin and can cause a number of disease states. An attempt was launched in 1988 to rectify such deficiencies by administering α_1-antitrypsin (in the form of a 394 amino acid residue protein sequence, Prolastin™, isolated from plasma or serum) as a treatment for cystic fibrosis, pulmonary emphysema and congestive heart disease. However, this treatment did not prove successful. **Aprotinin**, a natural inhibitor, was first extracted from bovine parotid gland, but is obtained commercially from bovine lung. It is a protein of 58 amino acid residues and is inactive by mouth because of degradation, so must be given to patients by injection. It has been used, experimentally and clinically, both to inhibit kallikreins (inhibiting production of vasoactive kinins) and also by virtue of its inhibition of plasmin (fibrinolysin) activity is used as a haemostatic agent. Also, the unrelated serine protease inhibitor camostat, has been shown to be protective in animal pancreatitis. In the latter case, aprotinin, by virtue of its antiplasmin activity and inhibition of plasminogen, is used for life-threatening haemorrhage due to hyperplastinaemia and as a haemostatic agent during open-heart surgery (see **ANTICOAGULANTS**). In relation to the blood-coagulation cascade, many of the numerous factors involved are serine proteases, e.g. factors XIIa, XIa, Xa, IXa and in haemostasis. See **ANTITHROMBINS**.

Peptidases. Others members of the serine protease family, cleave oligopeptides and do not necessarily act on proteins. These include two peptidases of particular interest (dipeptidylpeptidase IV and proline endopeptidase). See also **AMINOPEPTIDASE INHIBITORS; CARBOXYPEPTIDASE INHIBITORS; ENDOPEPTIDASE INHIBITORS; NEUTRAL ENDOPEPTIDASE INHIBITORS.**

(**4**) Thiol protease (thiol proteinase, cysteine protease, sulphydryl protease) are enzymes widely distributed in nature. Examples are the lysosomal proteases of the **cathepsin** family (A, B, C, H, L etc.) and **papain** (a plant enzyme). Mammalian proteolytic enzymes normally have their action balanced or limited by endogenous inhibitors which prevent unlimited, potentially disastrous, proteolysis and these include the protein superfamily, cystatins, subdivided into three families: stefins, cystatins and kininogens. Exogenous inhibitors include **leupeptin** but which also inhibits other proteases, including trypsin and plasmin. In general these sulphydryl enzymes *in vitro* are inactivated by iodoacetamide, *N*-ethyl maleimide and similar sulphydryl-specific reagents. **Aloxistatin** slowly inactivates dipeptidyl peptidase I and this inhibitor seems a useful tool for investigating the roles of thiol proteases, and agents of this type may prove useful in a number of proteolytic diseases. Metabolic inactivation of the anticancer antibiotic **bleomycin** by cysteine proteinase-like enzymes is thought to be a major mechanism of bleomycin tumour resistance. In experimental studies in mice, pre-treatment with aloxistatin sensitized a human colon carcinoma cell line to bleomycin and did not enhance the major toxicity of bleomycin, suggesting that resistance of human tumours to bleomycin can be circumvented by use of the inhibitor without enhancement of the major side-effects of bleomycin.

Peptidases. Aminopeptidase B (EC 3.4.11.6, aminopeptidase M1) is thought to be a chloride-activated-thiolproteinase. Substrates of interest include **leu-enkephalin**, **met-enkephalin** and **bradykinin**. Inhibitors include **arphamenine A** and **arphamenine B**.

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proteinase inhibitor E 64 ➡ **rexostatine.**

proteinase inhibitor PAI ➡ **plasminogen activator inhibitor.**

protein C ➡ **factor XIV.**

PROTEIN KINASE INHIBITORS fall into two main classes by function: the protein serine/threonine kinases (coupled to G-proteins) and the tyrosine kinases.

Serine/threonine kinases are a large family of kinases with sequence homologies in their catalytic domains and they belong to the same gene family. The tertiary structure of the catalytic domain is composed of two lobes separated by a cleft in which catalysis occurs and this is also highly conserved. However, kinases in this family vary greatly in their non-catalytic domains and these other regions are involved in the regulation and activation of these enzymes. The important families are: (**a**) cAMP-kinase (PKA) is a second-messenger-regulated (cyclic-nucleotide-regulated) enzyme that is physiologically activated by cAMP and can also be activated by **dibutyrylcyclic AMP** (bucladesine), 8-Br-cAMP and Sp-cAMP. It can be inhibited by PKI 2-22, KT 5720, HA 1004 and Rp-cAMPS. (**b**) cGMP-kinase (PKG) is a second-messenger-regulated (cyclic-nucleotide-regulated) enzyme that is physiologically activated by cGMP and can also be activated by 8-Br-cGMP and Sp-cGMPS. It can be inhibited by KT 5823, HA 1004 and Rp-cGMPS. Protein kinase C (PKC) is a second-messenger-regulated enzyme that is physiologically activated by a number of factors acting in concert (Ca^{2+} + diacylglycerol + phosphatidyl serine + free fatty acid) and can also be activated by phorbol esters and by bryostatin. It can be inhibited by peptide PKC 19-36; also at the ATP site by 7-hydroxystaurosporine and Ro 318229; at the DAG site by calphostin C; and at the substrate site by chelerythrine. This enzyme exists in several forms with slightly different activation properties: Classical PKC (PKC), New PKC (nPKC) and Atypical PKC (aPKC). Calcium/calmodulin regulated (CaMK) phosphorylase kinase is a second-messenger-regulated kinase, physiologically activated by Ca^{2+}/calmodulin. Related enzymes are myosin light chain kinase (MLCK) and CaMKI, II, II, IV and V. Inhibitors (for one or other kinase) are KT 5926, CAM kinase II 281-302, KN 62, KN 63, W 7, calmidazolium and **trifluoperazine** (where some of the last-named are relatively non-specific). There are a number of other kinases, but they are not well characterized and have no specific inhibitors.

Tyrosine kinases are enzymes present in multicellular eukaryotes which catalyse the phosphorylation of tyrosine residues by ATP, and all participate as signalling elements in transduction pathways. There are two types of protein tyrosine kinase: growth factor receptors, and cytoplasmic protein tyrosine kinases, which include src family kinases and the JAK family kinases. The growth factor receptors are activated by growth factors, and trigger signal transduction. The cytoplasmic protein tyrosine kinases transmit signalling from upstream non-tyrosine kinase receptors to downstream signalling elements. Taking these now in turn: EGRF receptors are activated by **EGF** (epidermal growth factor); **TGFα** (transforming growth factor α) and amphiregulin; and blocked selectively by tyrphostin AG 1478, PD 153035; and non-selectively by DAPH 1, lavendustin A, genistein and herbimycin A. The receptor is thought to be involved in various carcinomas and gliomas and in psoriasis. PDGF receptors are activated by **PDGF** (platelet derived growth factor); and blocked selectively by tyrphostin AG 1295, tyrphostin AG 1296; and non-selectively by lavendustin A, **genistein** and **herbimycin A**. The src and $pp60^{c\text{-}src}$ family kinases are blocked by tyrphostin AG 18, tyrphostin AG 34 and tyrphostin AG 82. These proteins are thought to be involved, in its viral form (v-src), in certain carcinomas. The JAK-2 kinases are blocked selectively by tyrphostin AG 490; and non-selectively by herbimycin A. These proteins are thought to be involved in certain lymphoblastic leukaemias. The BCR-ABL kinases are blocked selectively by **tyrphostin AG 82**; and non-selectively by herbimycin A. These proteins are thought to be involved in chronic myeloid leukaemia.

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protheobromine [INN] is a derivative of **theobromine**. It has VASODILATOR and DIURETIC properties. No longer used.

Prothiaden™ ➡ **dothiepin.**

prothionamide [BAN, USAN] (protionamide [INN]) is a thioamide derivative with ANTIBACTERIAL activity. It can be used as an ANTITUBERCULAR AGENT.

prothipendyl [BAN, INN] is an azaphenothiazine, a HISTAMINE H_1-RECEPTOR ANTAGONIST, SEDATIVE and ANTIEMETIC.

protionamide ➡ **prothionamide.**

protirelin tartrate ➡ **thyrotrophin-releasing hormone.**

protizinic acid [INN, JAN] (PRT; 17190 RP) is an elaborated member of the propionic acid series, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

protocatechuic acid ➡ **dihydroxybenzoic acid.**

protokylol [BAN, INN] is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype. Therapeutically, it can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.

Protopam chloride™ ➡ **pralidoxime.**

protriptyline [BAN, INN] (protriptyline hydrochloride [USAN]; Concordin™; Vivactil™) is one of the tricyclic class of monoamine UPTAKE INHIBITORS, and is used as an oral ANTIDEPRESSANT.

protriptyline hydrochloride ➡ **protriptyline.**

Protropin™ ➡ **human pituitary growth hormone.**

prourokinase ➡ **nasaruplase.**

prourokinase (enzyme-activating) (human clone pUK4/pUK18) ➡ **saruplase.**

Proventil™ ➡ **salbutamol.**

Provera™ ➡ **medroxyprogesterone.**

Pro-Viron™ ➡ **mesterolone.**

provitamin D_2 ➡ **ergosterol.**

Provocholine™ ➡ **methacholine chloride.**

proxazocaine hydrochloride ➡ **pramoxine.**

***prox*-benzotheophylline** (benzotheophylline) is an adenosine derivative, a (P1 purinoceptor) ADENOSINE RECEPTOR ANTAGONIST.

proxicromil [BAN, INN, USAN] is a chromone, an ANTIALLERGIC and mediator release inhibitor similar to **cromoglycic acid** and which potentially can be used for prophylaxis of allergic conditions, including asthma.

proxorphan [INN] (proxorphan tartrate [USAN]; BL 5572M) is one of the phenanthrene series, and is an OPIOID RECEPTOR AGONIST, OPIOID ANALGESIC and ANTITUSSIVE.

proxorphan tartrate ➡ **proxorphan**.

proxymetacaine [BAN, INN] (proparacaine hydrochloride [USAN]; Opthaine™ and many other names) is an ester series LOCAL ANAESTHETIC, which is used by topical application for ophthalmic use.

proxyphylline [BAN, INN] is a theophylline derivative, a SMOOTH MUSCLE RELAXANT and VASODILATOR, which can be used as a BRONCHODILATOR in ANTIASTHMA treatment.

Prozac™ ➡ **fluoxetine**.

prozapine [INN] (hexadiphane; R 714) is a substituted cyclohexamethyleneimine, which has been used as a CHOLERETIC and ANTISPASMODIC.

PRT ➡ **protizinic acid**.

pseudocapsaicin ➡ **capsaicin**; **nonivamide**.

pseudoephedrine [BAN, INN] (pseudoephedrine hydrochloride [USAN]; pseudoephedrine sulfate [USAN]; d-isoephedrine sulfate [JAN]; ψ-ephedrine) is the (1*S*,2*S*)-form of 2-(methylamino)-1-phenyl-1-propanol. It is one of the alkaloids from *Ephedra* spp., and other plants sources. It has properties similar to its isomer **ephedrine**; mainly as an (indirect-acting) SYMPATHOMIMETIC with both peripheral and CNS STIMULANT actions. It is a component of numerous compound preparations both as an oral and topical nasal DECONGESTANT.

pseudoephedrine hydrochloride ➡ **pseudoephedrine**.

pseudoephedrine sulfate ➡ **pseudoephedrine**.

pseudohypericin is a complex polycyclic structure isolated from the mealy bug *Nipaecoccus aurilanatus* and *Hypericum triquetrifolium*. It shows ANTIVIRAL activity against antiretroviruses, is a PROTEIN KINASE INHIBITOR (protein kinase C) and has ANTI-HIV activity.

psilocine (CX 59) is a hydroxyindole alkaloid from *Psilocybe* spp., *Copelandia chlorocystis* and also from *Stropharia* spp. It has euphoric and PSYCHOTROPIC (hallucinogen) actions similar to those of LSD. It is used as a pharmacological tool.

psilocybine [BAN, INN] (indocybin; CY 39) is a hydroxyindole alkaloid, the active principle of hallucinogenic mushrooms *Psilocybe mexicana* and other *Psilocybe* spp. Also from *Stropharia* spp. and *Conocybe cyanopus*. It has euphoric and PSYCHOTROPIC (hallucinogen) actions similar to those of LSD. It is used as a pharmacological tool.

Psorin™ ➡ **dithranol**.

PSVA ➡ **nonivamide**.

PSYCHOTROPIC AGENTS as a term will be used here as synonymous with the psychedelic, psychotomimetics, psychodysleptic agents or hallucinogens. However, psychedelics have been defined as 'heightening' or 'expanding' consciousness; psychotomimetics are agents producing effects that mimic psychotic states, psychodysleptic agents act as substances that produce mental changes which resemble some psychotic states and hallucinogens are drugs which induce hallucinations. At its simplest, all these categories overlap, and all such drugs can produce hallucinations; which may be defined as a false perception of something that is not really there. Hallucinations may be visual, auditory, gustatory or olfactory. Drugs may induce these changes in perception or mood, without occurring marked psychomotor stimulation or depression. Thoughts and perceptions tend to become distorted and dream-like, rather than being merely sharpened or dulled and changes in mood are more complex than a simple shift towards euphoria or towards depression. Psychotomimetics are no longer used in medicine in most countries, though they have been used in experimental psychiatry because of their ability to induce schizophrenia-like states. Of course, their social use is widespread – though in many countries such use is illegal. The drugs themselves will be discussed as two main groups.

(**1**) One group contains agents with a chemical resemblance to known neurotransmitters – mainly **5-HT** or **noradrenaline**. These include **LSD** and **psilocybin** which resemble 5-HT; and **mescaline** which resembles noradrenaline. LSD (D-lysergic acid diethylamide; lysergide) is perhaps the most potent hallucinogen known, both in terms of dose and in degree of dissociation produced. It was first derived in 1943 from the ergot alkaloid **lysergic acid**, obtained from the fungus *Claviceps purpurea* that grows on ergotized rye and other grains. Mescaline occurs naturally, notably in peyotl, the dried top of the Mexican cactus *Lophophora williamsii* and has been used, principally in religious-style ceremonies, for centuries. Psilocybin is obtained from certain fungi of *Psilocybe* spp., and again is known to have been used as part of ceremonies. Today, these various chemicals or their derivatives, sometimes of uncertain chemical properties, have social uses in many countries. The main effects of these psychotropic drugs is on mental function, such that perception is altered so that sights and sounds become distorted and fantastic. These changes are essentially subjective and not surprisingly it is difficult to devise animal tests that can predict this sort of activity. The drugs' mechanism of action is uncertain, but LSD is a partial agonist at certain 5-HT receptors and is known to affect firing of 5-HT-containing neurons in the raphe nuclei. However, the pharmacology of mescaline appears to differ, and it is thought to exert its effect principally on noradrenergic neurons.

(**2**) Another group of psychotropic drugs contains agents unrelated to monoamine neurotransmitters. **Cannabis** is produced in many forms from the hemp plant *Cannabis sativa*, which grows in temperate and tropical regions. Marijuana is a name given to the dried leaves and flower heads and hashish is the extracted resin. Cannabis contains many compounds called cannabinoids, and the main active compound is Δ^1-tetrahydrocannabinol (**Δ^1-THC** or **Δ^9-THC**) and there is also **Δ^6-THC** and **cannabinol** (which is formed spontaneously from **Δ^1-THC**). The effects of cannabis are much less pronounced than those of, say, LSD. The euphoric component is more pronounced in most subjects, and there are few of the alarming sensations and paranoid delusions of LSD. The most pronounced effect seems to be an apparent slowing of time. Appetite is increased in both animals and human subjects. Aggressive behaviour is much less apparent than with some other psychotomimetics. The pharmacology of Δ^1-THC in the CNS is better understood now that cannabinoid receptors have been isolated and cloned (see CANNABINOID RECEPTOR AGONISTS; CANNABINOID RECEPTOR ANTAGONISTS). The distribution of receptors corresponds roughly to the pharmacological effects. They occur

particularly in the hippocampus (which is concerned with memory impairment), the mesolimbic dopamine pathways (concerned with reward) and the cerebellum and substantia nigra (concerned with motor disturbances) as well as in the cortex. The occurrence of receptors has triggered a search for an endogenous ligand, and has led to the discovery of **anandamine** (the name derived from *ananda*, the Sanskrit word for bliss), an amide of **arachidonic acid**. This agent produces short-lived cannabinoid-like actions, and has led, in turn, to interest in factors influencing physiological alterations to the eicosanoid system. Certain cannabinoid derivatives have been developed for therapeutic use and show promise as analgesics or antiemetics: e.g. **nabilone**, an antinauseant used in cancer chemotherapy (see ANTIEMETICS).

Phencyclidine was originally synthesized for possible use as an anaesthetic, but was abandoned because of hallucinations and other psychotomimetic side-effects. A close relative, **ketamine**, has been developed for use in veterinary and human 'dissociative anaesthesia', especially in trauma surgery, though it has some propensity to cause hallucinations. Phencyclidine is now of interest mainly as a drug of abuse, but its mode of action may throw light on the aetiology of schizophrenia. It has the same reported tendency to cause 'bad trips' and to lead to psychotic episodes. The mechanism of action is not well understood, but it appears to have two distinct sites of action. One is a site common to some opioids, including the benzomorphans (e.g. **pentazocine** and **cyclazocine**) termed the σ (sigma) receptor (see OPIOID ANALGESICS). The other is as an ion channel blocker at the 'competitive' site on the NMDA receptor, an action shared by ketamine (see GLUTAMATE RECEPTOR ANTAGONISTS). The σ-site is believed to mediate the dysphoric and hallucinatory actions of the opioids, and may account for the psychotomimetic effects of phencyclidine. What the role is, if any, of the NMDA site is uncertain. However, another NMDA channel-blocker, **dizocilpine**, has similar behavioural effects to phencyclidine, though it has less psychotomimetic activity – and this may be because it lacks affinity for the σ-site. The question remains open as to whether there is an endogenous ligand for either site – an important point in relation to the aetiology of schizophrenia.

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PTA$_2$ ➡ pinane thromboxane A$_2$.

pteroylglutamic acid ➡ folic acid.

PTH ➡ parathyroid hormone.

PTX ➡ pertussis toxin.

Pulmadil™ ➡ rimiterol.

Pulmicort™ ➡ budesonide.

Puregon™ ➡ follicle-stimulating hormone.

Puri-Nethol™ ➡ mercaptopurine.

PURINE P2 RECEPTOR AGONISTS (previously called P$_2$ purinoceptors) are nucleotide-sensitive receptors that are dealt with under this heading; whereas P$_1$ purinoceptors, which are nucleoside-sensitive, may be found under another heading: see ADENOSINE RECEPTORS. P2 receptors can be activated extracellularly by nucleotides, including purines such as **ATP**, **ADP**, pyrimidines including the natural agents **UTP** and **UDP**, as well as a number of unnatural ligands. In view of the sensitivity of some P2 receptor subtypes to nucleotides other than purines, a case has been made for calling certain of them uridine or pyrimidinoreceptors rather than purinoceptors. In view of considerable overall structural similarities between these different G-protein coupled receptors recognizing various nucleotides (or dinucleotides) which does not readily allow subdivision into purine and pyrimidine receptors on a structural basis, the outcome from the point of view of nomenclature recommendations by NC-IUPHAR is that currently the overall receptor class will be referred to simply as subtypes within the 'P2' receptor class.

As a result of coupling considerations and structural information derived from cloning and expression studies, the P2 purinoceptors are now divided into two main classes. These are (**1**) the metabotropic **P2Y receptors**, which are G-protein-coupled, and (**2**) the ionotropic **P2X receptors**, which are intrinsic ion channel receptors. [It should be noted that details of nomenclature for these receptor have changed several times recently, particularly with regard to use of subscripts. The version adopted here, is that currently recommended by the NC-IUPHAR Nomenclature Subcommittee for Purinoceptors.]

The classification of subgroups through the use of nucleotide analogues is complicated by dephosphorylation of nucleotides by ectonucleotidases, with consequent alteration of biological potency of endogenous nucleotides and their analogues. In particular, ATP is rapidly degraded, mainly by dephosphorylation in most tissues to ADP, **AMP** and **adenosine**. For receptor studies it is preferable that the actions of ectonucleotidases are blocked with inhibitors. In the case of uridine nucleotides, the reverse process may take place physiologically, in as much as kinases may convert UDP to UTP, and thus lead to underestimates of the potency of UDP at 'uridine' receptors. Further, uptake processes may also be active, though these are believed to be most important for adenosine. These sorts of difficulty (and rapid inactivation or desensitization of excited P2X receptors) make it difficult to estimate the true affinity of ATP and other degradable ligands for these various receptors.

With these points in mind, some characteristics of the receptors are noted, particularly their sensitivities to the natural nucleotides; ADP (adenosine diphosphate), ATP (adenosine triphosphate), UTP (uridine triphosphate), UDP (uridine diphosphate) and **Ap4A** (Ap(4)A; P1,P5-diadenosine tetraphosphate).

(**1**) The metabotropic **P2Y receptors** (formally P$_{2Y}$-purinoceptors) are of the 7-transmembrane G-protein-coupled type, usually coupling via the InsP$_3$/DAG (G$_{q/11}$) system. Proposed receptors (of varying status) within this group include P2Y$_1$ (P$_{2Y1}$), P2Y$_2$ (P$_{2U}$), P2Y$_3$, P2Y$_4$ (uridine nucleotide receptors), P2Y$_6$ and P2Y$_{ADP}$ (P$_{2T}$; ADP receptors; but *vide infra*).

P2Y$_1$ (P$_{2Y1}$) receptors have been cloned from human and several other mammalian and non-mammalian species, and show an apparent functional order of potency ATP = ADP > AMP, and selective agonists include **2-methylthio-ATP** which is more potent than ADP; also **ADPβF**, **ADPβS** and **2-hexylthioATP**. These receptors are found in a number of tissues including intestinal smooth muscle, endothelial cells and hepatocytes. Normally they couple to the InsP$_3$/DAG system. Recently, expression studies have provided evidence that this receptor type may also account for at least some of

the properties of the proposed (uncloned) $P2Y_{ADP}$ receptor, which on blood platelets leads to aggregation (*vide infra*).

$P2Y_2$ (P_{2Y2}; P_{2U}) receptors are pyrimidine-preferring receptors that have been cloned in human and other mammalian species, and functionally show an order of potency UTP ≥ ATP >> ADP > AMP. The sensitivity of these receptors (and $P2Y_4$ and $P2Y_6$ receptors) to UTP, raises the question of the 'preferred ligand' (*vide supra*), and they have been referred to as pyrimidine receptors or uridine receptors (though action of Ap4A is another physiological possibility as an endogenous ligand). $P2Y_2$ receptors, normally coupling to the $InsP_3$/DAG system, are found in a number of tissues, including endothelial cells and on certain bone cells. This receptor type seems to offer novel therapeutic potential in the regulation of bone metabolism. Also, there has been experimental use of triphosphate nucleotides in lung disease to stimulate water and chloride transport, mucin release and ciliary beat frequency, and UTP inhalation in pharmacotherapy of cystic fibrosis in human patients increases mucociliary clearance (presumably via $P2Y_2$ receptor activation) without any detrimental effect on the calibre of the bronchioles (since this is P2X mediated).

$P2Y_3$ receptors have been cloned from chick brain and couple to the $InsP_3$/DAG ($G_{q/11}$) system. They show a rank order of potency UDP > UTP > ADP >> ATP. They may well be a species homologue of the rat and human $P2Y_6$ receptor (*vide supra*).

$P2Y_4$ receptors (P_{2Y4}; uridine receptors; pyrimidine nucleotide receptors) have been cloned from human genomic DNA; they couple to the $InsP_3$/DAG system (which in this instance is Pertussis-toxin-sensitive). Agonist show a rank order of potency UTP > UDP > ATP (partial agonist). Little is known, as yet, about the distribution or actions of these receptors, but they are found in human placenta and lung.

p2y5 receptors are cloned human structures without a functional correlate (and consequently NC-IUPHAR denotes them in lower case). It remains to be seen if they are indeed P2Y receptors (c.f. p2y7 receptors, *vide infra*).

$P2Y_6$ receptors have been cloned from rat smooth muscle and human placenta libraries (having 88% identity). They couple to the $InsP_3$/DAG system (which, unlike $P2Y_4$, here is Pertussis-toxin-insensitive) and are expressed in human placenta, lung, smooth muscle of several sites, including the intestine, but also in leucocytes, spleen and thymus (the latter distribution group suggesting a role in the immune system). They show a rank order of potency UDP >> UTP > ADP > ATP. Thus they show some dissimilarities to $P2Y_4$ receptors in terms of recognition and coupling, and have only 40% sequence identity. On the other hand, structural sequences suggest that this receptor is a (mammalian) species homologue of the chick $P2Y_3$ receptors.

$P2Y_{ADP}$ (*P_{2T}*; ADP) receptors were initially proposed from functional studies, but have not yet been cloned as such (and thus by NC-IUPHAR convention are denoted in italics). They have been shown to be sensitive only to ADP (and ATP acts as an antagonist), and appear to be expressed only on platelets, where they cause aggregation. However, the status of this receptor type has changed with the recent demonstration that human $P2Y_1$ receptors expressed in Jurkat cells (a type of malignant human white blood cell-line) showed, in pharmacological profile which measured in terms of calcium mobilization, showed an agonist potency order; 2-methylthio-ADP > ADP; whereas ATP, **SpATPαS** and **β,γ-methylene ATP** were antagonists. Since these activities are characteristic of functional *$P2Y_{ADP}$* (*P_{2T}*;ADP) receptors in intact human platelets, this suggests that at least some of the functional properties of *$P2Y_{ADP}$* can be explained in terms of expression of $P2Y_1$ receptors (though not necessarily all the actions of purine nucleotides in platelets). Thus it seems that $P2Y_1$ receptors are expressed both in human platelets and in megakaryoblastic cells lines.

(**2**) The ionotropic P2X receptors (formally P_{2X} purinoceptors) are of the intrinsic-ion-channel heterooligomeric type, mainly permeant to cations, and so cause depolarization or excitation. These receptors include $P2X_1$, $P2X_2$, $P2X_3$, $P2X_4$, $P2X_5$, $P2X_6$ and $P2X_7$ receptors. The number of subunits forming the channel is not yet clear, but is thought to be composed of four or five subunits. It is now clear from co-expression studies that simultaneous transfection of the $P2X_2$ and $P2X_3$ subforms leads to expression of a receptor that has the properties on neither isoform. It is also likely that wild-type functional receptor expressed in nerve endings may be a heterologous receptor formed by co-expression of $P2X_2$ and $P2X_3$ receptors. Consideration of this point shows that very large numbers of unique wild-type functional receptors might be found in nature, made up of combinations of a few fundamental units (as for other intrinsic-ion-channel heterooligomeric receptors). With these points in mind, the properties of the cloned receptors will be discussed.

$P2X_1$ receptors show an order of potency for the natural ligands ATP > ADP; and the unnatural ligands α,β-methylene-ATP and **ATP-γ-S** are useful investigational agonists, but desensitization is very evident. These receptors are found in a number of smooth muscle preparations including arterioles, vas deferens and the urinary bladder, where they cause depolarization and contraction. They are found only in neonate brains. The form of the receptor here seems to be a homopolymer formed of identical units. At these sites, the ejps (excitatory junction potentials) seen on sympathetic nerve stimulation are caused in response to ATP action at P2X purinoceptors when it is liberated – as a **cotransmitter** – from sympathetic varicosities.

$P2X_2$ receptors are similar to $P2X_1$ receptors but α,β-methylene-ATP is not active and desensitization is not evident. These receptors were found originally in the adrenal medulla, and have now been demonstrated in a number of neuronal sites including sensory neurons and a number of areas in the central nervous system.

$P2X_3$ receptors also show an order of potency ATP > ADP. Clones were from chick brain but a rat form has now been identified. Here α,β-methylene-ATP is active, and there is desensitization.

$P2X_4$ receptors show an order of potency ATP > ADP; and ATP-γ-S is a useful agonist. Clones are from rat brain and human placenta. Here α,β-methylene-ATP is not active and desensitization is not evident

$P2X_5$ receptors have been cloned from rat. Here α,β-methylene-ATP is not active and desensitization is not evident.

$P2X_6$ receptors have been cloned from rat. Here α,β-methylene-ATP is not active and desensitization is not evident.

$P2X_7$ (P_{2Z}; ATP^{4-}) receptors show an order of potency where ATP is active, but ADP or AMP is inactive; **dBz-ATP** (2′,3′-*O*-di(benzoyl)-adenosine triphosphate) is a relatively selective agonist. Many immune and inflammatory cells express these receptors which appear to be coupled in some way to plasma membrane pores. It was not initially evident that these receptors fell into the P2X ionotropic group, and

the pores formed are unlike those in the other receptor members. The large-conductance pore, which has about 700 Da permeability, is larger than for the others, and seems to form as a stable entity on persistent activation. The physiological role of such a receptor molecule is generally not known, except for the striking susceptibility to ATP-mediated cytotoxicity that it confers. The receptor is upregulated in human monocytes by interferon-γ and bacterial lipopolysaccharides, and is also expressed during macrophage differentiation.

As mentioned above, the P2X system appears to be involved in neuronal effects, including the excitation of sensory neuron peripheral nerve endings, where ATP has long been known to cause pain (for instance on application to human blister-base). The P2X purinoceptor subtype that is involved in sensory nerve activation is uncertain. Recent studies suggest that the functional receptor expressed in nerve endings or nodose ganglion may be a heterologous receptor formed by co-expression of a heteropolymer of $P2X_2$ and $P2X_3$, which suggests that many oligomeric P2X receptors can be expressed. Potentially, this heterogeneity may allow site-dependent selectivity of drug action.

Currently, new subtypes of P_2-purinoceptors are being cloned or otherwise discovered at a considerable rate, and some changes to the above scheme may be anticipated.

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PURINE P2 RECEPTOR ANTAGONISTS P2 receptors (P_2-purinoceptors) are quite distinct from P1 receptors (see ADENOSINE RECEPTORS), with the former activated by nucleotides, typically **ATP** and the latter by nucleosides, typically **adenosine**: see PURINE RECEPTOR AGONISTS. As a result of coupling considerations and structural information derived from cloning and expression studies, the P_2 purinoceptors are now divided into two main classes.

(**1**) The metabotropic P2Y receptors are G-protein-coupled. Proposed receptors (of varying status) within this group include: $P2Y_1$ (P_{2Y}), $P2Y_2$ (P_{2U}), $P2Y_3$, $P2Y_4$ (uridine nucleotide receptors), $P2Y_5$ and $P2Y_{ADP}$ (P_{2T}; ADP receptors; see PURINE RECEPTOR AGONISTS for discussion of possible identity with $P2Y_1$ receptors). Few selective antagonists are known, but **ARL 66096** and 2-chloro-ATP are active at $P2Y_{ADP}$ receptors. Paradoxically, ATP is an antagonist at the $P2Y_{ADP}$ site.

(**2**) The ionotropic **P2X receptors** include $P2X_1$, $P2X_2$, $P2X_3$, $P2X_4$, $P2X_5$, $P2X_6$ and $P2X_7$ receptors. There are no selective antagonists, but several P2X receptor subtypes ($P2X_1$, $P2X_3$, $P2X_1$, $P2X_1$) can be selectively desensitized by **α,β-methylene-ATP** or by β,γ-methylene-L-ATP. **Suramin** is a non-competitive antagonist that blocks at a number of P_2 sites ($P2X_1$, $P2X_2$, $P2X_5$), at some P2Y sites ($P2Y_1$ >> $P2Y_2$, but not at $P2Y_4$), and is not active at P_1 receptors). **PPADS** is an antagonist at certain P2X receptors, with an overall profile similar to suramin. In view of the distribution of these receptors and the actions mediated, therapeutic application of antagonists in a number of areas may be expected. For instance, if $P2Y_{ADP}$ receptors are involved in the pathophysiology of platelet aggregation and hence formation of thrombi, then antagonists should be antithrombotic; and indeed the putative antagonist **ARL 67085** has been evaluated as an infusible agent for use in post-angioplasty treatment. Similarly, blockade of the ionotropic receptors might be expected to have dramatic effects, since generally interference with fast synaptic transmission has profound physiological consequences, particularly within the CNS. The extensive distribution of mRNA for purinoceptors in various brain and neuronal sites, suggests many forms of therapeutic intervention in a number of neuronal states or diseases (e.g. neurotoxicity of stroke). The extensive distribution of P2X purinoceptors on sensory neurons should rekindle an interest in the long-recognized nociceptive actions of ATP and suggests the possible use of P_2 purinoceptor antagonists as analgesics.

Dunn, P.M. *et al.* (1988) Suramin: a reversible P2-purinoceptor antagonist in the mouse vas deferens. *Br. J. Pharmacol.*, **93**, 243-245.
Cusack, N.J. (1993) P2 receptor: Subclassification and structure-activity relationships. *Drug Dev. Res.*, **28**, 244-252.
Brown, C. *et al.* (1995) PPADS: An antagonist at endothelial P2Y-purinoceptors but not P_{2L}-purinoceptors. *Br. J. Pharmacol.*, **116**, 2413-2416.

Purinethol™ ➡ **mercaptopurine**.

puromycin [BAN, INN, USAN] (puromycin hydrochloride [USAN]; NSC 3055; CL 16536; antibiotic CL 16536; CL 13900; 3123L; P 638; antibiotic CL 13900; antibiotic 3123L; antibiotic P 638) is a nucleoside-type ANTIBIOTIC isolated from *Streptomyces alboniger*. It has ANTICANCER and ANTITRYPANOSOMAL activity.

puromycin hydrochloride ➡ **puromycin**.

p-xylotocopherol ➡ **β-tocopherol**.

Pylorid™ ➡ **ranitidine bismutrex**.

pyrabrom ➡ **mepyramine**.

pyrantel [BAN, INN] (pyrantel tartrate [USAN]; pyrantel pamoate [JAN, USAN]) is an ANTHELMINTIC.

pyrantel pamoate ➡ **pyrantel**.

pyrantel tartrate ➡ **pyrantel**.

pyrazinamide [BAN, INN] (pyrazinecarboxamide; Rifate™; Zinamide™ and many other names) is the pyrazine analogue of **nicotinamide**. It is an ANTIBACTERIAL and is one of the major forms of ANTITUBERCULAR treatment. It is generally used orally in combination with other drugs, such as **isoniazid** and **rifampicin**, in order to cover resistance and for maximum effect. Because it is only active against dividing forms of *Mycobacterium tuberculosis*, it is most effective in the early stages of treatment (i.e. the first few months).

pyrazinecarboxamide ➡ **pyrazinamide**.

Pyribenzamine™ ➡ **tripelennamine**.

Pyridiate™ ➡ **phenazopyridine**.

4-pyridinamine ➡ **4-aminopyridine**.

γ-pyridylamine ➡ **4-aminopyridine**.

Pyridium™ ➡ **phenazopyridine**.

pyridofylline [INN] (theophyllinylethyl sulphate) is a theophylline derivative, and is a RESPIRATORY and CNS STIMULANT. It is also a coronary VASODILATOR and BRONCHODILATOR that has been used in ANTIASTHMATIC and antibronchitic treatment.

pyridoglutethimide ➡ **rogletimide**.

pyridostigmine bromide [BAN, INN, JAN, USAN] (Ro 1-5130; Mestinon™; Regonol™) is a quaternary ammonium compound that is a reversible ANTICHOLINESTERASE. It can be used by injection at the termination of operations to reverse the actions of (competitive) NEUROMUSCULAR BLOCKING AGENTS (when it is often administered with **atropine**), and as a diagnostic agent for myasthenia gravis. It can also be used as a

PARASYMPATHOMIMETIC in ANTIGLAUCOMA TREATMENT. It can be used as a prophylactic against military nerve agent poisoning, and has been implicated in synergistic neurotoxicity (Gulf War Syndrome).

pyridoxal isonicotinoylhydrazone ➡ **PIH.**

pyridoxol ➡ **pyridoxine.**

pyridoxine [INN] (pyridoxine hydrochloride [USAN]; vitamin B_6; pyridoxol) is a vitamin found in rice husks, cane molasses, yeast, wheat germ and cod liver oils. As a dietary supplement or NUTRITIONAL AGENT it is often incorporated into vitamin B complex preparations. It can be given by injection in specific deficiencey (e.g. drug-induced deficiency). However, long-term treatment with large doses is associated with development of peripheral neuropathies.

pyridoxine hydrochloride ➡ **pyridoxine.**

pyrilamine ➡ **mepyramine.**

pyrilamine maleate ➡ **mepyramine.**

pyrimethamine [BAN, INN] (Daraprim™) is a pyrimidinediamine co-administered with SULPHONAMIDES in ANTIMALARIA treatment and for toxoplasmosis. It is usually used with **sulfadoxine** (Fansidar™) or with **dapsone** (Maloprim™).

pyrithidium bromide [BAN] (pyritidium bromide [INN]) is a veterinary ANTIPROTOZOAL, formerly used as an antitrypanocidal agent.

pyrithione zinc [BAN, INN, USAN] (zinc polyanemine; zinc pyrithione; omadine;zinc pyridinethione; zinc omadine; OM 1563) has ANTIBACTERIAL and ANTIFUNGAL actions, and is used topically as a DERMATOLOGICAL AGENT for antiseborrheic use, including in shampoos.

pyrithione zinc [BAN, INN, USAN] is an ANTISEBORRHEIC, ANTIBACTERIAL and ANTIFUNGAL AGENT. Formerly used commercially as a pesticide.

pyrithyldione [INN] (Nu 903) is a piperidinedione with action similar to **glutethimide**, and was used as a HYPNOTIC and SEDATIVE.

pyritidium bromide ➡ **pyrithidium bromide.**

Pyriton™ ➡ **pheniramine.**

Pyrogastrone™ ➡ **carbenoxolone; magnesium trisilicate; sodium bicarbonate.**

pyroibotenic acid ➡ **muscimol.**

pyrrocaine [BAN, INN, USAN] is an amide series LOCAL ANAESTHETIC formerly used in dentistry.

pyrrolamidol ➡ **moramide.**

pyrrolnitrin [INN, USAN] is a pyrrole ANTIBIOTIC with ANTIFUNGAL properties. Clinically, it can be used as a topical treatment for fungal infections.

pyrvinium chloride [INN] is an ANTHELMINTIC used against intestinal pinworms.

pyrvinium pamoate ➡ **viprynium embonate.**

PYY ➡ **peptide YY.**

Q

Qinghaosu™ ➡ **artemisinin.**

quadazocine [BAN, INN] (quadazocine mesylate [USAN]; Win 44441) is a (μ) OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC.

quadazocine mesylate ➡ **quadazocine.**

quadrosilan [BAN, INN] (KABI 1774) is a non-steroid, an ANTIANDROGEN and antigonadotropic agent. It can be used as an ANTICANCER AGENT for treatment of prostatic cancer.

quazepam [BAN, INN, USAN] (Sch 16134; Doral™ and many other names) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity, and is used orally for insomnia.

Quelicin™ ➡ **suxamethonium chloride.**

Quellada™ ➡ **lindane; malathion.**

Questran™ ➡ **cholestyramine.**

quiflapon (MK 0591) is a 2-indolealkanoic acid derivative, an inhibitor of 5-lipoxygenase-activating protein (FLAP), which is involved in leukotriene biosynthesis. It is an ANTIASTHMATIC and ANTIINFLAMMATORY, and is in clinical trials for asthma and inflammatory bowel disease.

Quilonum™ ➡ **lithium acetate.**

quinacrine hydrochloride ➡ **mepacrine.**

Quinaglute™ ➡ **quinidine.**

quinagolide [BAN, INN] is a tricyclic structure that is a (D_2) DOPAMINE RECEPTOR AGONIST and PROLACTIN RELEASE INHIBITOR. It has been investigated as an ANTIPARKINSONIAN AGENT and for hyperprolactinaemia.

quinalbarbitone (quinalbarbitone sodium [BAN]; secobarbital [INN, USAN]; secobarbital sodium [INN]; secobarbitone; Seconal Sodium™) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone**. It is used both as an oral hypnotic agent for insomnia and a sedative for anxiety. It is sometimes used by injection in pre-operative medication. Tuinal™ is a hypnotic mixture of amylobarbitone sodium and quinalbarbitone sodium.

quinalbarbitone sodium ➡ **quinalbarbitone.**

quinapril [BAN, INN] (quinapril hydrochloride [INN, USAN]; Accupro™; Accupril™) is an isoquinolinecarboxylic acid derivative which acts as an ACE INHIBITOR prodrug. It can be used as an ANTIHYPERTENSIVE (commonly with DIURETICS). The ethyl ester prodrug is converted *in vivo* to the active drug, quinaprilat.

quinaprilat ➡ **quinapril.**

quinapril hydrochloride ➡ **quinapril.**

quinbolone [INN, USAN] (MK 810) is a steroid with ANABOLIC properties.

quinestrol [BAN, INN, USAN] (W 3566; Estrovis™) is a derivative of the steroid ethinyloestradiol and is a synthetic OESTROGEN. It can be used to make up hormonal deficiencies and to treat menopausal or other gynaecological problems.

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quingestanol acetate ➡ **quingestanol**.

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quinidine gluconate ➡ **quinidine**.

quinidine sulfate ➡ **quinidine**.

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QUINOLONES are antibiotic-related agents that, though not antibiotic in chemical origin and purely synthetic, share characteristics with the true antibiotics. They are antimicrobials that are used as ANTIBACTERIAL AGENTS (including against some mycobacteria). Those used clinically are 4-quinolones, e.g. **cinoxacin**, **ciprofloxacin**, **nalidixic acid**, **norfloxacin** and **ofloxacin** (all but the first-named early member are fluoroquinolones). Quinolones are mainly used to treat infections in patients who are allergic to penicillin antibiotics, or whose strain of bacterium is resistant to standard antibiotics. Although they are active against a wide range of infective bacterial organisms, they are usually more effective against Gram-negative organisms and also have useful activity against some Gram-positive organisms (though not anaerobes). They work by inhibiting DNA gyrase (topoisomerase II), the enzyme that maintains the helical twists of DNA, by damaging the internal structure of bacteria (i.e. they are bactericidal).

quinisocaine ➡ **dimethisoquin**.

3-quinuclidinyl benzilate is a non-selective MUSCARINIC CHOLINOCEPTOR ANTAGONIST. It can be used as a pharmacological tool.

quinupramine [INN] is one of the tricyclic group that has been used as an ANTIDEPRESSANT.

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quipazine maleate ➡ **quipazine**.

R200 ➡ **chloroform**.

R 218M ➡ **alletorphine**.

R-493 (DArg-[Hyp^3,DPhe^7,Leu^8]BK) is a substitued **bradykinin** analogue, a BRADYKININ RECEPTOR ANTAGONIST selective for the B_2-receptor subtype.

R 522 ➡ **clocinizine**.

R 714 ➡ **prozapine**.

R 1120 ➡ **trichloroethylene**.

R 1406 ➡ **phenoperidine**.

R 1707 ➡ **glafenine**.

R 2010 ➡ **norgestrienone**.

R 2113 ➡ **desoxymethasone**.

R 2323 ➡ **gestrinone**.

R 2453 ➡ **demegestone**.

R 2580 ➡ **trenbolone**.

R 2858 ➡ **moxestrol**.

R 3345 ➡ **pipamperone**.

R 3365 ➡ **piritramide**.

R 3959 ➡ **clometacin**.

R 4318 ➡ **floctafenine**.

R 4584 ➡ **benperidol**.

R 4845 ➡ **bezitramide**.

R 5020 ➡ **promegestone**.

R 5205-M ➡ **homprenorphine**.

R 6238 ➡ **pimozide**.

R 13558 ➡ **fetoxylate**.

R 13615 ➡ **medrogestone**.

R 15403 ➡ **difenoxin**.

R 25061 ➡ **suprofen**.

R 30730 ➡ **sufentanil**.

R 33800 ➡ **sufentanil**.

R 33812 ➡ **domperidone**.

R 34995 ➡ **lofentanil**.

R 39209 ➡ **alfentanil**.

R 50547 ➡ **levocabastine**.

R 50970 ➡ **metrenperone**.

R 52245 ➡ **setoperone**.

R 60844 ➡ **irtemazole**.

R 68070 ➡ **ridogrel**.

R 72063 ➡ **loreclezole**.

R 75321 ➡ **draflazine**.

R 76713 ➡ **vorozole**.

Ra 101 ➡ **niprofazone**.

R-A 233-BS ➡ **mopidamol**.

rabeprazole [INN] (rabeprazole sodium [USAN]) is a substituted benzimidazole, a GASTRIC PROTON PUMP INHIBITOR and a (H^+/K^+) ATPASE INHIBITOR. It can be used as an ANTIULCEROGENIC in the treatment of gastric ulcers and other gastric acid-related gastrointestinal disorders.

rabeprazole sodium ➡ **rabeprazole**.

rabies immunoglobulin ➡ **globulin, immune**.

racecadotril ➡ **acetorphan**; **ecadotril**.

racefemine [INN] is a phenethylamine derivative, a SMOOTH MUSCLE RELAXANT reported to be a uterine ANTISPASMODIC.

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R 15403 ➡ **difenoxin**.

R 25061 ➡ **suprofen**.

R 30730 ➡ **sufentanil**.

R 33800 ➡ **sufentanil**.

R 33812 ➡ **domperidone**.

R 34995 ➡ **lofentanil**.

R 39209 ➡ **alfentanil**.

R 50547 ➡ **levocabastine**.

R 50970 ➡ **metrenperone**.

R 52245 ➡ **setoperone**.

R 60844 ➡ **irtemazole**.

R 68070 ➡ **ridogrel**.

R 72063 ➡ **loreclezole**.

R 75321 ➡ **draflazine**.

R 76713 ➡ **vorozole**.

Ra 101 ➡ **niprofazone**.

R-A 233-BS ➡ **mopidamol**.

rabeprazole [INN] (rabeprazole sodium [USAN]) is a substituted benzimidazole, a GASTRIC PROTON PUMP INHIBITOR and a (H^+/K^+) ATPASE INHIBITOR. It can be used as an ANTIULCEROGENIC in the treatment of gastric ulcers and other gastric acid-related gastrointestinal disorders.

rabeprazole sodium ➡ **rabeprazole**.

rabies immunoglobulin ➡ **globulin, immune**.

racecadotril ➡ **acetorphan**; **ecadotril**.

racefemine [INN] is a phenethylamine derivative, a SMOOTH MUSCLE RELAXANT reported to be a uterine ANTISPASMODIC.

racefenicol ➡ **thiamphenicol**.
racemethorphan [BAN, INN] is the methyl ether of racemorphan, and is an **OPIOID RECEPTOR AGONIST, OPIOID ANALGESIC** and **ANTITUSSIVE**.
racemetirosine ➡ **metirosine**.
racemoramide ➡ **moramide**.
racemorphan [BAN, INN] (Nu 2206) is the (±)-form of **hydroxy-N-methylmorphinan**, and is an **OPIOID RECEPTOR AGONIST, OPIOID ANALGESIC** and **ANTITUSSIVE**.
racephenicol ➡ **thiamphenicol**.
raclopride [BAN, INN] (raclopride tartrate [USAN]) is a substituted benzamide, a (D_2) **DOPAMINE RECEPTOR ANTAGONIST** investigated for used as an **ANTIPSYCHOTIC**.
raclopride tartrate ➡ **raclopride**.
ractopamine [INN] (ractopamine hydrochloride [USAN]) is an **β-ADRENOCEPTOR AGONIST** that is a positive **INOTROPIC**, chemically the (±)-form of **butopamine** (the (*R,R*)-form).
ractopamine hydrochloride ➡ **ractopamine**.
Radian B™ ➡ **ammonium salicylate**.
radicicol is a (macrolide) **ANTIBIOTIC**, a metabolite of *Nectria radicicola, Monosporium* spp., *Penicillium luteoorantium* and *Monocillium nordinii*. It is an **ANTICANCER** and **ANTIFUNGAL AGENT**. It also shows angiogenesis inhibitor and **PROTEIN KINASE INHIBITOR** activity.
rafoxanide [BAN, INN, USAN] is an **ANTHELMINTIC**, a veterinary fasciolicide.
Ralgex™ ➡ **ethyl salicylate; glycol salicylate**.
raloxifene [INN] (raloxifene hydrochloride [USAN]; LY 156758; Evista™) is a non-steroid with **ANTIOESTROGEN** activity (a selective oestrogen receptor modulator), prevents bone loss and reduces serum cholesterol in ovariectomized rats. It is a potential therapeutic agent for postmenopausal osteoporosis.
raloxifene hydrochloride ➡ **raloxifene**.
raltitrexed [BAN, INN, USAN] (ZD 1694; Tomudex™) is a thymidylate synthase inhibitor, an **ANTICANCER AGENT** which is used primarily to treat colon cancer.
RAM 327 ➡ **drotebanol**.
ramatroban [BAN, INN] is a carbazole derivative, a **THROMBOXANE RECEPTOR ANTAGONIST**. It inhibits antigen- and prostanoid-induced bronchoconstriction, and is a potential **ANTIASTHMATIC**.
ramifenazone [INN] is one of the pyrazolone series, a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity.
ramipril [BAN, INN, USAN] (Tritace™; Altace™) is a 2-aza-bicyclo derivative with prodrug activity as an **ACE INHIBITOR** which can be used as an **ANTIHYPERTENSIVE**. It is converted *in vivo* to ramiprilat [INN].
ramiprilat ➡ **ramipril**.
ramixotidine [INN] (CM 57755; CM 57862; ramixotidine hydrochloride) is a pyridinecarboxamide, a **HISTAMINE H_2-RECEPTOR ANTAGONIST, GASTRIC SECRETION INHIBITOR** and **ANTIULCEROGENIC**.
ramixotidine hydrochloride ➡ **ramixotidine**.
ramoplanin [INN, USAN] is a (glycolipodepsipeptide) **ANTIBIOTIC** complex. It shows **ANTIBACTERIAL** activity against Gram-positive bacteria.
ramorelix [INN] is a pseudopeptide and an analogue of **ganirelix**. It is a **LH-RH RECEPTOR ANTAGONIST** and can, in principle, be used as a **LUTEOLYTIC AGENT** to inhibit ovulation. A projected use is for the treatment of sex hormone-related diseases, especially as part of **ANTICANCER** hormone therapy of sex-hormone-dependent tumours. It is related to **cetrorelix, detirelix** and **ganirelix**.
ramosetron [INN] (YM 060) is a benzimidazolyl derivative, a ($5\text{-}HT_3$) **5-HYDROXYTRYPAMINE RECEPTOR ANTAGONIST**. It is a potential **ANTIEMETIC**.
ranakinin is a naturally occurring 11 amino acid residue *C*-terminally amidated peptide. It is a tachykinin similar to **physalaemin** from the brain of the frog *Rana ridibunda*. It acts as a **TACHYKININ RECEPTOR AGONIST** (showing greatest activity at NK_1 receptors), stimulates extravascular smooth muscle, is a powerful **vasodilator**, and is used as a pharmacological tool.
ranatachykinin A is a naturally occurring 11 amino acid residue *C*-terminally amidated peptide. It is a tachykinin from the brain and intestine of the frog *Rana catesbeiana*. It acts as a **TACHYKININ RECEPTOR AGONIST**, stimulates extravascular smooth muscle, is a powerful **VASODILATOR**, and is used as a pharmacological tool.
ranatachykinin B is a naturally occurring 10 amino acid residue *C*-terminally amidated peptide. It is a tachykinin from the brain and intestine of the frog *Rana catesbeiana*. It acts as a **TACHYKININ RECEPTOR AGONIST**, stimulates extravascular smooth muscle, is a powerful **VASODILATOR**, and is used as a pharmacological tool.
ranatachykinin C is a naturally occurring 10 amino acid residue *C*-terminally amidated peptide. It is a tachykinin from the brain and intestine of the frog *Rana catesbeiana*. It acts as a **TACHYKININ RECEPTOR AGONIST**, stimulates extravascular smooth muscle, is a powerful **VASODILATOR**, and is used as a pharmacological tool.
ranatachykinin D is a naturally occurring 10 amino acid residue *C*-terminally amidated peptide. It is a tachykinin from the brain and intestine of the frog *Rana catesbeiana*. It acts as a **TACHYKININ RECEPTOR AGONIST**, stimulates extravascular smooth muscle, is a powerful **VASODILATOR**, and is used as a pharmacological tool.
ranimustine [INN, JAN] (ranomustine; MCNU; NSC 270516) is a nirosourea derivative with general properties similar to **carmustine**. It is an alkylating cytotoxic **ANTICANCER AGENT** that has been tried therapeutically.
ranomustine ➡ **ranimustine**.
ranitidine [BAN, INN, JAN, USAN] (ranitidine hydrochloride [JAN, USAN]; Azantac™; Zantac™) is a furanylthionitroethene-diamine, a **HISTAMINE H_2-RECEPTOR ANTAGONIST, GASTRIC SECRETION INHIBITOR** and **ANTIULCEROGENIC AGENT**. See also **ranitidine bismutrex**.
ranitidine bismuth citrate ➡ **ranitidine bismutrex**.
ranitidine bismutrex [BAN] (ranitidine bismuth citrate [USAN]; GR 122311X; Pylorid™) is a compound of **ranitidine** with bismuth citrate. The ranitidine component is a **HISTAMINE H_2-RECEPTOR ANTAGONIST, GASTRIC SECRETION INHIBITOR** and **ANTIULCEROGENIC AGENT**; the bismuth component is an adjunct (with an **ANTIMICROBIAL**) in the eradication of *Helicobacter pylori* gastric infection.
ranitidine hydrochloride ➡ **ranitidine**.
ranolazine [INN] (ranolazine hydrochloride [USAN]) is a piperazineacetamide, a novel agent under investigation for **ANTIANGINAL** treatment. It appears to be an α_1-adreno-receptor upregulation inhibitor and calcium regulator.
rapamycin ➡ **sirolimus**.
Rapifen™ ➡ **alfentanil**.
Rapilysin™ ➡ **reteplase**.
Rapitil™ ➡ **nedocromil**.
Rastinon™ ➡ **tolbutamide**.
rat [pTyr6]ANP6-28 ➡ **dextronatrin**.
rathyronine ➡ **liothyronine**.
rat prolactin ➡ **prolactin**.

razoxane [BAN, INN] (ICI 59118; ICRF 159; NSC 129943;TIMP: (*S*)-form = dexrazoxane [BAN, INN, USAN]; ADR 529; ICRF 187; NSC 169780; Cardioxane™; Zinecard™) is a piperazinedione cyclic derivative of the metal CHELATING AGENT EDTA, which readily permeates cell membranes. It is thought that, after intracellular ring-opening, it chelates iron, so reducing iron-mediated free-radical generation which is probably responsible for some of the toxicity (particularly cardiotoxicity) of (anthracycline group) ANTIBIOTICS of the **adriamycin** group in ANTICANCER treatment (particularly doxorubicin for breast cancer).

RB 1515 ➡ **altretamine**.

RC 146 ➡ **nicocodine**.

RC 160 ➡ **vapreotide**.

RC-173 ➡ **alcloxa**.

RD 11654 ➡ **ibufenac**.

Re 82-TAD-15 ➡ **crisantaspase**.

rebamipide [INN, JAN] (OPC 12759) is an oxoquinoline derivative, an ANTIULCEROGENIC AGENT which inhibits *Helicobacter pylori*-induced gastric mucosal injury. It is an ANTIOXIDANT which shows hydroxyl radical scavenging properties *in vitro*.

Rec 7-0267 ➡ **dimefline**.

recainam [BAN, INN] (recainam hydrochloride [USAN]; recainam tosylate [USAN]) is an aminopropylxylylurea derivative, a (class I) ANTIARRHYTHMIC.

recainam hydrochloride ➡ **recainam**.

recainam tosylate ➡ **recainam**.

recIL-1ra (human) ➡ **anakinra**.

rec interleukin-1 receptor antagonists (human) ➡ **anakinra**.

recombinant human granulocyte-colony stimulating factor ➡ **filgrastim; lenograstim.**

recombinant human granulocyte macrophage-colony stimulating factor ➡ **molgramostim**.

recombinant human single-chain urokinase-type plasminogen activator ➡ **saruplase**.

Recombinate™ ➡ **factor VIII; octocog alfa**.

5α-REDUCTASE INHIBITORS inhibit the enzyme 5α-reductase and thus act as indirect ANTIANDROGENS. This enzyme converts 4-ene-oxysteroids (e.g. **testosterone**) irreversibly to the corresponding 5α-3-oxysterone (e.g. **dihydrotestosterone**) which has a greater affinity for androgen receptors that regulate specific gene expression.

Inhibitors, such as **finasteride**, which inhibit this enzyme, do not themselves bind to androgen receptors nor have they any direct hormonal actions. They do not inhibit the formation of other steroids and so they do not affect spermatogenesis. There are two forms of the enzyme, controlled by different genes, and these are called type I and type II and have been cloned. Most potent inhibitors are 4-azasteroids. Certain unsaturated fatty acids, such a **γ-linolenic acid**, also have some inhibitory action on this enzyme, suggesting a possible dietary link in disease. The main use of 5α-reductase inhibitors is in men to treat benign prostatic hyperplasia (BPH). In women the inhibitors may have a role in treating hirsutism, male-pattern baldness and acne. Trials are being conducted to examine a possible role as anticancer agents in prophylaxis against prostate cancer.

Sudduth, S.L. *et al.* (1993) Finasteride: the first 5α-reductase inhibitor. *Pharmacotherapy*, **13**, 309-325.

Russell, D.W. *et al.* (1994) Steroid 5α-reductase: two genes/two enzymes. *Annu. Rev. Biochem.*, **63**, 25-61.

Schroder, F.H. (1994) 5α-Reductase inhibitors and prostatic disease. *Clin. Endocrinol. (Oxf).*, **41**, 139-147.

Li, X. *et al.* (1995) The enzyme and inhibitors of 4-ene-3-oxosteroid 5α-oxidoreductase. *Steroids*, **60**, 430-441.

Refolinon™ ➡ **calcium folinate**.

Regaine™ ➡ **minoxidil**.

Reglan™ ➡ **metoclopramide**.

Regonol™ ➡ **pyridostigmine bromide**.

regramostim [INN, USAN] (colony-stimulating factor 2) is more fully termed human clone pCSF-1 protein moiety reduced), glycoform GMC 89-107, and is a single chain glycosylated peptide with 127 amino acid residues. MW *c.* 14,000 kD. It is a recombinant version of human granulocyte-macrophage colony-stimulating factor, a CYTOKINE RECEPTOR AGONIST, and acts as a haemopoietic agent and IMMUNOMODULATOR. See also **colony-stimulating factors**.

Reichstein's Substance Fa ➡ **cortisone**.

Reichstein's substance G ➡ **adrenosterone**.

Reichstein's Substance M ➡ **hydrocortisone**.

Reichstein's substance Q ➡ **deoxycortone**.

Reichstein's substance X ➡ **aldosterone**.

Relefact™ ➡ **gonadotrophin-releasing hormone**.

Relifex™ ➡ **nabumetone**.

remacemide [INN] (remacemide hydrochloride [USAN]) is a substituted acetamide, a (NMDA) GLUTAMATE RECEPTOR ANTAGONIST. It has experimental ANTIPARKINSONIAN, ANTIEPILEPTIC and ANTICONVULSANT activity.

remacemide hydrochloride ➡ **remacemide**.

Remergon™ ➡ **mirtazapine**.

Remeron™ ➡ **mirtazapine**.

remifentanil [INN] (remifentanil hydrochloride [USAN]; GI 87084B; Ultiva™) is one of the phenylpiperidine series, a (μ) OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity. It is an ultra-short acting analgesic, used intravenously during general anaesthesia.

remikiren [INN] is a pseudopeptide, a potent orally active RENIN INHIBITOR and an (aspartyl) PROTEASE INHIBITOR, which has ANTIHYPERTENSIVE properties.

remiprostol [INN, USAN] (SC 48834) is a synthetic prostaglandin, a (selective EP_3 subtype) PROSTANOID RECEPTOR AGONIST reported to have potential as a GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.

remoxipride [BAN, INN, USAN] (remoxipride hydrochloride [USAN]; A 33547; FLA 731; Roxiam™) is one of the substituted benzamide group, and is a DOPAMINE RECEPTOR ANTAGONIST with typical ANTIPSYCHOTIC properties.

remoxipride hydrochloride ➡ **remoxipride**.

renanolone [INN] is a semisynthetic steroid produced from 5β-pregnanetrione by incubating with *Saccharomyces cerevisiae*. It is a GENERAL ANAESTHETIC.

Renese™ ➡ **polythiazide**.

renin is an ENZYME and an (aspartyl) protease containing 340 amino acid residues. It is produced by the kidney and also is found in amniotic fluid. It converts angiotensinogenin to **angiotensin I**.

renin inhibiting peptide (RIP) is a decapeptide, a specific human RENIN INHIBITOR and an (aspartyl) PROTEASE INHIBITOR, with ANTIHYPERTENSIVE activity.

RENIN INHIBITORS act as direct inhibitors of **renin**, which is a 340 amino acid glycoprotein stored in the juxtaglomerular cells of the kidney, of which the only known substrate is angiotensinogen – an α_2-globulin of the blood. The renin–angiotensin system is of prime importance in the control of blood pressure, especially in relation to maintenance of renal perfusion. Renin release is controlled by three or more pathways. The renin–angiotensin system is a major contributor to the pathophysiology of cardiovascular diseases, such as congestive heart failure and hypertension.

For this reason, attempts to specifically block this system at some level have been a pharmacological goal for many years. Overall, activation of the renin–angiotensin systems is hypertensive when the system operates to increase renal perfusion. In the treatment of hypertension, blockade of the renin–angiotensin system has been attempted at three pivotal sites: the rate-limiting angiotensinogen–renin step, which can be attenuated with renin inhibitors; conversion of angiotensin I to angiotensin II; and the active receptor sites for the terminal products of angiotensin II and aldosterone (see ANGIOTENSIN RECEPTOR ANTAGONISTS). The X-ray crystal structure of recombinant human renin has been determined. Knowledge of the actual structure, as opposed to the use of models based on related enzymes, has facilitated the design of renin inhibitors. Renin inhibitors that have entered clinical studies have at least one naturally occurring amino acid and three or more amide bonds. A number of agents have been tested in humans. **Enalkiren**, a potent, dipeptide renin inhibitor, mimics the transition state of the human renin substrate, angiotensinogen. **Zankiren** is a potent renin inhibitor shown to have substantial bioavailability in several animal species and to produce dose-related reductions in blood pressure, plasma renin activity and angiotensin II in salt-depleted dogs. Others include **remikiren** and **ditekiren**.

Frishman, W.H. *et al.* (1994) Renin inhibition: a new approach to cardiovascular therapy. *J. Clin. Pharmacol.*, **34**, 873-880.

Wood, J.M. *et al.* (1994) Pharmacology of renin inhibitors and their application to the treatment of hypertension. *Pharmacol. Ther.*, **61**, 325-344.

Kleinert, H.D. (1995) Renin inhibition. Cardiovasc. *Drugs Ther.*, **9**, 645-655.

Rosenberg, S.H. (1995) Renin inhibitors. *Prog. Med. Chem.*, **32**, 37-114.

Rennie™ ➡ calcium carbonate; magnesium carbonate.

renzapride [BAN, INN] is a substituted benzamide, which appears to have mixed (5-HT_4) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST and (5-HT_3) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST actions. It is a GASTRIC MOTILITY STIMULANT (prokinetic agent).

Reomacrodex™ ➡ dextran.

ReoPro™ ➡ abciximab.

repirinast [INN, JAN, USAN] is a structure closely related to the chromones, and is an ANTIALLERGIC AGENT and mediator release inhibitor similar to **cromoglycic acid**. Potentially, it can be used for prophylaxis of allergic conditions, including prophylaxis as an antiasthmatic.

Replenine™ ➡ factor IX.

reproterol [BAN, INN] (reproterol hydrochloride [USAN]) is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype. Therapeutically, it can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.

reproterol hydrochloride ➡ reproterol.

Requip™ ➡ ropinirole.

Rescriptor™ ➡ delavirdine mesylate.

reserpine [BAN, INN, JAN, USAN] (Serpasil™) is an alkaloid from *Rauwolfia serpentina* and many other *Rauwolfia* spp. It is an ANTISYMPATHETIC, acting by depleting stores of **noradrenaline** in sympathetic neurons. It has ANTIHYPERTENSIVE and SEDATIVE or TRANQUILLIZER properties, and can be used as an ANTIPSYCHOTIC.

resiniferatoxin is a diterpene containing a phorbol-related moiety, and is obtained from the latex of a shrub of *Euphorbia* spp. It is a highly potent VANILLOID RECEPTOR AGONIST, with similar actions to **capsaicin**, though it is very much more active and toxic, producing actions of long duration. It is a specific SENSORY IRRITANT, stimulating sensory neurons, causing desensitization and depletion of neurotransmitters. It is a pharmacological tool used as a selective probe selective NEUROTOXIN for studying neurogenic inflammation and the role of nociceptors in animal and human pathophysiology.

resmethrin [ANSI, BSI, ISO, JMAF] is a pyrethroid INSECTICIDE.

resorcinol (resorcinol monoacetate [USAN]; Eskamel™) is a KERATOLYTIC, used topically as a DERMATOLOGICAL AGENT in ointments and lotions to treat acne and psoriasis.

resorcinol monoacetate ➡ resorcinol.

resorcinolphthalein ➡ fluorescein.

Respacal™ ➡ tulobuterol.

RESPIRATORY STIMULANTS are CNS stimulants that show some degree of selectivity for respiratory stimulation over and above their convulsant activity. Unfortunately, the margin of selectivity of any available agent is too small for safe use and such agents are rarely used nowadays. Supportive medical measures are preferred instead. A further reason for the decline in these non-specific agents, is that when respiratory depression is caused by a depressant agonist that works through a defined receptor, then (competitive) receptor antagonists are now often available (e.g. **naloxone** *vs.* (narcotic) opioid analgesics; **flumazenil** *vs.* benzodiazepines), and this sort of treatment is inherently much safer. However, no specific agent has been yet found that reverses barbiturate-induced respiratory depression. **Nikethamide** and **pentetrazol** (leptazol; pentamethylenetetrazole) are synthetic agents which were once used as respiratory stimulants: they are convulsants with a poorly understood mechanism of action. **Doxapram** is similar, but has a greater margin of safety – it is sometimes used by intravenous infusion in patients with acute respiratory failure. See CNS STIMULANTS.

Restandol™ ➡ testosterone.

Restoril™ ➡ temazepam.

reteplase [INN, USAN] (BM 06022; Rapilysin™) is more fully described as 173-L-Serine-174-L-tyrosine-175-L-glutamine-173-527-plasminogen activator (human tissue-type), and is a proteolytic ENZYME of the plasminogen activator group, forming plasmin which degrades fibrin and so breaking up thrombi, thus acting as a THROMBOLYTIC AGENT. Chemically, it is a recombinant non-glycosylated variant of human tissue-type plasminogen activator. Therapeutically, it can be used to treat myocardial infarction.

Retin-A™ ➡ tretinoin.

retinol [INN] (vitamin A_1; vitamin A; axerophthol) is a fat-soluble VITAMIN, and is a constituent of many fish-liver oils, milk, egg-yolk etc. It is essential for the development and maintenance of epithelial tissue and for vision, particularly in poor light. However, hypervitaminosis, through prolonged overdose, has very detrimental effects, especially to skin and hair. It is administered orally for clinical use to make up vitamin deficiency (which is rare in Western countries). Vitamin A used clinically may be retinol itself, or its esters.

Retrovir™ ➡ zidovudine.

Revanil™ ➡ lysuride.

REVERSE TRANSCRIPTASE INHIBITORS are used in the treatment of retroviral infections, including AIDS. In RNA retroviruses (e.g. AIDS and T-cell leukaemia), the virion contains a reverse transcriptase enzyme that makes a DNA copy of the viral RNA, and this copy is incorporated into the host genome, and is termed a provirus. The proviral DNA is transcribed into new genomic RNA, and mRNA for translation into viral proteins. Such viruses replicate by budding, which does not kill the host cell. Furthermore, some RNA retroviruses can transform normal host cells into malignant cells (e.g. with some sarcoma viruses). In the treatment of AIDS, a number of drugs are being, or have

been developed that are effective reverse transcriptase inhibitors (RTIs).

Zidovudine is an analogue of thymidine, which is phosphorylated within the cell to the triphosphate form, and this competes with substrate required for the formation of proviral DNA by reverse transcriptase (viral RNA-dependent DNA polymerase). Mammalian alpha-DNA polymerase is relatively resistant, but incorporation into the viral DNA strand results in chain termination. In patients with AIDS, it reduces opportunist infections and may produce great symptomatic improvement. It is claimed to delay the onset of AIDS, reduce transmission to the foetus and possibly reduce the chance of infection in needle-stick injury. **Didanosine** is a purine analogue that acts similarly to zidovudine, and therapy is sometimes switched between the two. **Zalcitabine** is a synthetic nucleoside analogue which acts by a different pathway to zidovudine, and is rather neurotoxic. **Foscarnet sodium** is a synthetic non-nucleoside analogue of pyrophosphate, and has a different pathway to zidovudine, because it inhibits viral DNA polymerase by binding directly to the pyrophosphate-binding site. It does not require intracellular conversion to an active drug; but with this type of agent there is a rapid fall in sensitivity of the virus and there is cross-resistance between different drugs of the class. It is rather toxic and its main use is in treating cytomegalovirus retinitis in AIDS immunocompromised patients for whom ganciclovir is inappropriate.

Mitsuya, H. (1992) Development of inhibitors of reverse transcriptase and protease as therapeutics against HIV infection. *J. Enzyme Inhib.*, **6**, 1-8.
Bartlett, J.G. (1993) Zidovudine now or later? *N. Engl. J. Med.*, **329**, 351-352.
Hirsch, M.S. *et al.* (1993) Therapy for human immunodeficiency virus infection. *N. Engl. J. Med.*, **328**, 1686-1695.

Reversol™ ➡ **edrophonium chloride**.
Rev-Eyes™ ➡ **dapiprazole**.
reviparin sodium [BAN, INN] is a (parenteral) ANTICOAGULANT that is chemically a low-molecular weight form of **heparin**. It can be used therapeutically in the treatment of deep vein thrombosis.
rexostatine (proteinase inhibitor E 64; E-64) is a microbial product isolated from *Aspergillus japonicus*. It is a (thiol) PROTEASE INHIBITOR, and can be used to sensitize lung and colon carcinomas to ANTICANCER chemotherapy.
RG 12561 ➡ **dalvastatin**.
R-GENE™ ➡ **arginine**.
RGH 0205 ➡ **thymotrinan**.
RGH 0206 ➡ **thymocartin**.
RGH 3332 ➡ **flumecinol**.
RGH 4405 ➡ **vinpocetine**.
RGH 4417 ➡ **vinmegallate**.
rhetinic acid ➡ **enoxolone**.
Rheumatrex™ ➡ **methotrexate**.
Rheumox™ ➡ **azapropazone**.
Rhinocort™ ➡ **budesonide**.
Rhinolast™ ➡ **azelastine**.
rHuG-CSF ➡ **filgrastim; lenograstim**.
rhu GM-CSF ➡ **sargramostim**.
ribavirin ➡ **tribavirin**.
riboflavine [INN] (vitamin B_2; vitamin G; lactoflavine; ovoflavine; russupteridine yellow III; E101 and many other names) is a water-soluble vitamin. It is widely distributed, but occurs naturally in free form only in the retina, whey and urine. The main active forms occurring in tissues and cells are flavine mononucleotide and flavine-adenine dinucleotide, which are involved in oxidation-reduction reactions in the body. It is used as a colour additive in food (E101). Deficiency is rare with a balanced diet, but it is incorporated into many multivitamin preparations.
ricasetron [INN] (BRL 46470A) is a substituted azabicycloindolecarboxamide, a (5-HT_3) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It is a potential ANXIOLYTIC.
Richlyn™ ➡ **dehydrocholic acid**.
Ridaura™ ➡ **auranofin**.
ridazolol [INN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIHYPERTENSIVE properties.
Rideril™ ➡ **thioridazine**.
ridogrel [BAN, INN, USAN] (R 68070) is a pyridinyl derivative, a (TP) PROSTANOID RECEPTOR ANTAGONIST and THROMBOXANE SYNTHETASE INHIBITOR. It is a PLATELET AGGREGATION INHIBITOR and HAEMOSTATIC.
rifabutin [BAN, INN] is a semisynthetic (ansamycin) ANTIBIOTIC. It is a broad-spectrum ANTIBACTERIAL and ANTITUBERCULAR, which also shows ANTIVIRAL (ANTI-HIV) activity. It is clinically used for prevention of mycobacterium avium complex (MAC) in AIDS patients, and also for prophylaxis against mycobacterial and pulmonary tuberculosis.
Rifadin™ ➡ **rifampicin**.
rifampin ➡ **rifampicin**.
rifampicin [BAN, INN, JAN] (rifampin [USAN]; Rifadin™; Rimactane™ etc.) is a semisynthetic ansamycin ANTIBIOTIC produced by *Streptomyces mediterranei*, and possesses important ANTIBACTERIAL and ANTITUBERCULAR properties, being one of the principal drugs used in the treatment of tuberculosis (mainly in combination with other antitubercular drugs, such as **isoniazid** or **pyrazinamide**). It acts against *Mycobacterium tuberculosis* and sensitive Gram-positive bacteria by inhibiting the bacterial RNA polymerase enzyme. It is also effective in the treatment of leprosy, brucellosis, legionnaires' disease and serious staphylococcal infections. Additionally, it may be used to prevent meningococcal meningitis and *Haemophilus influenzae* (type b) infection.
rifamycin [BAN, INN, JAN] is an (ansamycin-type) ANTIBIOTIC with ANTIBACTERIAL activity.
Rifate™ ➡ **pyrazinamide**.
rifaximin [INN, USAN] is a (rifamycin) ANTIBIOTIC with ANTIBACTERIAL activity, used to treat intestinal tract infections.
rilmafazone hydrochloride ➡ **rilmazafone**.
rilmakalim [INN] (Hoe 234) is a benzopyranpyrrolidinone, a POTASSIUM-CHANNEL ACTIVATOR. It has BRONCHODILATOR, ANTIASTHMATIC and ANTIHYPERTENSIVE actions.
rilmazafone [INN] (rilmafazone hydrochloride [JAN]; 450191 S) is a triazolecarboxamide, a HYPNOTIC AGENT converted to active metabolites via desglycylation by intestinal aminopeptidases.
rilmenidine [INN] (oxaminozoline) is an oxazoline derivative with (α_2-subtype) α-ADRENOCEPTOR AGONIST with properties similar to **clonidine**. It is reported to bind to proposed imidazoline receptors. It can be used as a centrally acting **oxaminozoline** ANTIHYPERTENSIVE.
Rilutek™ ➡ **riluzole**.
riluzole [BAN, INN, USAN] (PK 26124; RP 54274; Rilutek™) is a GLUTAMATE RECEPTOR ANTAGONIST (non-competitive at the NMDA receptors). It is an antineuroexcitotoxic agent with ANTICONVULSANT activity, and is used in the treatment of amyotrophic lateral sclerosis.
Rimactane™ ➡ **rifampicin**.
rimantadine [BAN, INN] (rimantadine hydrochloride [USAN]; Flumadine™) is an **amantadine**-like ANTIVIRAL. Clinically, it can be used in the prophylaxis and treatment of influenza.
rimantadine hydrochloride ➡ **rimantadine**.
Rimapurinol™ ➡ **allopurinol**.
rimiterol [BAN, INN] (rimiterol hydrobromide [USAN];

Pulmadil™) is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype. Therapeutically, it can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.

rimiterol hydrobromide ➡ **rimiterol.**

RIP ➡ **renin inhibiting peptide.**

ripisartan [INN] (UP 2696) is a triazolopyrimidinone, an ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE properties.

Risperdal™ ➡ **risperidone.**

risperidone [BAN, INN, USAN] (Risperdal™) is a 5-ringed structure, with (5-HT_2) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST and (D_2) DOPAMINE RECEPTOR ANTAGONIST activity. It has recently been introduced as an oral ANTIPSYCHOTIC to tranquillize patients suffering from schizophrenia and other acute and chronic psychoses.

Ritalin™ ➡ **methylphenidate.**

ritanserin [BAN, INN, USAN] is a complex 5-ringed structure is a (5-HT_2 and others) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST and (D_2) DOPAMINE RECEPTOR ANTAGONIST. It shows ANTIPARKINSONIAN, ANXIOLYTIC and ANTIHYPERTENSIVE properties.

ritodrine [BAN, INN, USAN] (ritodrine hydrochloride [USAN]; Yutopar™) is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype. The (±)-*erythro*-form is usually used. Therapeutically, it can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment, and as a SMOOTH MUSCLE RELAXANT to treat premature labour.

ritodrine hydrochloride ➡ **ritodrine.**

ritolukast [INN, USAN] is a quinolinyl derivative, a (LTD_4) LEUKOTRIENE RECEPTOR ANTAGONIST, and is an ANTIASTHMATIC.

ritonavir [BAN, INN, USAN] (Norvir™) is a peptidominetic protease inhibitor ANTIVIRAL AGENT which acts against HIV-1 protease. It can be used orally (together with nucleoside agents) in ANTI-HIV management.

Rivotril™ ➡ **clonazepam.**

rizolipase [INN] (pancrelipase [USAN]; Creon™; Encron™; Pancrease™) has the actions and uses of **pancreatin**, and some preparations are described under either name. It is a concentrate of pancreatic ENZYMES standardized for lipase content, and used as a DIGESTIVE AGENT in replacement therapy, given by mouth in enteric-coated forms, to treat deficiencies due to impaired natural secretion by the pancreas, such as in cystic fibrosis and also following operations involving removal of pancreatic tissue, such as panreatectomy and gastrectomy.

RMI 9918 ➡ **terfenadine.**

RMI 16289 ➡ **clomiphene.**

RMI 16312 ➡ **clomiphene.**

RMI 71754 ➡ **vigabatrin.**

RMP-7 is a synthetic 9-residue pseudopeptide analogue of **bradykinin**, and is a (B_2) BRADYKININ RECEPTOR AGONIST that can be used to increase cerebrovascular permeability in order to allow delivery to the brain of drugs that would otherwise not pass the blood–brain barrier (e.g. **methotrexate** and **carboplatin** in anticancer tumour treatment).

Ro 09-1450 ➡ **vinaxanthone.**

Ro 1-5130 ➡ **pyridostigmine bromide.**

Ro 1-5431 ➡ **levorphanol.**

Ro 1-6463 ➡ **methyprylone.**

Ro 1-6794 ➡ **dextrorphan.**

Ro 1-7700 ➡ **levallorphan.**

Ro 1-7977 ➡ **succimer.**

Ro 1-9569 ➡ **tetrabenazine.**

Ro 2-3198 ➡ **edrophonium chloride.**

Ro 2-7113 ➡ **allylprodine.**

Ro 2-9757 ➡ **fluorouracil.**

Ro 2-9578 ➡ **trimethobenzamide.**

Ro 4-1778 ➡ **metofoline.**

Ro 4-3780 ➡ **isotretinoin.**

Ro 4-6467 ➡ **procarbazine.**

Ro 4-8347 ➡ **trengestone.**

Ro 5-0831 ➡ **isocarboxazid.**

Ro 5-2180 ➡ **nordazepam.**

Ro 5-3027 ➡ **delorazepam.**

Ro 5-3438 ➡ **fludiazepam.**

Ro 5-4200 ➡ **flunitrazepam.**

Ro 5-5516 ➡ **lormetazepam.**

Ro 5-6901 ➡ **flurazepam.**

Ro 7-1986/1 ➡ **irazepine.**

Ro 7-6102 ➡ **flutazolam.**

Ro 8-4650 ➡ **diclofensine.**

Ro 10-1670 ➡ **acitretin.**

Ro 10-7614 ➡ **diflucortolone.**

Ro 10-9359 ➡ **etretinate.**

Ro 11-1163 ➡ **moclobemide.**

Ro 11-2465 ➡ **cianopramine.**

Ro 11-7891 ➡ **bentiromide.**

Ro 12-0068 ➡ **tenoxicam.**

Ro 12-7024 ➡ **domoprednate.**

Ro 13-5057 ➡ **aniracetam.**

Ro 13-7652 ➡ **isoetretin.**

Ro 13-9297 ➡ **lornoxicam.**

Ro 15-1788 ➡ **flumazenil.**

Ro 16-0154 ➡ **iomazenil.**

Ro 20-5720/000 ➡ **carprofen.**

Ro 21-3981 ➡ **midazolam.**

Ro 21-5535 ➡ **calcitriol.**

Ro-21-6937 ➡ **trimoprostil.**

Ro 21-8837 ➡ **estramustine.**

Ro 21-9738 ➡ **doxifluridine.**

Ro 22-1319 ➡ **piquindone.**

Ro 228181 ➡ **interferon α.**

Ro 23-6019 ➡ **teceleukin.**

Ro 24-5913 ➡ **cinalukast.**

Ro 47-0203 ➡ **bosentan.**

Ro 44-9883 ➡ **lamifiban.**

Roaccutane™ ➡ **isotretinoin.**

Robaxin™ ➡ **methocarbamol.**

robenidine [BAN, INN] (robenidine hydrochloride [INN, USAN]) is an ANTIPROTOZOAL and ANTICOCCIDIAL for poultry.

robenidine hydrochloride ➡ **robenidine.**

Robinul-Neostigmine™ ➡ **neostigmine bromide.**

Robitussin™ ➡ **dextromethorphan; guaiphenesin.**

Rocaltrol™ ➡ **calcitriol.**

Roccal™ ➡ **benzalkonium chloride.**

rocepafant [INN] (BN 50730) is a complex diazepine, a PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST. It has ANTIALLERGIC properties, experimental antiarthritic activity, and has been investigated for treatment of drug-induced retinopathy.

Rocephin™ ➡ **ceftriaxone.**

rociverine [INN] is a tertiary amine compound with MUSCARINIC CHOLINOCEPTOR ANTAGONIST and SMOOTH MUSCLE RELAXANT activity, which was formerly used in the treatment of irritable bowel syndrome and nocturia.

'Rocket Fuel' ➡ **eticyclidine; phencyclidine.**

rocuronium bromide [BAN, INN, USAN] (Esmeron™; Zemuron™) is a monoquaternary amine complex heterocyclic, an analogue of **rocuronium**. It acts as a NICOTINIC CHOLINOCEPTOR ANTAGONIST and a (competitive)

NEUROMUSCULAR BLOCKING AGENT, which can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia.

Roferon A™ ➡ **interferon α.**

Rogaine™ ➡ **minoxidil.**

Rogitine™ ➡ **phentolamine.**

rogletimide [INN, USAN] (pyridoglutethimide) is a non-steroid and an inhibitor of adrenal corticosteroid synthesis. It is an AROMATASE INHIBITOR investigated as an ANTICANCER AGENT for the treatment of oestrogen-dependent cancers, specifically for treatment of breast cancer. It has experimental antitumorigenic effects.

Rohypnol™ ➡ **flunitrazepam.**

rolafagrel [INN] (FCE 22178) is an imidazolylnaphthalene-carboxylic acid derivative, a THROMBOXANE SYNTHETASE INHIBITOR with PLATELET AGGREGATION INHIBITOR and antinephritic activity.

rolgamidine [BAN, INN, USAN] is a pyrroleacetamide, an ANTIULCEROGENIC and ANTIDIARRHOEAL AGENT.

rolipram [INN, USAN] (ZK 62711) is a pyrrolidinone, a (type IV) PHOSPHODIESTERASE INHIBITOR. It has ANTIINFLAMMATORY and TRANQUILLIZER properties. It is reported to inhibit development of autoimmune encephalomyelitis in animal models, which has implications for multiple sclerosis.

rolitetracycline [BAN, INN, USAN] is a semisynthetic (tetracycline) ANTIBIOTIC with ANTIBACTERIAL activity.

rolziracetam [BAN, INN] (PD 105587; CI 911) is a pyrrolizine related to the **piracetam** group, and has been used as a NOOTROPIC AGENT. It shows amnesia-reversing properties in memory-impaired patients.

Romglizone™ ➡ **troglitazone.**

Rommix™ ➡ **erythromycin.**

Romozint™ ➡ **troglitazone.**

romurtide [INN, JAN] (DJ 7041) is a derivative of the adjutant **muramyl dipeptide**, and is an (IMMUNOSTIMULANT) IMMUNOMODULATOR which augments production of granulocyte colony-stimulating factor (G-CSF). It has activity as an ANTICANCER and ANTIVIRAL AGENT.

ronactolol I is a β-ADRENOCEPTOR ANTAGONIST.

Rondec™ ➡ **carbinoxamine.**

Ronglitazone™ ➡ **troglitazone.**

Ronicol™ ➡ **nicotinic acid.**

ronidazole [BAN, INN, USAN] is a nitroimidazole carbamate, used as a veterinary ANTIPROTOZOAL.

ronifibrate [INN] (I 612) is a derivative of **clofibrate** and **nicotinic acid**, used as an ANTIHYPERLIPIDAEMIC.

ropinirole [BAN, INN] (SKF 101468; Requip™) is an indolone, and is a recently introduced (D_2) DOPAMINE RECEPTOR AGONIST similar to **bromocriptine**. It is used in oral ANTIPARKINSONIAN therapy to improve symptoms and signs of the disease, often in combination with **levodopa**.

ropivacaine [BAN, INN] is an amide series LOCAL ANAESTHETIC that has been studied for use in long-acting infiltration and central block anaesthesia. It is also a (K_{ATP}) POTASSIUM-CHANNEL BLOCKER.

roquinimex [INN] (LS 2616) is a quinolinecarboxamide derivative, an IMMUNOMODULATOR with activity as an ANTICANCER AGENT (rat prostatic cancer) and antiangiogenic.

rosaprostol [INN] (IBI-C 83) is a synthetic prostaglandin analogue, a PROSTANOID RECEPTOR AGONIST with PLATELET-AGGREGATION INHIBITOR and reported potential GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC activity.

rosaramicin [BAN, INN, USAN] (rosaramicin sodium phosphate [USAN]; rosaramicin stearate [USAN]; rosaramicin propionate [USAN]; rosaramicin butyrate [USAN]) is a (macrolide) ANTIBIOTIC with broad-spectrum ANTIBACTERIAL activity against Gram-positive and -negative bacteria.

rosaramicin butyrate ➡ **rosaramicin.**

rosaramicin propionate ➡ **rosaramicin.**

rosaramicin sodium phosphate ➡ **rosaramicin.**

rosaramicin stearate ➡ **rosaramicin.**

rose bengal (C.I. Solvent red 141; C.I. 45440) is a dye used for cosmetics and as a food additive. Clinically, it is used as a diagnostic agent as an ocular stain for detection of lesions and foreign bodies. Also, it is taken up by the liver and excreted in the bile, so can be used for determination of hepato-bilary function.

rotenone [BSI, ISO] (derris [JMAF]; tubotoxin; rotenonum) is the active ingredient of derris (the dried rhizome and roots of *Derris elliptica*). It is widely distributed in the Leguminosae (Papilionoideae), e.g. in many other *Derris* spp., including *Lonchocarpus* spp., *Millettia* spp., *Tephrosia* spp., *Amorpha fruticosa, Antheroporum pierrei, Crotalaria* spp., *Mundulea* spp., *Neorautanenia* spp. It is extensively used as a contact INSECTICIDE and pesticide, and is a potent mitochondrial poison and a potential ANTICANCER AGENT.

rotenonum ➡ **rotenone.**

rotoxamine ➡ **carbinoxamine.**

Rowachol™ ➡ **cineole.**

Rowasa™ ➡ **mesalazine.**

roxadimate [INN, USAN] (dihydroxypropyl PABA; BB 99) is a substituted aminobenzoate, with general properties similar to PABA, and is an effective SUNSCREEN against UVB light.

roxatidine [BAN, INN] (roxatidine acetate [BAN]; Hoe 062; Hoe 760) is a piperidinotolyloxyglycolamide, a HISTAMINE H_2-RECEPTOR ANTAGONIST, GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC.

roxatidine acetate ➡ **roxatidine.**

Roxiam™ ➡ **remoxipride.**

Roxicodone™ ➡ **oxycodone.**

roxithromycin [INN, JAN, USAN] is a (macrolide) ANTIBIOTIC. It can be used clinically as an oral ANTIBACTERIAL to treat a variety of infections.

7843 RP ➡ **thioproperazine.**

17190 RP ➡ **protizinic acid.**

RP 3359 ➡ **proguanil.**

RP 7162 ➡ **trimipramine.**

RP 7204 ➡ **cyamemazine.**

RP 7676 ➡ **pralidoxime.**

RP 9965 ➡ **metopimazine.**

RP 16091 ➡ **metiazinic acid.**

RP 19366 ➡ **pipothiazine.**

RP 27267 ➡ **zopiclone.**

RP 31264 ➡ **suriclone.**

RP 40749 ➡ **picartamide.**

RP 45319 ➡ **pipequaline.**

RP 48740 ➡ **dacopafant.**

RP 54274 ➡ **riluzole.**

RP 56142 ➡ **tabilautide.**

RP 59227 ➡ **tulopafant.**

RP 60180 ➡ **apadoline.**

RS 67506 is a piperidinyl derivative, a selective ($5\text{-}HT_4$ subtype) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST, used as a pharmacological tool.

RP 67580 is a substituted isoindolone, a TACHYKININ RECEPTOR ANTAGONIST selective for the NK_1-receptor subtype. It is a pharmacological tool used in the study of substance P-induced neurogenic inflammation and nociception. It has experimental antinociceptive activity.

RPR 100893 ➡ **dapitant.**

RS 1044 ➡ **mestranol.**

RS 1310 ➡ **delmadinone.**
RS 1320 ➡ **flunisolide.**
RS 4691 ➡ **cloprednol.**
RS 9390 ➡ **prostalene.**
RS 21607 ➡ **azalanstat.**
RS 26306 ➡ **ganirelix.**
RS 3268R ➡ **nandrolone.**
RS 37449 ➡ **temurtide.**
RS 42358 ➡ **palonosetron.**
RS 43179 ➡ **lonapalene.**
RS 49014 ➡ **tazifylline.**
RS 68439 ➡ **detirelix.**
RS 70678 ➡ ML 10302.
RS 81943 ➡ **nafimidone.**
RS 82856 ➡ **lixazinone.**
RS 84043 ➡ **fenprostalene.**
RS 84135 ➡ **enprostil.**
RS 87476 ➡ **lifarizine.**
RS 94991-298 ➡ **nafarelin.**
RTI 4614-4 ➡ **ohmefentanyl.**
RU 486 ➡ **mifepristone.**
RU 1697 ➡ **trenbolone.**
RU 2323 ➡ **gestrinone.**
RU 15060 ➡ **tiaprofenic acid.**
RU 15750 ➡ **floctafenine.**
RU 23908 ➡ **nilutamide.**
RU 31158 ➡ **loprazolam.**
RU 32698 ➡ **divaplon.**
rubella immunoglobulin ➡ **globulin, immune.**
Rubex™ ➡ **doxorubicin.**
rubidomycin ➡ **daunorubicin.**
rubomycin C ➡ **daunorubicin.**
Rufen™ ➡ **ibuprofen.**
rufocromomycin [BAN, INN] (streptonigrin [USAN]) is a (benzoquinone) ANTIBIOTIC produced by *Streptomyces* spp. It shows IMMUNOSUPPRESSANT, ANTICANCER, ANTI-HIV and ANTILEUKAEMIC activity. It has been discontinued.
rupatadine [INN] (UR 12592) is a pyridine derivative, a PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST and HISTAMINE H_1-RECEPTOR ANTAGONIST. It is a potential ANTIALLERGIC and ANTIINFLAMMATORY AGENT.
'Russian Flies' ➡ **cantharides.**
russupteridine yellow III ➡ **riboflavine.**
RV 144 ➡ **erdosteine.**
RV 12424 ➡ **flunoxaprofen.**
RWJ 17021 ➡ **topiramate.**
RWJ 20485 ➡ **tepoxalin.**
RWJ 22164 ➡ **atosiban.**
RX 67408 ➡ **fenclofenac.**
RX 77989 ➡ **pentamorphone.**
RX 783006 ➡ **DAMGO.**
ryanodine is an alkaloid from *Ryania speciosa* (Flacourtiaceae). It has been used as an INSECTICIDE, but is now superseded. It is a calcium-transport blocker, binding to intracellular receptor channels in the endoplasmic reticulum. It is used as a pharmacological tool.
Rynacrom™ ➡ **cromoglycic acid.**
Rythmodan™ ➡ **disopyramide.**

S

S 46 ➡ **pheneturide.**
S-67 ➡ **actinomycin C.**
S 99A ➡ **spirogermanium.**
S 135 is a thienylpyrazoloquinoline, a BENZODIAZEPINE BINDING-SITE INVERSE AGONIST, used as a pharmacological tool.
S 222 ➡ **ditazole.**
S 486 ➡ **nicoclonate.**
S 805 ➡ **loxapine.**
S 1290 ➡ **cinmetacin.**
S 1320 ➡ **budesonide.**
S 1530 ➡ **nimetazepam.**
S 3460 ➡ **alclometasone.**
S 8527 ➡ **clinofibrate.**
S 10036 ➡ **fotemustine.**
S 10364 ➡ **mepitiostane.**
S 20098 is a naphthalenylacetamide derivative, a **melatonin** analogue and MELATONIN RECEPTOR AGONIST (acting at Mel_{1A} and Mel_{1B} subtypes). It is a chronobiotic that potentially may be useful for circadian rhythm disorders.
S40015 ➡ **zolimidine.**
S 74676 ➡ **buserelin.**
S 770777 ➡ **prednicarbate.**
S 792892A ➡ **tilsuprost.**
10275 S ➡ **epitiostanol.**
SA 96 ➡ **bucillamine.**
saccharin [USAN] (benzoic sulphimide; benzosulfinide; E 954; Hermesetas™; Sweeta™; Garantose™) is a widely used sweetening agent, with a sweetness *c.* 300-times that of sucrose. As a DIGESTIVE AGENT it is permitted in foods in the EU at a defined maximal level.
saclofen is chemically related to **phaclofen**, and is a ($GABA_B$) GABA RECEPTOR ANTAGONIST. It is used as a pharmacological tool.
safrazine is one of the hydrazine class, and is an irreversible MONOAMINE-OXIDASE INHIBITOR (MAOI active against both A and B) that is used as an ANTIDEPRESSANT.
safrole (allylcatechol methylene ether) is a constituent of several essential oils especially sassafras oil from *Sassafras officinale*. Topically, it shows LOCAL ANAESTHETIC, ANTISEPTIC and PEDICULICIDAL and COUNTER-IRRITANT properties. It is no longer used orally because it is a human carcinogen and is hepatotoxic, but has been regarded as a carminative. It is banned by the FDA for use in food.
Saizen™ ➡ **human pituitary growth hormone.**
salacetamide [INN] (acetylsalicylamide) is a member of the salicylate series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.
Salactol™ ➡ **salicylic acid.**
Salazopyrin™ ➡ **sulphasalazine.**
salazosulfapyridine ➡ **sulphasalazine.**
salbutamol [BAN, INN] (albuterol [USAN]; albuterol sulfate [USAN]; salbutamol hemisulfate [JAN]; Proventil™; Ventolin™) is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype. The (*R*)-form is the more active enantiomer but

RS 1310 ➡ **delmadinone.**
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rubella immunoglobulin ➡ **globulin, immune.**
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safrole (allylcatechol methylene ether) is a constituent of several essential oils especially sassafras oil from *Sassafras officinale*. Topically, it shows LOCAL ANAESTHETIC, ANTISEPTIC and PEDICULICIDAL and COUNTER-IRRITANT properties. It is no longer used orally because it is a human carcinogen and is hepatotoxic, but has been regarded as a carminative. It is banned by the FDA for use in food.
Saizen™ ➡ **human pituitary growth hormone.**
salacetamide [INN] (acetylsalicylamide) is a member of the salicylate series of CYCLOOXYGENASE INHIBITORS with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.
Salactol™ ➡ **salicylic acid.**
Salazopyrin™ ➡ **sulphasalazine.**
salazosulfapyridine ➡ **sulphasalazine.**
salbutamol [BAN, INN] (albuterol [USAN]; albuterol sulfate [USAN]; salbutamol hemisulfate [JAN]; Proventil™; Ventolin™) is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype. The (*R*)-form is the more active enantiomer but

the racemate is generally used, either as base or salt. Therapeutically, it can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment, as a SMOOTH MUSCLE RELAXANT to treat premature labour and for a number of other purposes.

salbutamol hemisulfate ➡ **salbutamol**.

salcatonin is synthetic salmon **calcitonin**. It is a CALCITONIN RECEPTOR AGONIST and CALCIUM METABOLISM MODIFIER, and has activity similar or higher than that of human calcitonin. (See calcitonin entry for details of uses.)

salcolex ➡ **choline salicylate**.

salicin (saligenin glucoside; salicoside) is a glycoside of poplar and willow bark. Its antipyretic and antirheumatic activities were noted by Stone in the mid-18th century, and its chemical manipulation yielded salicylic acid. Subsequently there was enormous use of sodium salicyate as an ANALGESIC, ANTIPYRETIC and ANTIINFLAMMATORY (though a gastric irritant). This, in turn, prompted the synthesis of acetylsalicylic acid (**aspirin**), and subsequently the salicylate series of NSAID ANALGESICS, which later proved to work through being CYCLOOXYGENASE INHIBITORS.

salicoside ➡ **salicin**.

salicylamide [BAN, INN] is one of the salicylate series of NSAID ANALGESICS. It can be used topically as a COUNTER-IRRITANT (rubefacient or topical analgesic) for symptomatic relief of underlying muscle or joint pain.

salicylazosulfapyridine ➡ **sulphasalazine**.

salicylic acid (Acnisal™; Duofilm™; Occlusal™; Salactol™; and many other names) occurs in the form of esters in essential oils and other plant products, e.g. oil of wintergreen. It has systemic NSAID ANALGESIC, ANTIPYRETIC and weak ANTIINFLAMMATORY actions, but is a gastric irritant and is not normaly used by this route. It can be used as an ANTISEPTIC, ANTIFUNGAL and KERATOLYTIC for various skin conditions and removal of warts. It is used in many compound preparations, and many esters and other derivatives of salicylic acid are also used. See also **sodium salicyate**.

salicylic acid acetate ➡ **aspirin**.

saligenin glucoside ➡ **salicin**.

salinomycin [BAN, INN] is a polyether ANTIBIOTIC showing ANTICOCCIDIAL activity and used in veterinary practice. It has claimed ANTIVIRAL and ANTI-HIV activity.

salmefamol [BAN, INN] is a β-ADRENOCEPTOR AGONIST. Therapeutically, it can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.

salmeterol [BAN, INN, USAN] (salmeterol xinafoate [BAN, INN, USAN]; Serevent™) is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype. The xinafoate derivative is the 1-hydroxy-2-naphthoate, and the racemate is generally used. Therapeutically, it can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment, where it has a very prolonged duration of action.

salmeterol xinafoate ➡ **salmeterol**.

salmon calcitonin(8-32) is a CALCITONIN RECEPTOR ANTAGONIST which inhibits several actions of **calcitonin**.

Salofalk™ ➡ **mesalazine**.

Saluric™ ➡ **chlorothiazide**.

Saluron™ ➡ **hydroflumethiazide**.

sal volatile ➡ **ammonium carbonate**.

Salyrgan™ ➡ **mercuderamide**.

sampatrilat [BAN, INN] is a pseudopeptide, an ACE INHIBITOR and neutral ENDOPEPTIDASE INHIBITOR ('enkephalinase' inhibitor). It is a VASODILATOR and ANTIHYPERTENSIVE.

Sandimmune™ ➡ **cyclosporine**.

Sandocal™ ➡ **calcium carbonate**.

Sandoglobulin™ ➡ **globulin, immune**.

Sandostatin™ ➡ **octreotide**.

sanguinarium chloride [INN, USAN] is the salt of an alkaloid extracted from a wide variety of genera in the Papaveraceae. Reported to possess LOCAL ANAESTHETIC, ANTIFUNGAL, ANTIMICROBIAL and ANTIINFLAMMATORY activity, and to be a powerful cytotoxic agent (functioning by DNA intercalation and uncoupling of oxidative phosphorylation). It is an ENZYME INHIBITOR (alanine aminotransferase and human plasma diamine oxidase). It shows antiplaque activity, and has been used in toothpastes and oral rinses. Causes temporary change in intraocular pressure.

Sanomigran™ ➡ **pizotifen**.

Sanorex™ ➡ **mazindol**.

Santavy's Substance F ➡ **demecolcine**.

saperconazole [BAN, INN, USAN] is a triazole ANTIFUNGAL. Investigated for treatment of candidiasis.

saprisartan [BAN] (GR 138950) is an imidazole-carboxamide and analogue of **zolasartan**. It is an (AT_1) ANGIOTENSIN RECEPTOR ANTAGONIST and ANTIHYPERTENSIVE.

saquinavir [BAN, INN] (saquinavir mesylate [USAN]; Invirase™) is an ANTIVIRAL AGENT, an HIV-1 protease inhibitor, which it can be used orally in ANTI-HIV treatment.

saquinavir mesylate ➡ **saquinavir**.

Sar[DPhe⁸,desArg⁹]BK ➡ **Sar[DPhe⁸,desArg⁹]bradykinin**.

Sar[DPhe⁸,desArg⁹]bradykinin (Sar[DPhe⁸,desArg⁹]BK) is a BRADYKININ RECEPTOR AGONIST selective for the B_1-receptor subtype (induced in inflammatory states).

sarafotoxins types A, B and C are 21 amino acid residue peptide venoms from the burrowing asp *Astracapis engaddenis*. These toxins act as ENDOTHELIN RECEPTOR AGONISTS, active at both the ET_A and ET_B receptor subtypes. They generally mimic the endothelins, and cause bradycardia followed by coronary VASOCONSTRICTOR effects.

saralasin [BAN, INN] (saralasin acetate [USAN]; [Sar^1,Val^5,Ala^8]AII) is an angiotensin analogue, one of the earliest agents shown to have ANGIOTENSIN RECEPTOR ANTAGONIST activity.

saralasin acetate ➡ **saralasin**.

sarcolysin ➡ **melphalan**.

L-sarcolysin ➡ **melphalan**.

sargramostim [BAN, INN, USAN] (rhu GM-CSF; BI 61.012; Leukine™) is more fully termed 23-L-Leucine colony-stimulating factor 2 (human clone pHG25 protein moiety, and is a single-chain, glycosylated polypeptide of 127 amino acid residues produced by recombinant technology in a yeast *Saccharomyces cerevisiae* expression system. It differs from the endogenous human GM-CSF sequence in one residue (Leu^{23}) and probably in the carbohydrate content. It is a (GM-CSF subtype) CYTOKINE RECEPTOR AGONIST, and acts as a haemopoietic agent and IMMUNOMODULATOR. It is used as an adjuvant in anticancer chemotherapies; for treatment of secondary neutropenia; and for myeloid reconstitution after autologous bone marrow transplant. See also **colony-stimulating factors**.

sarmesin is a synthetic peptide derivative of angiotensin II, and is one of the earliest agents shown to have ANGIOTENSIN RECEPTOR ANTAGONIST activity.

sarmoxicillin ➡ **oxetacillin**.

sarpicillin ➡ **hetacillin**.

sarpogrelate [INN] (MCI 9042) is a phenoxybutanedioate, a ($5\text{-}HT_{2A}$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It is a PLATELET AGGREGATION INHIBITOR and ANTITHROMBOTIC.

saruplase [INN] (recombinant human single-chain urokinase-type plasminogen activator; scu-PA; prourokinase (enzyme-activating) (human clone pUK4/pUK18)) is a proform of a proteolytic ENZYME of the plasminogen activator group, forming plasmin that degrades fibrin, so breaking up thrombi and thus acting as a THROMBOLYTIC AGENT. Chemically, it is recombinant glycosylated derivative of urokinase. Therapeutically, it can be used to treat myocardial infarction.

SAS 643 ➡ **doxefazepam.**

SAS 646 ➡ **flutemazepam.**

sassafras oil ➡ **safrole.**

saterinone [INN] is a pyridinecarbonitrile, a (type III) PHOSPHODIESTERASE INHIBITOR. It is a VASODILATOR and PLATELET AGGREGATION INHIBITOR.

sauvagine is a peptide from the skin of the South American frog *Phyllomedusa sauvagei*, and has a HYPOTENSIVE action, inhibits prolactin, thyrotropin and growth hormone release, causes corticotrophin and endorphin release, and acts as a CORTICOTROPHIN-RELEASING FACTOR RECEPTOR AGONIST. It is used as a pharmacological tool.

saviprazole [INN] (Hoe 731) is a thienoimidazole, a GASTRIC PROTON PUMP INHIBITOR, a (H^+/K^+) ATPASE INHIBITOR. Potentially, it can be used as an ANTIULCEROGENIC in the treatment of gastric ulcers and other gastric acid-related gastrointestinal disorders.

saxitoxin is a complex heterocyclic ring structure, a potent SODIUM-CHANNEL BLOCKER (most subtypes) and NEUROTOXIN, acting as a paralytic poison. It is found in Alaska butter clams *Saxidomus giganteus*, toxic mussels *Mytilus californianus*, the plankton *Gonyaulax cantenella* and *Protogonyaulax tamarensis*. It is a causal agent of paralytic shellfish poisoning. It has similar properties to **tetrodotoxin**, but the details of binding differ. It is used as a pharmacological tool.

SB 75 ➡ **cetrorelix.**

SB 5833 ➡ **camazepam.**

SB 204070 is a benzodioxane, and acts as a selective ($5\text{-}HT_4$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It has been used as a pharmacological tool in the investigation of normal and disturbed gastrointestinal activity.

SB 204741 is a thiazolylurea derivative, a selective and high-affinity ($5\text{-}HT_{2B}$-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It is used as a pharmacological tool.

SC ➡ **allyloestrenol.**

SC 1674 ➡ **florantyrone.**

SC 1749 ➡ **menbutone.**

SC 9369 ➡ **phenoperidine.**

SC 9880 ➡ **flugestone acetate.**

SC 11585 ➡ **oxandrolone.**

SC 12937 ➡ **azacosterol.**

SC 23992 ➡ **prorenoate.**

SC 26304 ➡ **dicirenone.**

SC-29333 ➡ **misoprostol.**

SC 41156 ➡ **dimetagrel.**

SC 48834 ➡ **remiprostol.**

SC 52458 ➡ **forasartan.**

SCABICIDALS are agents used to kill the mites that cause scabies, which is an infestation by the itch-mite *Sarcoptes scabiei*. ACARICIDES are chemicals used to kill ticks and mites. Ticks belong to an order of the arthropods called Acarina, which also contains the mites; and chemicals used against the latter may be referred to as scabicidals, or miticidals in USA.

Scandonest™ ➡ **mepivacaine.**

Sch 412 ➡ **metharbitone.**

Sch 4358 ➡ **methylprednisolone.**

Sch 5350 ➡ **dichlorisone.**

Sch 10304 ➡ **clonixin.**

Sch 10595 ➡ **bupicomide.**

Sch 12041 ➡ **halazepam.**

Sch 13521 ➡ **flutamide.**

Sch 16134 ➡ **quazepam.**

Sch 22219 ➡ **alclometasone.**

Sch 29851 ➡ **loratadine.**

Sch 30500 ➡ **interferon α.**

Sch 31846 ➡ **indolapril.**

Sch 32088 ➡ **mometasone.**

Sch 39300 ➡ **molgramostim.**

Scha 1659 ➡ **binedaline.**

schisandrin ➡ **schizandrin.**

schisandrol A ➡ **schizandrin.**

schizandrin (wuweizichun A; wuweizi alcohol A; schisandrin; schisandrol A; schizandrol A) is a benzocyclooctenol and a constituent of *Schizandra chinensis*. It is a microsomal cytochrome P 450 inducer, hepatoprotective, ANTIOXIDANT & FREE-RADICAL SCAVENGER.

schizandrol A ➡ **schizandrin.**

schizophyllan ➡ **sizofiran.**

Scoline™ ➡ **suxamethonium chloride.**

Scopoderm™ ➡ **hyoscine.**

scopolamine butyl bromide ➡ **hyoscine butyl bromide.**

scopolamine ethobromide ➡ **oxitropium bromide.**

scopolamine hydrobromide ➡ **hyoscine.**

scopoline tropate ➡ **hyoscine.**

scu-PA ➡ **saruplase.**

scyliorhinin I is a naturally occurring 10 amino acid residue *C*-terminally amidated peptide, and is a tachykinin from the brain and intestine of the dogfish *Scylliorhinus caniculus*. It is a TACHYKININ RECEPTOR AGONIST and stimulates extravascular smooth muscle. It is used as a pharmacological tool, and can be used in a radiolabelled form.

SD 25 ➡ **syndyphalin 25.**

SD 19050 ➡ **tofisopam.**

SDZ 215-811 ➡ **pentetreotide.**

SDZ CO 611 ➡ **ilatreotide.**

SE 63 ➡ **taprostene.**

Sea-Legs™ ➡ **meclozine.**

Secadrex™ ➡ **acebutolol.**

secbutabarbital ➡ **secbutobarbitone.**

secbutobarbitone [BAN] (secbutabarbital [INN]; butabarbital [USAN]; butabarbital sodium [USAN]; Butisol™) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone**. It is used as a hypnotic.

seclazone [INN, USAN] (W 2354) is a benzoxazinone, with ANTIINFLAMMATORY and URICOSURIC actions.

secnidazole [BAN, INN] is a nitroimidazole analogue which has ANTIMICROBIAL and AMOEBICIDAL activity, and can be used as an antitrichomonal agent.

secobarbital ➡ **quinalbarbitone.**

secobarbital sodium ➡ **quinalbarbitone.**

secobarbitone ➡ **quinalbarbitone.**

Seconal Sodium™ ➡ **quinalbarbitone.**

secoverine [INN] is a tertiary amine compound with non-selective MUSCARINIC CHOLINOCEPTOR ANTAGONIST, SMOOTH MUSCLE RELAXANT and ANTISPASMODIC properties.

secretin [BAN, INN, JAN] (porcine secretin; Hoe 69; Secretin-Ferring™) is a peptide hormone from duodenal mucosa which stimulates release of bicarbonate from the pancreas. It

may stimulate gastric secretion in patients with Zollinger-Ellison syndrome (whereas there is little effect in normal subjects). It is used as a diagnostic agent in evaluating pancreatic endocrine diseases, in diagnosis of Zollinger-Ellison syndrome and also as an adjunct in obtaining pancreatic cells for examination.

Secretin-Ferring™ ➡ **secretin**.

Sectral™ ➡ **acebutolol**.

Securopen™ ➡ **azlocillin**.

seglitide [INN] (seglitide acetate [USAN]; L 363586) is a cyclic hexapeptide peptide, a potent analogue of **somatostatin**. It is a SOMATOSTATIN RECEPTOR AGONIST reported to show ANTIINFLAMMATORY activity. It is used as a pharmacological tool in receptor studies. It appears to be active as an agonist at sst_2 receptors, but behaves as an antagonist in guinea-pig atria (presumably acting as a partial agonist).

seglitide acetate ➡ **seglitide**.

Seldane™ ➡ **terfenadine**.

selegiline [BAN, INN] (selegiline hydrochloride [USAN]; *l*-deprenyl; Deprenaline™; Eldepryl™) is an acetylenic derivative of phenethylamine, and the (*R*)-form (laevorotatory) is the pharmacologically active isomer. It has (type B) MONOAMINE-OXIDASE INHIBITOR activity, and can be used as an ANTIPARKINSONIAN, as an ENZYME INHIBITOR it prolongs the action of endogenous **dopamine**, or it can be administered in combination with **levodopa**. It was once believed to be an ANTIDEPRESSANT but is now thought that specific type-B MAO inhibitors are not antidepressants. They produce much less adverse interactions with foodstuffs.

selegiline hydrochloride ➡ **selegiline**.

selenium disulphide ➡ **selenium sulfide**.

selenium sulfide [USAN] (selenium disulphide; Selsun™) has ANTIFUNGAL and antiseborrheic properties. It can be used as a DERMATOLOGICAL AGENT in medical soaps and shampoos for dandruff and in the treatment of seborrhoeic eczema.

selenomethionine is a selenium-containing butyric acid derivative found in onion, cabbage, seeds of *Lecythis elliptica* and other plants, and is a major component of *E. coli* β-galactosidase. It is a product of the metabolism of inorganic selenium by plants and bacteria. It is used as a dietary supplement for avoidance of Se deficiency in humans and ruminants; also used as a biochemical tool in metabolic studies. It has radioprotective, UV-protectant (SUNSCREEN) and putative ANTICANCER properties. The ^{75}Se labelled compound is used as a radioactive and diagnostic agent (selenomethionine 75 Se [INN, JAN, USAN]; Sethotope™).

selenomethionine 75 Se ➡ **selenomethionine**.

selfotel [INN, USAN] (CGS 19755) is a piperidinecarboxylic acid derivative, a competitive and selective (NMDA) GLUTAMATE RECEPTOR ANTAGONIST. It has NEUROPROTECTIVE actions and ameliorates neuronal damage in stroke patients.

Selsun™ ➡ **selenium sulfide**.

semduramicin [BAN, INN, USAN] is a (polyether) ANTIBIOTIC. It can be used as an animal feed supplement and an ANTICOCCIDIAL in fowls.

semisodium valproate ➡ **valproic acid**.

Semprex™ ➡ **acrivastine**.

semustine [INN, USAN] (methyl CCNU; NSC 95441) is a nitrosourea, the methyl analogue of **lomustine** and is an alkylating cytotoxic that has ANTICANCER AGENT properties.

senktide (Succ-[Asp^6,Me-Phe^8]SP$_{6-11}$) is a **substance P** derivative, a TACHYKININ RECEPTOR AGONIST, selective at the NK_3-receptor subtype. It is used as a pharmacological tool.

Sensorcaine™ ➡ **bupivacaine**.

SEDATIVES calm and soothe, relieving anxiety and disposing towards drowsiness. Of the earlier agents used, many are HYPNOTICS (e.g. barbiturates), but used at lower dose. The advent of the benzodiazepines, which cause much less sleepiness at lower doses, has largely replaced agents such as the barbiturates. These were initially termed tranquillizers and then minor tranquillizers. The term ANXIOLYTICS is now used for benzodiazepine-type agents used to relieve anxiety without causing excessive sleepiness.

Koch-Weser, J., *et al.* (1974) The archaic barbiturate hypnotics. *N. Engl. J. Med.*, **291**, 790-791.

SENSORY IRRITANTS are defined here as exogenous irritant agents that can act on the sensory nerve endings of the skin, conjunctiva of the eyes, the various mucosae and the airways. The discussion will be limited to some potent agents of special interest or particular medical, industrial or social importance. Agents acting within the alimentary tract are not included. There is a considerable number of aromatic but irritant agents that have traditionally been used medically, though their mode of action has been somewhat obscure. Some of these have been termed COUNTER-IRRITANTS, rubefacients or local analgesics. When rubbed in topically to the skin they cause a feeling of warmth, which seems to offset pain from underlying muscle, joints, viscera or from the skin. Some members of the group have now been studied in some detail, and it is known that at local axon-reflex neurogenic mechanisms induce the release of sensory neuromediators (e.g. **calcitonin gene-related peptide** and tachykinins) that are responsible for the observed vascular and other local effects. The best studied of these agents is **capsaicin** (or capsicum oleoresin) (vide infra), but the actions of some others such as **camphor**, **menthol**, **methyl salicylate**, turpentine oil and possibly other topical salicylate derivatives (e.g. **choline salicylate**, **diethylamine salicylate**, **ethyl salicylate**, **glycol salicylate**, **salicylamide**, **salicylic acid**, **ammonium salicylate**) are probably similar. Whether further agents otherwise regarded as NSAID ANALGESICS, such as **benzydamine**, **felbinac**, **ibuprofen**, **piroxicam** that are available as preparations for topical application, act more through a local counter-irritant mechanism is less certain.

Capsaicin, from hot peppers (*Capsicum* spp., Solanaceae), is a diterpene that is now known to be an agonist at newly defined vanilloid receptors. Activation of these causes opening of a cation-selective ion channel-receptor complex that admits Ca^{2+} and Na^+, causing depolarization of nerve endings and release of stored sensory neurotransmitters. The action of capsaicin at this site can be antagonized competitively by **capsazepine**, and non-competitively by **ruthenium red**. At low doses, its stimulation of sensory neurons leads to irritation and eventually pain. At higher doses it is a neurotoxin that causes degeneration of sensory neurons, and given to neonatal rats leads to complete degeneration of sensory afferents. A super-agonist at these receptors is **resiniferatoxin** (from the latex of a shrub, *Euphorbia* spp.), which is a diterpene containing a phorbol-related moiety. Although it has similar actions to capsaicin, it is very much more active, producing actions of long duration. It is highly neurotoxic.

The actions of an irritant substance on sensory nerve endings can be conveniently studied in humans by applying the test substances to an artificially produced (**cantharidin**) blister-base; an area where the epidermis has been removed to expose nerve endings in the dermis, usually on the forearm. In these valuable and unambiguous tests, it transpires that at the higher end of the concentration range capsaicin produces extreme pain. In comparison,

bradykinin (mainly B_2 receptors), **5-HT** (mainly 5-HT_3 receptors) and **ATP** (P2X receptors) produce strong pain, while histamine (H_1 receptors) produces mainly itching. An acid pH is painful and synergises with capsaicin in a complex manner, showing that the proton is a powerful sensory irritant. See BRADYKININ RECEPTOR AGONISTS; HISTAMINE RECEPTOR AGONISTS; 5-HYDROXYTRYPTAMINE RECEPTOR AGONISTS; PURINE RECEPTOR AGONISTS; VANILLINOID RECEPTOR AGONISTS.

These observations on sensory nerve endings can probably be extended mechanistically and transposed to other sites (e.g. the airways). In skin it seems certain that a local axon reflex is involved in the 'triple response' described by Lewis, whereby there is flush, flare and wheal; manifestation of which denotes neurogenic inflammation. Many of these manifestations can be blocked with bradykinin and tachykinin receptor antagonists, and antihistamines, used in concert. It is now presumed that these basic observations in the skin can be applied to conjunctivae and the airways, and there is every reason to suppose that much the same events are involved in (defensive) reaction to exogenous irritant chemicals.

Cantharidin (Spanish fly) is a lipid-soluble irritant vesicant extracted from the blister beetle. Manifestations of cantharidin poisoning range from local vesiculobullous formation to gross haematuria, myocardial damage, denudation of the gastrointestinal tract and occasionally death. Despite the wide spectrum of clinical symptomatology, the available information on this subject is scanty. Currently, cantharidin is the active ingredient in various wart removal compounds. It has been shown to inhibit both type 1 and type 2A phosphatase activity, and it may be that its effects are mediated by increasing the phosphorylation state of several regulatory proteins. See TOXINS.

Industrial hazards: There are many man-made agents, industrial gases and volatile liquids that constitute hazards in terms of accidental exposure, e.g. various aldehydes (**formaldehyde**, **glutaraldehyde**), **sulphur dioxide**, **ammonia**, **nitrogen dioxide** etc.). An industrial irritant agent much studied recently is **toluene diisocyanate**, which potently evokes the signs of neurogenic inflammation.

Warfare and riot control: There is a wide range of man-made irritant and/or vesicant agents that have been developed and used in warfare or riot control. A number of these warfare agents have been, or still are stockpiled (supposedly destined for disposal), and there is considerable current interest in their toxic properties. Mustard gas (**trimustine**, trichloromethine, Nitrogen Lost, Agent HD) was first used in World War I. Its cytotoxicity prompted successful research and development of mustards as a class for use in cancer chemotherapy (see ANTICANCER AGENTS). This poisonous chemical agent exerts a local irritant action on the eyes, skin and respiratory tissue, with subsequent systemic action on the nervous, cardiac and digestive systems in humans and laboratory animals, causing lachrymation, malaise, anorexia, salivation, respiratory distress, vomiting, hyperexcitability and cardiac distress. Mustard gas readily combines with various components of the cell, such as amino acids, amines and proteins. There is evidence of an association between lung cancer and mustard gas encountered on the battlefields of World War I, and epidemiological data accumulated from the poison gas factories in Japan and elsewhere after World War II. It has had recent use in the Middle East in the Iran–Iraq War and the Gulf War, and there is some monitoring of the outcome.

Nitrogen mustard gas (**mustine**, chlormethine) has a vesicant action on skin and mucous membranes, with severe eye irritation. It is used in cancer chemotherapy (with nausea, bone-marrow depression and neurotoxicity) and is an experimental carcinogen and teratogen. **Lewisite** (Agent L) is an 'arsenical' war agent, against the toxic effect of which **BAL** (British Anti-Lewisite, **dimercaprol**) was developed (see CHELATING AGENTS). Lewisite is a potent toxic vesicant that reacts with the sulphydryl groups of proteins through its arsenic group. **Adamsite** (diphenylamine chloroarsine) is a sensory irritant and vesicant, used as a war gas and riot-control agent. **Phosgene** ($COCl_2$) is a colourless irritant and reactive gas, which is heavier than air and is very poisonous. This gas was originally manufactured as an agent for chemical warfare during World War I, and there were a great many studies on phosgene poisoning during the early years of industrial use. It is still widely used in the synthesis of chemicals and plastics.

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sepimostat [INN] (sepimostat methanesulfonate; FUT-187) is a naphthalenylimidazolylaminobenzoate, an ENZYME INHIBITOR active as a (serine) PROTEASE INHIBITOR. It can be used as a proteolysis inhibitor in the treatment of postgastrectomy reflux oesophagitis.

sepimostat methanesulfonate ➡ **sepimostat**.

septide ([pGlu^6,Pro^9]SP_{6-11}) is a **substance P** derivative, a TACHYKININ RECEPTOR AGONIST, selective at the NK_1-receptor subtype. It is used as a pharmacological tool.

Septisol™ ➡ **hexachlorophane**.

seractide [BAN, INN] (seractide acetate [USAN]) is a synthetic peptide, a structural CORTICOTROPHIN ANALOGUE, which has been used clinically. See also **corticotrophin**.

seractide acetate ➡ **seractide**.

seratrodast [INN] is a benzoquinone derivative, a THROMBOXANE RECEPTOR ANTAGONIST. It is a BRONCHODILATOR and ANTIASTHMATIC.

Serax™ ➡ **oxazepam**.

serazapine [INN] (serazapine hydrochloride [USAN]; CGS 15040A) is a benzodiazepine, a (5-HT_2) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It is an ANXIOLYTIC.

serazapine hydrochloride ➡ **serazapine**.

Serc™ ➡ **betahistine**.

Serdolect™ ➡ **sertindole**.

Serenace™ ➡ **haloperidol**.

Serevent™ ➡ **salmeterol**.

sergolexole [INN] (sergolexole maleate [USAN]; LY 281067) is an ergoline derivative, a (5-HT_2) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It is an ANTIMIGRAINE AGENT.

sermorelin [BAN, INN] (human GRF(1-29)NH_2; Geref 50™) is a synthetic peptide containing 29 residues corresponding to the 1-29 sequence (amide) of the 44 residue human **growth hormone-releasing hormone**. It is used by injection as a diagnostic agent to test for secretion of growth hormone.

Sernyl™ ➡ **phencyclidine**.

Sernylan™ ➡ **phencyclidine**.

Seromycin™ ➡ **cycloserine**.

Serophene™ ➡ **clomiphene**.

Serotone™ ➡ **azasetron**.

serotonin ➡ **5-hydroxytryptamine**.

serotonin creatine sulphate ➡

5-hydroxytryptamine.

serotonin sulphate ➡ **5-hydroxytryptamine.**

Seroxat™ ➡ **paroxetine.**

Serpasil™ ➡ **reserpine.**

sertindole [BAN, INN, USAN] (Lu 23-174; Serdolect™) is an imidazolidinone, a (D_2) DOPAMINE RECEPTOR ANAGONIST and ($5\text{-}HT_{2A}$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It has been recently introduced as an ANTIPSYCHOTIC, used orally to tranquillize patients suffering from schizophrenia and other acute and chronic psychotic disorders.

Sertoli cell factor ➡ **inhibin.**

sertraline [BAN, INN] (sertraline hydrochloride [USAN]; CP 51974-01; Lustral™; Zoloft™) has a tricyclic structure unrelated to other classes of selective SSRIs, tricyclics or MAOI agents. It is an SSRI, a selective serotonin (re-) UPTAKE INHIBITOR, extensively used orally as an ANTIDEPRESSANT with minimal sedative actions.

sertraline hydrochloride ➡ **sertraline.**

serum gonadotrophin [BAN, INN] (PMSG; pregnant mares' serum gonadotropin and many other names) is a glycoprotein from the blood of pregnant mares. It is a gonadotropic hormone, previously used in human clinical practice, with properties similar to chorionic gonadotrophin.

serum prothrombin conversion accelerator ➡ **factor VII.**

serum thymic factor ➡ **nonathymulin.**

Serzone™ ➡ **nefazodone.**

SeS_2 ➡ **selenium sulfide.**

setastine [INN] is a methylpyrrolidine and derivative of **clemastine**. It is a HISTAMINE H_1-RECEPTOR ANTAGONIST, but is claimed to have little sedative activity. It has been used orally for the symptomatic relief of allergic symptoms, such as hay fever and urticaria.

Sethotope™ ➡ **selenomethionine.**

Setlers™ ➡ **dimethicone.**

setoperone [INN, USAN] (R 52245) is a fluorothiazol thiazolopyrimidinone, a potent ($5\text{-}HT_2$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST with ANTIPSYCHOTIC properties. As a ^{18}F-labelled compound it is used as a pharmacological tool to study cerebral serotonergic activity.

sevoflurane [BAN, INN, USAN] (BAX 3084; MR 654; Sevoflurane™) is a halogenated ether and volatile liquid. It is used as an inhalation GENERAL ANAESTHETIC.

Sevredol™ ➡ **morphine.**

sezolamide [INN] (sezolamide hydrochloride [USAN]) is chemically a sulphonamide, a CARBONIC ANHYDRASE INHIBITOR, and can be used in ANTIGLAUCOMA TREATMENT.

SF 572 ➡ **tiopronin.**

SG 4341 ➡ **nandrolone.**

Sgd 24774 ➡ **beclobrate.**

SH 427 ➡ **nileprost.**

SH 475 ➡ **nocloprost.**

SH 489 ➡ **atamestane.**

SH 582 ➡ **gestronol.**

SH 601 ➡ **methenolone.**

SH 714 ➡ **cyproterone.**

SH 60723 ➡ **mesterolone.**

SH 80714 ➡ **cyproterone.**

SHB 286 ➡ **sulprostone.**

SHB 331 ➡ **gestodene.**

sibutramine [BAN, INN] (sibutramine hydrochloride [USAN]) is a butyldimethylamine, a monoamine UPTAKE INHIBITOR examined as an ANTIDEPRESSANT and APPETITE SUPPRESSANT.

sibutramine hydrochloride ➡ **sibutramine.**

siguazodan (SKF 94836) is a pyridazinylphenylguanidine derivative, a (PDE-III) PHOSPHODIESTERASE INHIBITOR. It has coronary VASODILATOR, CARDIAC STIMULANT, BRONCHODILATOR, and PLATELET AGGREGATION INHIBITOR activity.

sildenafil citrate (Viagra™) is a piperazine derivative, a selective cGMP-specific (type 5) PHOSPHODIESTERASE INHIBITOR which acts as a SMOOTH MUSCLE RELAXANT and VASODILATOR, probably through enhancing the action of **nitric oxide** (NO). It relaxes blood vessels of the corpus cavernosum of the penis, and is used in oral therapy for erectile dysfunction in men.

silibinin [INN] (silybin; silybum substance E6; silymarin and many other names) is a polycyclic structure isolated from *Silybum marianum*. It has ANTIOXIDANT and hepatoprotective properties, and has been used clinically for the treatment of brain oedema and liver disorders.

silidianin [INN] (silydianin; silybum substance E5) is a polycyclic structure isolated from *Silybum marianum*. It has ANTIOXIDANT and hepatoprotective properties, and also is a plant growth regulator.

silteplase [INN, JAN] is a recombinant protein, an ENZYME that acts as a FIBRINOLYTIC AGENT of the (tissue-type) plasminogen activator group, forming plasmin which degrades fibrin so breaking up thrombi, thus acting as a THROMBOLYTIC. It can be used in thrombolytic therapy.

Silvadene™ ➡ **silver sulfadiazine.**

silver nitrate [JAN, USAN] shows ANTIBACTERIAL activity and can be used as a topical ANTISEPTIC and antiinfective. It is used to treat local ulcers and some eye conditions (e.g. prophylaxis against gonococcal infection).

silver sulfadiazine [USAN] (Silvadene™) is the silver salt of sulfadiazine, a SULPHONAMIDE with ANTIBACTERIAL activity. It can be used to treat burns.

silybin ➡ **silibinin.**

silybum substance E5 ➡ **silidianin.**

silybum substance E6 ➡ **silibinin.**

silydianin ➡ **silidianin.**

silymarin ➡ **silibinin.**

simfibrate [INN, JAN] (CLY 503) is one of the fibrate group, and has been used as an ANTIHYPERLIPIDAEMIC.

simvastatin [BAN, INN, USAN] (MK 733; Zocor™ and many other names) is derived synthetically from a fermentation product of *Aspergillus terreus*, and is a HMG-COA REDUCTASE INHIBITOR. It is used orally as an ANTIHYPERLIPIDAEMIC to reduce risk of death in patients with coronary heart disease and high serum cholesterol levels. In 1996 it was the 3rd best-selling prescription drug in the world.

sincalide [BAN, INN, USAN] (CCK-8; cholecystokifinoctapeptide; SQ 19844; Kinevac™) is a synthetic peptide comprising the 8 C-terminal residues of **cholecystokinin** (CCK-33). Like CCK-33 it is a CHOLECYSTOKININ RECEPTOR AGONIST and causes gallbladder contraction; and in the presence of **secretin** it stimulates pancreatic secretion. It is used clinically as a diagnostic agent for pancreatic and gallbladder function.

sinefungin [INN, USAN] is a nucleoside ANTIBIOTIC with ANTIPROTOZOAL properties.

Sinemet™ ➡ **carbidopa.**

Sinequan™ ➡ **doxepin.**

Singulair™ ➡ **montelukast.**

Sinthrome™ ➡ **nicoumalone.**

Siopel™ ➡ **dimethicone.**

SIPI 8915 ➡ **mevastatin.**

sirolimus [INN] (rapamycin; antibiotic AY 22989; AY 22989) is a (polyene group) ANTIBIOTIC produced by *Streptomyces hygroscopicus*. It has activity as an ANTIFUNGAL,

IMMUNOSUPPRESSANT and ANTICANCER AGENT.

sisomicin ➡ **sissomicin**.

sissomicin [BAN] (sisomicin [INN, USAN]) is an (aminoglycoside) ANTIBIOTIC, used for its ANTIBACTERIAL properties.

sitofibrate [INN] is a derivative of **clobibrate** and **sitosterol**, and has been used as an ANTIHYPERLIPIDAEMIC.

sitosterol (β-sitosterol) is widely distributed in plants and is the commonest sterol of higher plants. It has been used as an ANTIHYPERLIPIDAEMIC. See also **sitofibrate**.

β-sitosterol ➡ **sitosterol**.

sizofiran [INN, JAN] (schizophyllan; SPG) is a (polysaccharide) ANTIBIOTIC, isolated from *Schizophyllum commune*, showing (IMMUNOSTIMULANT) IMMUNOMODULATOR activity. It has ANTICANCER activity in a number of systems, including against sarcoma-180 ascites, and also augments anticancer properties of **interleukin-2** in mice.

SK 1 ➡ **niceritrol**.

SK 818 ➡ **propagermanium**.

SK 27702 ➡ **carmustine**.

Skelaxin™ ➡ **metaxalone**.

SKELETAL MUSCLE RELAXANTS are agents that relax skeletal (voluntary) muscle, and are a quite different class of drugs to those used as SMOOTH MUSCLE RELAXANTS. Some skeletal muscle relaxants, the NEUROMUSCULAR BLOCKING AGENTS, act directly at the skeletal neuromuscular junction to interfere with neurotransmission, and this type of drug has its main use during operations and other major manipulations. One class of these is the competitive blocker type, e.g. **atracurium besylate**, **gallamine**, **tubocurarine** and **vecuronium**. The other main class is the depolarizing blocker type, e.g. **suxamethonium chloride** and **decamethonium** (see NICOTINIC CHOLINOCEPTOR AGONISTS; NICOTINIC CHOLINOCEPTOR ANTAGONISTS). There are other useful agents acting directly within skeletal muscle on the sarcoplasmic reticulum to modify calcium release, e.g. **dantrolene sodium**. Yet other skeletal muscle relaxants act indirectly at the level of the CNS sites, e.g. **baclofen** and **diazepam** (see GABA RECEPTOR AGONISTS).

SKF 5 ➡ **tenamfetamine**.

SKF 478 ➡ **diphenidol**.

SKF 525A ➡ **proadifen**.

SKF 5883 ➡ **thioproperazine**.

SKF 6539 ➡ **flurothyl**.

SKF 6611 ➡ **norclostebol**.

SKF 10812 ➡ **flupenthixol**.

SKF 91923 ➡ **burimamide**.

SKF 92058 ➡ **metiamide**.

SKF 92334 ➡ **cimetidine**.

SKF 92676 ➡ **impromidine**.

SKF 92994 ➡ **oxmetidine**.

SKF 93479 ➡ **lupitidine**.

SKF 93574 ➡ **donetidine**.

SKF 93944 ➡ **temelastine**.

SKF 94836 ➡ **siguazodan**.

SKF 95282 ➡ **zolantidine**.

SKF 95587 ➡ **sulotroban**.

SKF 100916J ➡ **aclatonium napadisylate**.

SKF 101468 ➡ **ropinirole**.

SKF 104864 ➡ **topotecan**.

SKF 108566 ➡ **eprosartan**.

SKF D-39162 ➡ **auranofin**.

Skinoren™ ➡ **azelaic acid**.

SL 76002 ➡ **progabide**.

slaked lime ➡ **calcium hydroxide**.

SM 1213 ➡ **amiprilose**.

SM 3997 ➡ **tandospirone**.

SM 7354 ➡ **pimozide**.

SM 10902 ➡ **pimilprost**.

SMOOTH MUSCLE RELAXANTS relax smooth (involuntary) muscle, and are of a quite different class to drugs used as SKELETAL MUSCLE RELAXANTS. A number of smooth muscle relaxants are used as VASODILATOR compounds, i.e. agents that dilate blood vessels. Some that act directly on the blood vessels are **glyceryl trinitate**, **hydralazine**, **isosorbide dinitrate**, **pentaerythritol tetranitrate** and **sodium nitroprusside**. These and other nitrite and nitrate drugs are thought to mimic the actions of the endogenous mediator **nitric oxide**, which relaxes smooth muscle through elevation of cGMP. These drugs are used for a number of purposes, including as ANTIANGINAL AGENTS or in acute hypertension. See NITRERGIC STIMULANTS.

The CALCIUM-CHANNEL BLOCKERS act to block a subset of voltage-sensitive calcium channels (L-channels), so reducing Ca^{2+}-influx into smooth muscle, and can be used to induce relaxation of virtually all smooth muscle, though they are mostly used as VASODILATORS, e.g. **diltiazem**, **verapamil**.

The potassium-channel openers are thought to work by opening a subset of K^+-channels, which leads to membrane stabilization. Agents such as this have so far been proposed as vasodilators for the treatment of hypertension or heart failure, e.g. **nicorandil**. They may, however, become used for their smooth muscle relaxant action at other sites, e.g. in the airways as ANTIASTHMATIC AGENTS, or for bladder hyperexcitability. Other examples of drugs that work at least partly by this mechanism are **cromakalim**, **diazoxide**, **pinacidil** and **minoxidil**. See POTASSIUM-CHANNEL ACTIVATORS.

Other smooth muscle relaxants act indirectly by blocking, mimicking, or modifying, the action of hormones or neurotransmitters, e.g. α-ADRENOCEPTOR ANTAGONISTS (e.g. **indoramin**), β-ADRENOCEPTOR AGONISTS, ACE INHIBITORS (e.g. **captopril**). They may be used as ANTIHYPERTENSIVE AGENTS to treat chronic raised blood pressure. Certain compounds work directly to relax smooth muscle, via a mechanism that is poorly understood, and are used to treat poor circulation in the extremities (peripheral vascular disease or Raynaud's phenomenon), e.g. **inositol nicotinate**. In treating intestinal colic, smooth muscle relaxants that work by blocking the effects of the cholinergic innervation can be effective, e.g. **atropine**, **cyclopentolate**, **hyoscine**, **mebeverine**, **propantheline bromide**: see MUSCARINIC CHOLINOCEPTOR ANTAGONISTS.

SMS 201-995 ➡ **octreotide**.

SN 12837 ➡ **proguanil**.

SNAP ➡ **S-nitroacetylpenicillamine**.

***S*-nitroacetylpenicillamine** (SNAP) acts as a nitric oxide (NO) donor, and so is a NITRERGIC STIMULANT.

SNX III ➡ **ω-conotoxin MI**.

SOD ➡ **superoxide dismutase**.

Sodium Amital™ ➡ **amylobarbitone**.

sodium artesunate ➡ **artesunate**.

sodium ascorbate ➡ **ascorbic acid**.

sodium aurothiomalate ➡ **gold sodium thiomalate**.

sodium aurotiosulfate [INN] (aurothiosulphate) is a thiogold derivative, and can be used as an ANTIINFLAMMATORY in antiarthritic and antirheumatic treatment. Also a reported ANTIHYPERTENSIVE, acting as a CYCLOOXYGENASE INHIBITOR.

sodium azodisalicylate ➡ **olsalazine**.

sodium benzoate can be used orally (together with sodium phenylacetate) to treat urea cycle enzymopathies.

sodium bicarbonate [JAN, USAN] (sodium hydrogen

carbonate; carbonic acid monosodium salt; baking soda) is used as a mild, rapid-acting oral **ANTACID**, for hyperacidity, dyspepsia and indigestion, and as an adjunct in the treatment of peptic ulcers. It is also sometimes used in infusion media to replace lost electrolytes, or to treat severe metabolic acidosis, e.g. in kidney failure or diabetic coma. It is a component of many compound antacid preparations, e.g. Alka-Seltzer™, Bisodol™, Gastrocote™, Gaviscon™, Andrews Salts™, Phosphate-Sandoz™ and Pyrogatrone™.

sodium calcium edetate ➡ **edetic acid**.

sodium cefapirin ➡ **cephapirin**.

SODIUM-CHANNEL ACTIVATORS activate or open one or more of the many types of sodium channels found in cell membranes, of which there are two main types.

(1) *The voltage-gated sodium channels* – of which there are at least five types – can in some cases be modified by sodium-channel activators that change Na^+-channel gating so as to increase the open-state probability. Such agents comprise of a number of toxins, plant alkaloids and synthetic agents. They facilitate Na^+-channel activation so that Na^+-channels open at normal resting potential and they also inhibit inactivation, so the channels fail to close if the membrane remains depolarized. The overall effect of this opening of sodium channels is to initially cause excitation and repetitive firing with a prolonged action potential in neurons and other excitable tissue. This then normally gives way to permanent depolarization, inexcitable membranes and paralysis. In cardiac muscle, these agents cause extra-systoles, arrhythmias and fibrillation, and in skeletal muscle spontaneous discharges cause twitching, with convulsion of neural origin. In the smooth muscle these agents have no appreciable action in the absence of a Na^+-channel with a central role in these cells. Such sodium-channel activators include several **NEUROTOXINS**, e.g. **batrachotoxinin**, **grayanotoxin**, α-scorpion toxins, β-scorpion toxins, sea anemones toxins, brevetoxins, plant pyrethroid **INSECTICIDES** (e.g. **permethrin**) and cardioactive plant alkaloids (e.g. **aconitine**, **veratridine**). Such agents are useful experimental tools, but are not used in clinical medicine.

(2) *The diverse family of ligand-gated channels*, some of which are permeant to other cations as well as sodium. Amongst the heterooligomeric intrinsic-ion-channel superfamily that admit Na^+, are cholinergic nicotinic receptors and NMDA glutamate receptors: see **GLUTAMATE RECEPTOR AGONISTS**; **NEUROMUSCULAR BLOCKING AGENTS**; **NICOTINIC CHOLINOCEPTORS AGONISTS**; **SKELETAL MUSCLE RELAXANTS**.

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SODIUM-CHANNEL BLOCKERS are agents that block or close any of the many types of sodium channels. There are two main types.

(1) In the cell membrane, the voltage-gated sodium channels comprise of at least 5 types – termed I, II, III, μ1, and h1 channels – that may be differentiated by electrophysiological, molecular cloning and pharmacological criteria. They are of the heterooligomeric type, and homologous with other voltage-gated cation channels. They are mainly found in a variety of neuronal sites, in skeletal muscle (μ1 and h1) and in cardiac muscle (I, h1). The individual properties of each of these ion channels resides largely in the α_1-subunit. The principal role of Na^+ in these excitable cells is as a charge-carrier leading to depolarization, excitation and in appropriate circumstances, generation of action potentials. However, Na^+ is not important as a charge-carrier in smooth muscle, where Ca^{2+} takes its place. In cardiac muscle both ions are important, but in different phases of the action potential. Pharmacological differences between different sodium channels can be shown, but few blockers have much selectivity. The related toxins **tetrodotoxin** and **saxitoxin** will block many, but not all, sodium channels at low concentrations – though they have not proved to have any safe clinical uses (see **NEUROTOXINS**). A number of metal ions will block the channels, and have some experimental value in differentiating subtypes, e.g. Zn^{2+}, Cd^{2+}, Pb^{2+}. A wide variety of other agents may block, modulate or open sodium channels (see **SODIUM-CHANNEL ACTIVATORS**). **LOCAL ANAESTHETICS** block most of the channels, this being their major mechanism of action. **ANTIARRHYTHMIC AGENTS** (Class 1 agents, e.g. **disopyramide**, **flecainide**, **lignocaine**, **procainamide**, **quinidine**) are sodium-channel blockers and are mainly used to treat atrial and ventricular tachycardias (see antiarrhythmic agents). **ANTIEPILEPTICS** have a number of mechanisms of action, but some appear to have a component involving modulation of sodium-channel function, e.g. **carbamaxepine** and **phenytoin** (see **ANTICONVULSANTS**).

(2) The diverse family of ligand-gated channels, some of which are permeant to other cations. Amongst the heterooligomeric intrinsic-ion-channel superfamily that admit Na^+, are cholinergic nicotinic receptor and NMDA glutamate receptors. These channels are opened by natural and unnatural agonist ligands, an effect opposed by competitive antagonist ligands (e.g. **tubocurarine** or **gallamine** at the nicotinic receptors). Conversely, the channels may be blocked by certain ligands previously thought to be competitive antagonists (e.g. **hexamethonium** or **mecamylamine** at the nicotinic receptors of the autonomic ganglia). Rather more indirectly, sodium (and calcium) ions are admitted by NMDA glutamate receptors and these channels are blocked by the dissociative anaesthetic **ketamine** and the psychotomimetic **phencyclidine** (see **GLUTAMATE RECEPTOR ANTAGONISTS**).

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sodium clodronate ➡ **clodronic acid**.

sodium cromoglicate ➡ **cromoglycic acid**; **sodium cromoglycate**.

sodium cromoglycate [BANM] (cromoglycic acid [BAN]; cromoglicic acid [INN]; cromolyn sodium [USAN]; sodium cromoglicate [JAN]; cromoglicate lisetil [INN]; Opticrom™; Rynacrom™; Intal™ and many other names) is a benzopyran derivative, an **ANTIALLERGIC** and **ANTIINFLAMMATORY**, used for a range of allergic conditions.

sodium diethyldithiocarbamate ➡ **ditiocarb sodium**.

sodium etidronate ➡ **etidronic acid**.

sodium flucloxacillin ➡ **flucloxacillin**.

sodium fusidate ➡ **fusidic acid**.

sodium gentisate ➡ **gentisic acid.**
sodium hydrogen carbonate ➡ **sodium bicarbonate.**
sodium iodide [USAN] has ANTIFUNGAL and EXPECTORANT properties, and can be used as a dietary supplement for iodine. Labelled compounds are used as radioactive agents and in thyroid function determination (sodium iodide I 123 [USAN] and sodium iodide I 125 [USAN]). ^{131}I also is used as an ANTITHYROID and ANTICANCER AGENT.
sodium iodide I 123 ➡ **sodium iodide.**
sodium iodide I 125 ➡ **sodium iodide.**
sodium L-throxine ➡ **thyroxine.**
sodium nitrite [USAN] is a nitric oxide (NO) donor, and so is a NITRERGIC STIMULANT. It has VASODILATOR properties, causes methaemoglobinaemia and is used as an ANTIDOTE for cyanide poisoning in combination with sodium thiosulfate.
sodium nitroferricyanide ➡ **sodium nitroprusside.**
sodium nitroprusside [USAN] (sodium nitroferricyanide; Nitropress™) is a nitric oxide (NO) donor, and so is a NITRERGIC STIMULANT. It acts as a VASODILATOR with little action on other smooth muscle (via metabolic release of NO) and can be used as an ANTIHYPERTENSIVE in hypertensive crisis.
sodium oxybate ➡ **4-hydroxybutanoic acid.**
sodium picosulfate ➡ **sodium picosulphate.**
sodium picosulphate [BAN] (sodium picosulfate [INN]) is a (stimulant) LAXATIVE of the diphenylmethane group. It can be used therapeutically alone or in combination with other laxatives.
sodium salicyate is the sodium salt of salicylic acid, derived from **salicin** from willow bark. It was extensively used before it prompted the synthesis of acetylsalicylic acid (**aspirin**), and subsequently the salicylate series of NSAID ANALGESICS. It is little used today.
sodium stibocaptate ➡ **stibocaptate.**
sodium stibogluconate (Pentostam™) is a pentavalent antimony compound, with ANTIPROTOZOAL activity. It can be used by injection to treat various forms of leishmaniasis, or kala-azar, which is caused by parasitic protozoa transmitted in sandfly bites and which leaves extensive lesions on the skin.
sodium sulfate ➡ **sodium sulphate.**
sodium sulphate (sodium sulfate [USAN]; disodium sulphate; Glauber's salt) is an oral (osmotic) LAXATIVE.
sodium thiosulfate [JAN, USAN] has ANTIFUNGAL properties. Its main therapeutic use is as an ANTIDOTE for cyanide poisoning.
sodium valproate ➡ **valproic acid.**
sofalcone [INN, JAN] (SU-88) is a cinnamoylphenoxyacetic acid derivative, and is an ANTIULCEROGENIC AGENT.
Soframycin™ ➡ **framycetin sulphate.**
Solatene™ ➡ **β-carotene.**
Solclot™ ➡ **duteplase.**
Solfa™ ➡ **amlexanox.**
sulfonphthal ➡ **phenolsulfonphthalein.**
Solfoton™ ➡ **phenobarbitone.**
Solganal™ ➡ **aurothioglucose.**
Solpadol™ ➡ **codeine.**
soluble aspirin (B.P.) ➡ **aspirin.**
soluble ferric citrate ➡ **ferric ammonium citrate.**
soluble indigo blue ➡ **indigotin disulfonate sodium.**
soluble insulin ➡ **insulin.**
somalapor ➡ **porcine pituitary growth hormone.**
somatoliberin ➡ **growth hormone-releasing hormone.**
somatomedin C ➡ **mecasermin.**
somatorelin ➡ **growth hormone-releasing hormone.**
somatorelin acetate ➡ **growth hormone-releasing hormone.**
somatostatin [BAN, INN] (growth hormone release-inhibiting factor; GH-RIF; somatotropin release inhibiting factor; SRIF; CM 9357) is a cyclic peptide of 14 residues with an internal disulphide bond between 3 and 14. It is formed from a precursor of 28 residues (**SRIF-28**). It was originally regarded solely as a HYPOTHALAMIC HORMONE (factor), but it is now known to have a more extended CNS neuronal distribution, in some peripheral nerves, including the gut enteric nervous system, and is also produced in the pancreas (α_1- or D-cells) providing local paracrine control. It has potentially wide inhibitor function in the body. It inhibits the release of **growth hormone**, **thyrotropin**, **insulin**, **glucagon**, **gastrin**, **pepsin**, **secretin** and **vasoactive intestinal peptide** (VIP). Somatostatin itself is of little therapeutic value because of its lability *in vivo* and multivariate actions. There is intensive research to find analogues with somatostatin receptor agonists (and antagonists) with more prolonged and/or selective actions. An agonist cyclic analogue with 8 residues, **octreotide**, is used clinically.
SOMATOSTATIN RECEPTOR AGONISTS activate receptors recognizing somatostatin, a hormone and neuropeptide. Somatostatin has a number of names. The names growth hormone release-inhibiting hormone (GHRIH), growth hormone-release-inhibiting factor (GHRIF) and somatotropin release inhibitory factor (SRIF) all refer to its role as a hypothalamic factor whose release leads to inhibitory modulation of the release of growth hormone (**somatotropin**) from the pituitary gland. However, it is now known to exist in various nerve tracts and neuroendocrine tissues and it has general inhibitor actions. It can also inhibit release of other pituitary hormones (including **thyroid-stimulating hormone** (TSH) and **prolactin**), other endocrine hormones including pancreatic hormones (**insulin** and **glucagon**), peptide hormones from a variety of neuroendocrine tumours (e.g. VIPomas and glucagonomas) and also the release of most intestinal hormones. It is produced in the gut, the pancreas and in some peripheral nerves (see HYPOTHALAMIC HORMONES; PITUITARY HORMONES). Somatostatin is a cyclic peptide of 14 residues (SRIF-14) but is formed from a precursor of 28 residues (SRIF-28).

There are now some 5 somatostatin subtypes of receptor that have been cloned, which the current official NC-IUPHAR appellation system terms (in lower case, since their functional expression is not yet established): sst_1, sst_2, sst_3, sst_4 and sst_5. These are all 7-transmembrane G-protein-coupled receptors, and seem to fall into 2 groups – sst_1 and sst_4; or sst_2, sst_3 and sst_5 – on the grounds of sequence homology (>90% within groups, <80% between groups), and similar pharmacology.

It should be noted that these individual receptors, or groups of receptors, have also variously been termed: $SRIF_1$ and $SRIF_2$, SS_1 and SS_2, SS_A and SS_B, or SOM_A and SOM_B, and also $SRIF_{1A}$, $SRIF_{1B}$, $SRIF_{1C}$ and $SRIF_{2A}$, $SRIF_{2B}$, and even $SRIF_{14}$ and $SRIF_{28}$.

All five subtypes have now been shown to be capable of coupling negatively to adenylyl cyclase ($G_{i/o}$). However, under appropriate conditions, they can also couple to the $InsP_3$/DAG system. The end-result of certain G-protein–mediated pathways is to close Ca^{2+}-channels or open K^+-channels and thus inhibit neuronal activity. Furthermore,

sst_1 and sst_2 receptors have been shown to activate phosphotyrosine phosphatase, a property that may be essential for direct tumour growth control. Indeed, such a stimulation may counteract the growth-promoting properties of growth factors and the subsequent receptor tyrosine kinases that they activate.

The natural agonist ligands SRIF-14 and SRIF-28 have only small differences in potency or affinity at the five receptors. Some reasonable selective synthetic agonists are available: at sst_1 receptors, des-Ala^{1,2,5}-[D-Trp^8,Iamp^9]SRIF; at sst_2 receptors, **octreotide** and **seglitide**; and at sst_5 receptors BOM 23052 (selective at rat but not human receptors). The relationship between cloned and functional receptors is not yet fully established (for this reason the NC-IUPHAR convention is to denote the subtypes in lower case letters). Active agonists have been formed by analogue variations of the cyclic 8 residues of somatostatin, where it is known that a tetrapeptide sequence is essential for activity. The cyclic octapeptide octreotide is used therapeutically, as it is less enzymatically degraded, and can be used for the relief of symptoms originating from the release of hormones from tumours of the endocrine system, including VIPomas (secreting vasoactive intestinal polypeptide), glucagonomas and may prove to have a place in the treatment of acromegaly and Graves' disease (oversecretion of thyroid hormone). Indeed somatostatin receptors are expressed on a wide variety of tumours (breast tumours, renal cell carcinomas, glial and meningiomas of the brain, lymphomas), as well as in the gastroenteropancreatic tumours; so somatostatin agonist analogues may prove to have a wider application.

Hoyer, D. *et al.* (1995) Classification and nomenclature of somatostatin receptors. *Trends Pharmacol. Sci.*, **16**, 86-88.
Patel, Y.C. *et al.* (1995) The somatostatin receptor family. *Life Sci.*, **57**, 1249-1265.
Reubi, J.-C. *et al.* (1995) Multiple actions of somatostatin in neoplastic disease. *Trends Pharmacol. Sci.*, **16**, 110-115.
Reisine, T. *et al.* (1995) Molecular properties of somatostatin receptors. *Neuroscience*, **67**, 777-790.

SOMATOSTATIN RECEPTOR ANTAGONISTS act at somatostatin receptors (see **SOMATOSTATIN RECEPTOR AGONISTS**). However, to date, few potent antagonists have been announced, though under certain conditions, depending on factors, such as tissue reserve and the transduction system involved, the analogues **seglitide** and somatuline appear to behave as specific receptor antagonists in guinea-pig atria (presumably acting as partial agonists). The synthetic peptide ligand BIM 23056 has recently been reported to be an active antagonist at human recombinant sst_5 receptors.

Dimech, J. *et al.* (1993) Antagonist effects of seglitide (MK 678) at somatostatin receptors in guinea-pig isolated right atria. *Br. J. Pharmacol.*, **109**, 898-899.
Wilkinson, G.F. *et al.* (1996) Potent antagonism by BIM-23056 at the human recombinant somatostatin sst_5 receptor. *Br. J. Pharmacol.*, **118**, 445-447.
Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

somatotropin (human) ➡ **human pituitary growth hormone.**

somatotropin release inhibiting factor ➡ **somatostatin.**

somatrem ➡ **human pituitary growth hormone.**

somatropin ➡ **human pituitary growth hormone.**

somavubove ➡ **bovine pituitary growth hormone.**

somenopor ➡ **porcine pituitary growth hormone.**

sometribove ➡ **bovine pituitary growth hormone.**

sometripor ➡ **porcine pituitary growth hormone.**

somfasepor ➡ **porcine pituitary growth hormone.**

somidobove ➡ **bovine pituitary growth hormone.**

Sominex™ ➡ **promethazine.**

somniferine is an alkaloid from *Papaver somniferum* (Papaveraceae) and has **HYPNOTIC** properties.

sonermin ➡ **tumour necrosis factor.**

sopromidine [INN] is a substituted imidazolylthioguanidine, a partial (H_2) **HISTAMINE RECEPTOR AGONIST.**

soquinolol [INN] is a **β-ADRENOCEPTOR ANTAGONIST.**

sorbinicate [INN] (D-glucitol hexanicotinate) is a coronary **VASODILATOR**, which can be used for the treatment of circulatory disorders.

sorbinil [BAN, INN, USAN] is an **ALDOSE REDUCTASE INHIBITOR** (ARI) similar to **tolrestat**. These agents have potential for the treatment of peripheral diabetic neuropathies.

Sorbitrate™ ➡ **isosorbide dinitrate.**

Sotacor™ ➡ **sotalol.**

sotalol [BAN, INN] (sotalol hydrochloride [USAN]; Sotacor™) is a (both class II and III) **ANTIARRHYTHMIC** and (subtype-non-selective) **β-ADRENOCEPTOR ANTAGONIST**, which is relatively water-soluble. Chemically, it is a racemate with the receptor-blocking activity residing in the (-)-isomer, and antiarrhythmic activity shown by both (the (+)-*S*-form is **dexsotalol**). Therapeutically, it is normally used as an antiarrhythmic rather than as an **ANTIHYPERTENSIVE.**

sotalol hydrochloride ➡ **sotalol.**

soterenol [INN] (soterenol hydrochloride [USAN]) is a **β-ADRENOCEPTOR AGONIST.** Therapeutically, it can be used as a **BRONCHODILATOR** in **ANTIASTHMATIC** treatment.

soterenol hydrochloride ➡ **soterenol.**

SP ➡ **substance P.**

[D-Arg^1,D-Trp^{7,9},Leu^{11}]SP$_{1-11}$ (spantide I) is a **substance P** derivative, a **TACHYKININ RECEPTOR ANTAGONIST** used as a pharmacological tool.

SP(4-11) ➡ **substance P.**

SP 175 ➡ **nabazenil.**

SP 325 ➡ **naboctate.**

SP 732 ➡ **prolintane.**

[Pro^9]SP ➡ **[Pro^9]-substance P.**

[Sar^9,Met(O$_2$)^{11}]SP is a substance P derivative, a **TACHYKININ RECEPTOR AGONIST** somewhat selective at the NK_1-receptor subtype. It is used as a pharmacological tool.

[pGlu^6,Pro^9]SP$_{6-11}$ ➡ **septide.**

'Spanish Fly' ➡ **cantharides.**

spantide I ➡ **[D-Arg^1,D-Trp^{7,9},Leu^{11}]SP1-11.**

sparfloxacin [BAN, INN, USAN] fluoroquinolone, is a broad-spectrum **ANTIBACTERIAL** which can be used as an **ANTILEPROTIC** and **ANTITUBERCULAR AGENT.**

sparfosate sodium ➡ **sparfosic acid.**

sparfosic acid [INN] (sparfosate sodium [USAN]; phosphonoacetylaspartic acid; NSC 224131; PALA; CI 882) is an aspartate transcarboxylase inhibitor that prevents the first step in pyrimidine biosynthesis, thus acting as an antimetabolite **ANTICANCER AGENT.** It has been tried with limited success in treating various solid tumours.

Sparine™ ➡ **promazine.**

SPCA ➡ **factor VII.**

spearmint oil ➡ **carvone.**

Spectazole™ ➡ **econazole nitrate.**

spectinomycin [BAN, INN, USAN] (spectinomycin hydrochloride [USAN]; Trobicin™) is an (aminoglycoside-like aminocyclitol) **ANTIBIOTIC** with **ANTIBACTERIAL** activity against Gram-positive and Gram-negative bacteria. It is used to treat Neisseria gonorrhoea infections.

spectinomycin hydrochloride ➡ **spectinomycin.**

SPG ➡ **sizofiran.**

spheroidine ➡ **tetrodotoxin.**

spiradoline [INN] (spiradoline mesylate [USAN]; U 62066E) is a novel pyrrolidinyloxaspiro compound, a (κ) OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.
spiradoline mesylate ➡ **spiradoline**.
spiramycin [BAN, INN, USAN] is a (macrolide) ANTIBIOTIC complex with ANTIBACTERIAL and ANTIPROTOZOAL properties.
spirapril [INN, USAN] is a captopril-like ACE INHIBITOR, used as an ANTIHYPERTENSIVE. It can be given in the form of the prodrug ethyl ester, spirapril hydrochloride [USAN].
spirapril hydrochloride ➡ **spirapril**.
spirendolol [INN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIARRHYTHMIC properties.
spiro 32 ➡ **spirogermanium**.
Spiroctan-M™ ➡ **canrenoic acid**.
spirogermanium [BAN, INN] (spirogermanium hydrochloride [USAN]; NSC 192965; S 99A; spiro 32) is an organic cyclogermanium compound that inhibits protein and nucleic acid synthesis, and acts as an antimetabolite ANTICANCER AGENT. It has been tried in a variety of malignant neoplasms. It also shows antiarthritic activity.
spirogermanium hydrochloride ➡ **spirogermanium**.
spironolactone [BAN, INN] (Aldactide™; Aldactone™ etc.) is an ALDOSTERONE-ANTAGONIST (potassium-sparing) DIURETIC which can be used in ANTIHYPERTENSIVE therapy. It can be used orally to treat oedema associated with aldosteronism, in congestive HEART FAILURE TREATMENT, kidney disease and ascites caused by cirrhosis of the liver. It is often used with thiazide diuretics.
spiroplatin [BAN, INN, USAN] (NSC 311056; TNO 6) is an organic platinum compound related to **cisplatin**, and is an alkylating ANTICANCER AGENT tried in cancer treatment.
spirorenone [INN] (ZK 35973) is a steroid, an ALDOSTERONE-ANTAGONIST (potassium-sparing) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.
spiroxasone [INN, USAN] is a steroid, an ALDOSTERONE-ANTAGONIST (potassium-sparing) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.
spizofurone [INN, JAN] (AG 629) is a spirobenzofuran, an ANTIULCEROGENIC AGENT with cytoprotective actions.
SPMeO ➡ **SP methyl ester**.
SP methyl ester (SPMeO) is a substance P derivative, a TACHYKININ RECEPTOR AGONIST, selective at the NK_1-receptor subtype. It is used as a pharmacological tool.
Sporanox™ ➡ **itraconazole**.
SQ 1089 ➡ **hydroxyurea**.
SQ 2128 ➡ **etoxazene**.
SQ 16374 ➡ **methenolone**.
SQ 19844 ➡ **sincalide**.
SQ 20009 ➡ **etazolate**.
SQ 20881 ➡ **teprotide**.
SQ 29072 is a mercapto compound, a NEUTRAL ENDOPEPTIDASE INHIBITOR. It enhances the ANTIHYPERTENSIVE activity of ACE INHIBITORS.
SQ 31000 ➡ **pravastatin**.
SR 27897 ➡ **lintitript**.
SR 44866 ➡ **bimakalim**.
SR 47436 ➡ **irbesartan**.
SR 48527 is a quinolinylpyrazolyl compound, a nonpeptide NEUROTENSIN RECEPTOR ANTAGONIST. It is used as a pharmacological tool.
SR 95228 ➡ **growth hormone-releasing hormone**.
SR 142801 ➡ **osanetant**.
SR 141716A is a pyrazole derivative, reported to be a selective (CB_1) CANNABINOID RECEPTOR ANTAGONIST.
$SrCl_2$ ➡ **strontium chloride**.
SRI 63-675 is a PAF analogue, a PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST.
SRIF ➡ **somatostatin**.
SRIF-28 ➡ **somatostatin**.
ST 9067 ➡ **azintamide**.
Stadol™ ➡ **butorphanol**.
stallimycin [INN] (stallimycin hydrochloride [USAN]; distamycin A) is a (peptide) ANTIBIOTIC active as an ANTIVIRAL. It is used topically to treat herpes simplex infections.
stallimycin hydrochloride ➡ **stallimycin**.
stanolone [BAN] (androstanolone [INN]; androstanolone propionate; androstanolone enanthate; dihydrotestosterone) is a steroid, an ANDROGEN and ANABOLIC agent. It has been used orally and topically in the form of an eye ointment.
stanozolol [BAN, INN, JAN, USAN] (NSC 43193; Win 14833; Winstrol™; Stromba™) is a steroid with ANDROGEN and ANABOLIC properties. It is used orally to treat certain conditions including hereditary angio-oedema.
Staphcillin™ ➡ **methicillin**.
Staril™ ➡ **fosinopril**.
stavudine [INN, USAN] (d4T; Zerit™) is a synthetic thymidine nucleoside group reverse trascriptase inhibitor ANTIVIRAL AGENT, clinically used orally in ANTI-HIV treatment.
StC 1400 ➡ **fludrocortisone**.
Stelazine™ ➡ **trifluoperazine**.
Stemetil™ ➡ **prochlorperazine**.
stenbolone [INN] (stenbolone acetate [USAN]) is a steroid with ANABOLIC properties.
stenbolone acetate ➡ **stenbolone**.
stepronin [INN] (TTPG) is a thiopropionylglycine derivative, with MUCOLYTIC activity and has also been used in acute hepatitis.
Ster-Zac™ ➡ **hexachlorophane**; **triclosan**.
stibamine glucoside [BAN, INN] is an antimonal ANTIPROTOZOAL, formerly used for leishmaniasis.
stibocaptate [BAN] (sodium stibocaptate [INN]) is an antimonal ANTISCHISTOSOMAL AGENT.
stibosamine [INN] is an antimonal ANTIPROTOZOAL AGENT.
Stiedex™ ➡ **desoxymethasone**; **dexamethasone**.
Stiemycin™ ➡ **erthromycin**.
stilbamidine [BAN] (stilbamidine isetionate [INN]) is an ANTIPROTOZOAL AGENT.
stilbamidine isetionate ➡ **stilbamidine**.
stilbazium iodide [BAN, INN, USAN] is an ANTHELMINTIC.
stilbestrol diphosphate ➡ **fosfestrol**.
stilboestrol [BAN] (diethylstilbestrol [INN, USAN]; DES; NSC 3070; Stilphostrol™ and many other names) is a synthetic non-steroid OESTROGEN and metabolite of diethylstilbestrol. It is used as an ANTICANCER AGENT for breast and prostate cancer, and sometimes in HRT.
stilboestrol diphosphate ➡ **fosfestrol**.
Stilnoct™ ➡ **zolpidem**.
stilphostrol ➡ **fosfestrol**.
Stilphostrol™ ➡ **stilboestrol**.
Stimate™ ➡ **desmopressin**.
Stimlor™ ➡ **naftidrofuryl**.
stiripentol [INN, USAN] (BCX 2600) is a benzodioxolyl derivative, an ANTICONVULSANT and ANXIOLYTIC.
K-stophanthin-α ➡ **strophanthin-K**.
stophanthoside-K ➡ **strophanthin-K**.
Streptase™ ➡ **streptokinase**.
streptococcal deoxyribonuclease ➡ **streptodornase**.

streptodornase [BAN, INN] (streptococcal deoxyribonuclease; Varidase™) is a deoxyribonuclease ENZYME isolated from *Streptococcus haemolyticus*, which depolymerizes deoxyribonucleoproteins. It is used only in conjunction with **streptokinase** (a FIBRINOLYTIC) in topical treatment of wounds, lesions and skin ulcers (as Varidase™). Also, it can be administered through a catheter to dissolve clots in the urinary bladder.

streptokinase [BAN, INN] (Kabikinase™; Streptase™) reacts with blood plasminogen to form a complex which then has ENZYME activity as a FIBRINOLYTIC, breaking up thrombi and so acting as a THROMBOLYTIC. Chemically, it is a protein isolated from *Streptococcus haemolyticus*. Therapeutically, it can be used in the treatment of myocardial infarction, venous thrombosis and pulmonary embolism.

streptomycin [BAN, INN] (streptomycin sulfate [JAN, USAN]; isonicotinoyl hydrazone derivative: streptonicozid [BAN, USAN]; streptoniazid [INN]) is an (aminoglycoside) ANTIBIOTIC, the original member isolated from *Streptomyces griseus*. Clinically, it is can be used for its ANTIBACTERIAL properties but ototoxicty and neurotoxicity now restricts its systemic use to serious infections, e.g. as an ANTITUBERCULAR.

streptomycin sulfate ➡ **streptomycin**.

streptoniazid ➡ **streptomycin**.

streptonicozid ➡ **streptomycin**.

streptonigrin ➡ **rufocromomycin**.

streptozocin [INN, USAN] (Zanosar™) is an (aminoglycoside) ANTIBIOTIC produced by *Streptomyces* spp., and is a nitrosourea similar to **carmustine**. It shows activity as an IMMUNOSUPPRESSANT, ANTI-HIV and ANTICANCER AGENT. It can be used as an alkylating cytotoxic agent in the chemotherapy of islet-cell tumours of the pancreas.

Stromba™ ➡ **stanozolol**.

strontium chloride ($SrCl_2$) is used in toothpastes to relieve dental hypersensitivity. The ^{85}Sr and ^{89}Sr labelled compounds are used as radioactive agents in treating the pain of bone cancer and painful metastases (strontium chloride Sr 85 [USAN] and strontium chloride Sr 89 [USAN]; Metastron™).

strontium chloride Sr 85 ➡ **strontium chloride**.

strontium chloride Sr 89 ➡ **strontium chloride**.

strophanthin ➡ **strophanthin-K**.

strophanthin-G ➡ **ouabain**.

strophanthin-K (Kombé strophanthin; strophanthin; stophanthoside-K) is a mixture of CARDIAC GLYCOSIDES from stophanthus, the seeds of *Strophanthus kombe* and other plants. It has general properties similar to **digoxin**, and was formerly used for similar purposes, mainly as an (inotropic) CARDIAC STIMULANT and ANTIARRHYTHMIC in congestive HEART FAILURE TREATMENT. (Note: it should not be confused with K-stophanthin-α which is cymarin.)

strophanthoside-G ➡ **ouabain**.

strychnine [BSI, ISO] is an alkaloid from the seeds of *Strychnos nux-vomica*, from *Strychnos wallichiana* and many other *Strychnos* spp. Bark of *Strychnos icaja* is the richest known source (Strychnaceae). It is a CNS STIMULANT and violent tetanic convulsant poison, employed commonly in vermin killers, but use as animal poison is prohibited in UK. Small doses were formerly used as tonics, but pharmaceutical use is now essentially obsolete. It is a competitive GLYCINE RECEPTOR ANTAGONIST, and this is the reason for its NEUROTOXIN stimulant actions (particularly at spinal cord level). It is an important pharmacological tool in neurophysiological research. It also has anticholinesterase actions.

Stuart-Prower factor ➡ **factor X**.

Stugeron™ ➡ **cinnarizine**.

SU 88 ➡ **sofalcone**.

SU 4885 ➡ **metyrapone**.

SU 21524 ➡ **pirprofen**.

Sublimaze™ ➡ **fentanyl**.

substance K ➡ **neurokinin A; neuropeptide K**.

substance P (SP) is a naturally occurring 11 amino acid residue *C*-terminally amidated peptide, and is a tachykinin present in the brain of vertebrate species, in spinal ganglia and in the intestines. It is formed from the precursor preprotachykinin A (PPT-A). It acts as a TACHYKININ RECEPTOR AGONIST and stimulates extravascular smooth muscle, is a powerful VASODILATOR and transient HYPOTENSIVE, and causes salivation and increased capillary permeability. Notably, *N*-terminally deleted fragments (e.g. SP(4-11)) are as active as substance P itself on many systems. It is used as a pharmacological tool.

[Pro^9]-substance P ([Pro^9]SP) is a substance P derivative, a TACHYKININ RECEPTOR AGONIST reasonably selective at the NK_1-receptor subtype. It is used as a pharmacological tool.

Succ-[Asp^6,Me-Phe^8]SP$_{6-11}$ ➡ **senktide**.

succimer [BAN, INN, USAN] (DIM-SA; DMS; DMSA; DTS; Ro 1-7977; Chemet™) is a CHELATING AGENT, used as an ANTIDOTE for heavy metal poisoning (Pb, As, Hg) and as a diagnostic agent. A ^{99}Tc derivative is used in renal scintigraphy.

succinoylcholine ➡ **suxamethonium chloride**.

succinylcholine chloride ➡ **suxamethonium chloride**.

succinylsulfathiazole [INN] is a sulphonamide used as an intestinal ANTIBACTERIAL AGENT.

succisulfone [INN] is a sulphone with ANTIBACTERIAL activity.

sucralfate [BAN, INN, JAN, USAN] (Antepsin ™; Carafate™ and many other names) is a complex of aluminium hydroxide and sulphated sucrose. It can be used orally as a long-term ANTIULCEROGENIC for treatment of gastric and duodenal ulcers. It is a local cytoprotectant, probably by forming a barrier over an ulcer.

sucrosofate [INN] (sucrosofate potassium [USAN]) is a sulphated sucrose, which has a cytoprotective and ANTIULCEROGENIC activity.

sucrosofate potassium ➡ **sucrosofate**.

Sudafed™ ➡ **xylometazoline**.

sudismase ➡ **superoxide dismutase**.

Sufenta™ ➡ **sufentanil**.

sufentanil [BAN, INN, USAN] (sufentanil citrate [USAN]; Fentatienil™; Sufenta™; Sulfentanyl™; R 30730; R 33800) is one of the phenylpiperidine series, an analogue of fentanyl and alfentanil. It is an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC and used to treat moderate pain.

sufentanil citrate ➡ **sufentanil**.

Sufrexal™ ➡ **ketanserin**.

Sular™ ➡ **nisoldipine**.

sulbactam [BAN, INN] (sulbactam pivoxil [USAN]; sulbactam sodium [USAN]; penicillanic acid sulphone) is a semisynthetic (penicillin) ANTIBIOTIC, an ENZYME INHIBITOR resistant to β-lactamase, and is a β-LACTAMASE INHIBITOR that inhibits this penicillin-degrading enzyme. Clinically, it is only weakly ANTIBACTERIAL but can be administered together with antibacterial penicillins as a synergistic agent.

sulbactam pivoxil ➡ **sulbactam**.

sulbactam sodium ➡ **sulbactam**.

sulbenicillin [INN] (disodium sulbenicillin [JAN]) is a semisynthetic (penicillin) ANTIBIOTIC. It can be used

clinically as an ANTIBACTERIAL to treat certain infections.

sulbentine [INN] is a thiadiazine-thione that has ANTIFUNGAL properties. Clinically, it can be used topically.

sulconazole [BAN, INN] (sulconazole nitrate [USAN]; Exelderm™) is a broad-spectrum imidazole ANTIFUNGAL. It can be used topically to treat a range of fungal infections.

sulconazole nitrate ➡ **sulconazole**.

Suleo-C™ ➡ **carbaryl**.

suleparoid sodium ➡ **heparan sulphate**.

sulfabenz [INN, USAN] (sulfanilanilide) is a SULPHONAMIDE with ANTIBACTERIAL activity and was used as a veterinary ANTICOCCIDIAL.

sulfabenzamide [INN, USAN] (sulfabenzide; *N*-sulfanilylbenzamide) is a SULPHONAMIDE with ANTIBACTERIAL activity. It is combined with two similar drugs, **sulphacetamide sodium** and **sulphathiazole**, in a proprietary preparation (Sultrin™), which can be used topically to treat gynaecological infections and to prevent infection following gynaecological surgery.

sulfabenzide ➡ **sulfabenzamide**.

sulfacarbamide ➡ **sulphaurea**.

sulfacetamide ➡ **sulphacetamide sodium**.

sulfachlorpyridazine ➡ **sulphachlorpyridazine**.

sulfacitine [INN] is a SULPHONAMIDE with ANTIBACTERIAL activity.

sulfadiasulfone sodium ➡ **acetosulfone sodium**.

sulfadiazine ➡ **sulphadiazine**.

sulfadiazine sodium ➡ **sulphadiazine**.

sulfadicramide [INN] is a SULPHONAMIDE with ANTIBACTERIAL activity.

sulfadimethoxine ➡ **sulphadimethoxine**.

sulfadoxine [BAN, INN, USAN] is a SULPHONAMIDE used in ANTIMALARIAL treatment, often in combination with **pyrimethamine** (Fansidar™).

sulfafurazole ➡ **sulphafurazole**.

sulfaguanidine [INN] is a SULPHONAMIDE with ANTIBACTERIAL activity.

sulfaguanole [INN] is a SULPHONAMIDE with ANTIBACTERIAL activity.

sulfalene ➡ **sulfametopyrazine**.

sulfaloxic acid [INN] is a SULPHONAMIDE with ANTIBACTERIAL activity which can be used for intestinal infections.

sulfamazone [INN] is a sulphone with ANTIBACTERIAL and ANTIPYRETIC properties.

sulfamerazine ➡ **sulphamerazine**.

sulfamerazine sodium ➡ **sulphamerazine**.

sulfamethizole ➡ **sulphamethizole**.

sulfamethoxazole ➡ **sulphamethoxazole**.

sulfametomidine [INN] is a SULPHONAMIDE with ANTIBACTERIAL activity which is given by depot injection.

sulfametopyrazine [BAN, JAN] (sulfalene [INN, JAN]) is a SULPHONAMIDE with ANTIBACTERIAL activity which is used in the treatment of respiratory and urinary tract infections.

sulfametoxydiazine ➡ **sulphamethoxydiazine**.

sulfametrole [BAN, INN] is a SULPHONAMIDE with ANTIBACTERIAL activity.

sulfamonomethoxine [BAN, INN, JAN, USAN] is a SULPHONAMIDE with ANTIBACTERIAL activity.

sulfamoxole ➡ **sulphamoxole**.

Sulfamylon™ ➡ **mafenide**.

sulfanilamide [INN] (AVC™; Prontosil album™) is a SULPHONAMIDE with ANTIBACTERIAL activity now chiefly of historical importance (it is the active principle of **prontosil**, the first sulphonamide used), but still with some uses (e.g. bacterial vaginitis). Numerous derivatives have antibacterial properties.

sulfanilanilide ➡ **sulfabenz**.

***N*-sulfanilylbenzamide** ➡ **sulfabenzamide**.

sulfaphenazole ➡ **sulphaphenazole**.

sulfapyridine ➡ **sulphapyridine**.

sulfaquinoxaline [BAN, INN] is a SULPHONAMIDE with ANTIMICROBIAL activity which can be used as a veterinary ANTICOCCIDIAL.

sulfasalazine ➡ **sulphasalazine**.

sulfathiazole ➡ **sulphathiazole**.

Sulfentanyl™ ➡ **sufentanil**.

sulfinalol [INN] (sulfinalol hydrochloride [USAN]) is a β-ADRENOCEPTOR ANTAGONIST with ANTIHYPERTENSIVE properties. It is no longer marketed.

sulfinalol hydrochloride ➡ **sulfinalol**.

sulfinpyrazone ➡ **sulphinpyrazone**.

sulfiram ➡ **monosulfiram**.

sulfisomidine ➡ **sulphasomidine**.

sulfisoxazole ➡ **sulphafurazole**.

sulfobromophthalein ➡ **sulfobromophthalein sodium**.

sulfobromophthalein sodium [BAN] (sulfobromophthalein; BSP; bromsulfophthalein; bromsulphalein) is a dye used as a diagnostic agent in liver function determination.

sulfoguaiacol ➡ **potassium guaiacolsulfonate**.

sulfomyxin ➡ **polymyxin B**.

sulfoxone sodium ➡ **aldesulfone sodium**.

sulglicotide ➡ **sulglycotide**.

sulglycotide [BAN] (sulglicotide [INN]; GLPS) is a sulphated product of a glycopeptide isolated from porcine duodenum, and is an ANTIULCEROGENIC with GASTRIC SECRETION INHIBITOR and antipepsin activity.

sulindac [BAN, INN, JAN, USAN] (Clinoril™) is closely related to **indomethacin** of the indole acetic acid series, and is a prodrug that yields a sulphite metabolite that is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It is used orally to treat pain and inflammation in rheumatic disease and other musculoskeletal disorders. It is also an ALDOSE REDUCTASE INHIBITOR and is being studied for use in the treatment of eye disorders.

sulisobenzone [INN, USAN] is a substituted benzophenone, and can be used by topical application as a SUNSCREEN. It is a potential thymidylate synthase inhibitor.

sulmazole [INN] is an imidazopyridine, a (type III) PHOSPHODIESTERASE INHIBITOR with CARDIAC STIMULANT actions; also shows ANTIALLERGIC antianaphylactic activity.

suloctidil [BAN, INN, USAN] (MJF 12637) is a thiobenzenemethanol derivative, a CALCIUM-CHANNEL BLOCKER. It has PLATELET AGGREGATION INHIBITOR, ANTITHROMBOTIC and VASODILATOR activity, and can be used to increase cerebral blood flow.

sulofenur [BAN, INN, USAN] (LY 186641) is a sulphonylurea under investigation as an ANTICANCER AGENT.

sulotroban [BAN, INN, USAN] (BM 13177; SKF 95587) is a phenylsulphonylamine derivative, a (thromboxane; TP) PROSTANOID RECEPTOR ANTAGONIST and ANTITHROMBOTIC. It has been used in the treatment of glomerulonephritis.

sulparoid sodium ➡ **heparan sulphate**.

sulphacetamide sodium [BAN] (sulfacetamide [INN]) is a SULPHONAMIDE, an amide of **sulfanilamide**, which can be used clinically as an ANTIBACTERIAL, particularly topically as eye-drops and skin lotion. It is combined with two similar drugs, **sulfabenzamide** and **sulphathiazole**, in a proprietary

preparation (Sultrin™), which can be used topically to treat gynaecological infections and to prevent infection following gynaecological surgery.

sulphachlorpyridazine [BAN] (sulfachlorpyridazine [INN]) is a **SULPHONAMIDE**, used as a veterinary **ANTIBACTERIAL**.

sulphadiazine [BAN] (sulfadiazine [INN]; sulfadiazine sodium [INN, USAN]) is a **SULPHONAMIDE** and is an **ANTIBACTERIAL AGENT** used orally or by injection to treat serious infections, particularly meningococcal meningitis and to prevent recurrence of rheumatic fever.

sulphadimethoxine [BAN] (sulfadimethoxine [INN]) is a long-acting **SULPHONAMIDE**, and is an **ANTIBACTERIAL**.

sulphadimidine [BAN] (sulfadimidine [INN]) is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity which is used in the treatment of systemic and urinary tract infections.

sulphafurazole [BAN] (sulfafurazole [INN]; sulfisoxazole [USAN]; Gantrisin™) is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity which is used orally in the treatment of urinary tract infections and topically for eye infections.

sulphaloxic acid [BAN] is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity.

sulphamerazine [BAN] (sulfamerazine [INN]; sulfamerazine sodium [INN]) is a **SULPHONAMIDE** with **ANTIBACTERIAL** properties, used in veterinary practice.

sulphamethizole [BAN] (sulfamethizole [INN]; Thiosulfil™) is a short-acting **SULPHONAMIDE** with **ANTIBACTERIAL** activity, administered orally for the treatment of urinary tract infections.

sulphamethoxazole [BAN] (sulfamethoxazole [INN, USAN]; Gantanol™) is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity, used in the treatment of respiratory and urinary tract infections. It is usually used in conjunction with **trimethoprim** (co-trimoxazole).

sulphamethoxydiazine [BAN] (sulfametoxydiazine [INN]) is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity.

sulphamethoxypyridazine [BAN] (sulfamethoxypyridazine [INN]) is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity, used for systemic infections.

sulphamoxole [BAN] (sulfamoxole [INN, USAN) is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity, used for treatment of respiratory and urinary tract infections.

sulphan blue [BAN] (isosulfan Blue, [USAN]; P 1888; P 4125) is a dye used as a diagnostic agent in lymphangiography and in testing the circulatory function.

sulphaphenazole [BAN] (sulfaphenazole [INN]) is a sulfonamide with high **ANTIBACTERIAL** activity against streptococci.

sulphapyridine [BAN] (sulfapyridine [INN]) is a **SULPHONAMIDE**, a metabolite of **sulfasalazine**, once extensively used as an **ANTIBACTERIAL**.

sulphasalazine [BAN] (sulfasalazine [INN]; salazosulfapyridine [JAN]; salicylazosulfapyridine; Salazopyrin™; Azulfidine™) is a compound metabolized to the aminosalicylate **mesalazine** (5-aminosalicylic acid) and **sulphapyridine**, and is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity. It can be used as an **ANTICOLITIS AGENT** to treat active Crohn's disease and to induce and maintain remission of the symptoms of ulcerative colitis (where aminosalicylic acid is thought to be the active species). It is sometimes used to treat rheumatoid arthritis.

sulphasomidine [BAN] (sulfisomidine [INN]) is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity, formerly used in the treatment of urinary tract infections. It is a veterinary **ANTIMICROBIAL AGENT**.

sulphathiazole [BAN] (sulfathiazole [INN]) is a **SULPHONAMIDE** with **ANTIBACTERIAL** activity, formerly used in the treatment of severe staphylococcal infections. It is combined with two similar drugs, **sulfabenzamide** and **sulphacetamide sodium**, in a proprietary preparation (Sultrin™), which can be used topically to treat gynaecological infections and to prevent infection following gynaecological surgery.

sulphaurea [BAN] (sulfacarbamide [INN]) is a **SULPHONAMIDE** with antibacterial activity.

sulphinpyrazone [BAN] (sulfinpyrazone [INN, JAN, USAN]; Anturan™) is structurally related to **phenylbutazone**, and is a **URICOSURIC AGENT** used orally as a prophylactic antigout agent and to treat renal hyperurea. It works by promoting the excretion of uric acid in the urine. It also is a **PLATELET AGGREGATION INHIBITOR** and **ANTITHROMBOTIC**, and was formerly used to treat myocardiac infarction.

SULPHONAMIDES (sulfonamides, USA) are a chemical family of **ANTIMICROBIAL** drugs – referred to as sulphonamides in medical usage in the UK, or simply as 'sulpha drugs' or 'sulfa drugs' – that have evolved out of the discovery of *in vivo* bacteriostatic actions of the azo-dye **prontosil** in the 1930s. The active moiety was shown to be **sulfanilamide**, which has the property of preventing the growth of bacteria. A large number of analogues have been tested or developed since, and though their importance has given way somewhat to antimicrobial antibiotics, the sulphonamides have an established place in chemotherapeutics. In the face of widespread resistance of parasitic organisms to many important antibiotics, they may have something of a renaissance. In the meantime, sulphonamides and the related sulfones, have an important place in the clinical treatment of leprosy and malaria. See **ANTILEPROTIC AGENTS**; **ANTIMALARIALS**; **ANTIPROTOZOALS**.

It may also be noted that, apart from the development of the antibacterial sulfones, the basic structure of sulfanilamide has been adapted to form groups of drugs not used for antibacterial purposes. These include important drugs such as the sulphonylurea oral **HYPOGLYCAEMIC AGENTS**, and the acetazolamide and thiazide groups of **DIURETICS**, and the **ANTIINFLAMMATORY, ANTICOLITIS** drug **sulfasalazine**. The clinically useful antibacterial sulphonamides have been developed out of sulphanilamide by amide group substitutions and include: **sulfadimethoxine**, **sulfadimidine**, **sulfadoxine**, **sulphadiazine**, **sulphamethoxazole** and **sulfametopyrazine**.

The mechanism of action of sulphonamides rests on the resemblance of sulphanilamide to *p*-aminobenzoic acid, which is essential for the synthesis of folic acid in bacteria. Folate is required for the synthesis of purine nucleotides, which in turn are essential for DNA synthesis and cell division. It is necessary to convert folates in the blood, through two separate enzyme-catalysed reduction stages, to tetrahydrofolate (FH_4). The first stage involves the enzyme dihydropteroate reductase, which catalyses the conversion of *p*-aminobenzoic acid to folate (and this stage can be inhibited by sulphonamides). The second stage of conversion of folate to **tetrahydrofolate** is by the enzyme dihydrofolate reductase. This second stage is inhibited by the antibacterial drug **trimethoprim**, the antimalarial drugs **pyrimethamine** and **proguanil**, and the anticancer drug **methotrexate**. Since mammals can obtain folate from the diet, whereas bacteria must synthesize it, folate antagonists can be used for selective chemotherapy. Moreover, it is often more efficient to block both the stages in the production of folic acid, so inhibitors are often given in combination. In the present instance, the

sulphonamide **sulfamethoxazole** is given with the dihydrofolate reductase inhibitor trimethoprim as a compound preparation called co-trimoxazole, which makes an effective and much-used bacteriostatic antibacterial treatment. The two constituents so complement one another that the resultant synergism allows reduction of each to a fraction of what would be required alone, and consequently unwanted toxic side-effects are much reduced.

Sulfones are chemically related to sulphonamides, and are presumed to work by a similar mechanism. The only one still in clinical used is **dapsone** and this is used in combination with other drugs to treat leprosy. See **ANTILEPROTIC AGENTS**.

There are few absolute clinical indications for the use of sulphonamides. They have been used extensively in the past for urinary tract infections, though less now. They are used for certain respiratory infections, including that by *Pneumocystis carnii*, some sexually transmitted diseases (chlamidia, chancroid, trachoma), in drug-resistant malaria (with pyrimethamine), in inflammatory bowel disease (sulfasalazine) and as silver sulfadiazine for topical application in infected burns.

Brumfitt, W. *et al.* (1980) Trimethoprim. *Br. J. Hosp. Med.*, **23**, 281, 284-286, 288.
Franklin, T.J., *et al.* (1989) *Biochemistry of Antimicrobial action*, 4th edn, Chapman & Hall, London.
Lerner, B.H. (1991) Scientific evidence versus therapeutic demand: the introduction of the sulfonamides revisited. *Ann. Intern. Med.*, **115**, 315-320.
Zinner, S.H., *et al.* (1995) Sulfonamides and trimethoprim, in *Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases*, 4th edn, (eds G.L. Mandell *et al.*), Churchill Livingstone, Inc., New York, pp. 354-363.

sulpiride [BAN, INN, JAN, USAN] (Dolmatil™; Sulpitil™ and many other names) is a substituted benzamide (D_2) **DOPAMINE RECEPTOR AGONIST**, used chiefly as an oral non-sedative **ANTIPSYCHOTIC** in the managment of schizophrenia (to increase an apathetic and withdrawn patient's awareness, acting in effect as an **ANTIDEPRESSANT**). Quite separately from its antipsychotic uses, it can be used for disorders that may cause tremor, tics, involuntary movements or involuntary utterances (e.g. Gilles de la Tourette syndrome).

Sulpitil™ ➡ **sulpiride**.

sulprostone [INN, USAN] (CP 34089; SHB 286; ZK 57671) is a prostaglandin and synthetic analogue of **dinoprostone** (PGE_2), and is an (EP_3-subtype-selective) receptor **PROSTANOID RECEPTOR AGONIST** with tissue-selective actions. It is a **LUTEOLYTIC** and **OXYTOCIC** (uterine stimulant) **AGENT**. It has been used in early pregnancy by application to the cervix by pessary as part of the therapeutic abortion procedure, later in pregnancy as an **ABORTIFACIENT**, and also to treat post-partum haemorrhage.

sulpyrine ➡ **dipyrone**.

sultamicillin [BAN, INN, USAN] is a semisynthetic (penicillin) **ANTIBIOTIC**, a prodrug of **ampicillin** and **sulbactam**, joined by a double ester, where the latter is an **ENZYME INHIBITOR** that is resistant to β-lactamase and inhibits this penicillin-degrading enzyme. It can be used clinically as an **ANTIBACTERIAL** to treat certain infections.

sultopride [INN] (sultopride hydrochloride [JAN]; LIN 1418) is one of the substituted benzamides, with properties similar to **sulpiride**, and is a **DOPAMINE RECEPTOR ANTAGONIST**. It has **ANTIEMETIC** actions, and has been used as an **ANTIPSYCHOTIC** in the management of acute psychosis.

sultopride hydrochloride ➡ **sultopride**.

Sultrin™ ➡ **sulfabenzamide**; **sulphacetamide sodium**; **sulphathiazole**.

sulukast [INN, USAN] is a tetrazol derivative, a (LTD_4) **LEUKOTRIENE RECEPTOR ANTAGONIST** with antiasthmatic activity.

SUM 3170 ➡ **loxapine**.

sumatriptan [BAN, INN] is an indolemethanesulphonamide derivative, a ($5HT_1$-selective) **5-HYDROXYTRYPTAMINE RECEPTOR AGONIST**, which can be used in **ANTIMIGRAINE** treatment for acute attacks (orally, by injection or nasal spray).

sumatriptan hemisuccinate ➡ **sumatriptan**.

sumatriptan succinate ➡ **sumatriptan**.

suncillin [INN] (suncillin sodium [USAN]) is a semisynthetic (penicillin) **ANTIBIOTIC**, with **ANTIBACTERIAL** activity.

suncillin sodium ➡ **suncillin**.

SUNSCREEN AGENTS are creams and lotions containing chemical agents that partly block the passage of ultraviolet radiation in sunlight, and they are also used for protection during some radiation therapies to the skin. Ultraviolet radiation harms the skin and exacerbates many skin conditions. It may be divided into wavelength bands: UVB (290–320nm) causes sunburn and contributes to skin cancer and ageing. UVA (320–400 nm) causes problems by sensitizing the skin to certain drugs and, in the long term, may cause skin cancers. UVC (200–290nm) is only a problem at high altitudes. A number of substances offer protection against UVB, but do so less against UVA. Some preparations also contain substances which are reflective, and provide some protection against UVA, e.g. **calamine**, **titanium dioxide**, **zinc oxide**. Other preparations that contain ultraviolet radiation-absorbent agents or radiotherapy absorbent agents include **aminobenzoic acid** (**para-aminobenzoic acid**; PABA) and aminobenzoates (e.g. **padimate O**), benzophenones (e.g. **mexenone**, **oxybenzone**), dibenzoylmethanes (e.g. **avobenzone**) and some cinnamates.

Bestak, R. (1995) Sunscreen protection of contact hypersensitivity responses from chronic solar-simulated ultraviolet irradiation correlates with the absorption spectrum of the sunscreen. *J. Invest. Dermatol.*, **105**, 345-351.
Roberts, L.K. *et al.* (1995) Commercial sunscreen lotions prevent ultraviolet-radiation-induced immune suppression of contact hypersensitivity. *J. Invest. Dermatol.*, **105**, 339-344.

superoxide dismutase (SOD; orgotein [BAN, INN, USAN]; ormetein A) is a group of water-soluble protein congeners widely distributed in nature. They are enzymes (MW *c.* 330000) that catalyse the conversion of superoxide radicals (O_2^-) to peroxide (H_2O_2 and O_2). Several forms exist, varying in their metal composition (forms that contain copper, or copper and zinc, are common). By acting as a free-radical scavenger, SOD attenuates oxidative damage *in vivo*, acts as an **ANTIINFLAMMATORY**, is **NEUROPROTECTIVE** and may be a factor in ageing and onset of degenerative diseases. The drug used to date, called orgotein, is from bovine liver sources. A human decombinant technology version of *N*-acetylsuperoxide dismutase is known as sudismase.

Supprelin™ ➡ **histrelin**.

Suprane™ ➡ **desflurane**.

Suprarenaline™ ➡ **adrenaline**.

Suprarenin™ ➡ **adrenaline**.

Suprax™ ➡ **cefixime**.

Suprecur™ ➡ **buserelin**.

Suprefact™ ➡ **buserelin**.

suprofen [BAN, INN, JAN, USAN] (R 25061; Profenal™) is a member of the propionic acid series, and is a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC**, **ANTIINFLAMMATORY** and **ANTIPYRETIC** activity. It was formerly used systemically, but now is used topically to the eye as a mydriatic agent (to inhibit intraoperative miosis).

Surgam™ ➡ **tiaprofenic acid**.

suriclone [BAN, INN] (RP 31264) is a piperazine-carboxylate derivative, with **ANXIOLYTIC** and **HYPNOTIC** activity.

Surmontil™ ➡ **trimipramine**.

suronacrine [INN] (suronacrine maleate [USAN]; HP 128) is an acridine derivative, an **ANTICHOLINESTERASE** that has been

studied for the treatment of Alzheimer's desease.

suronacrine maleate ➡ **suronacrine**.

Sustenon™ ➡ **testosterone**.

sutilains [BAN, INN, USAN] (BAX 1515; Travase™) is an ENZYME derived from *Bacillus subtilis*. It is a proteolytic enzyme used for wound debridement in moist conditions.

suxamethonium chloride [BAN, INN] (succinylcholine chloride [USAN]; suxamethonium bromide [BAN]; succinoylcholine; Scoline™; Quelicin™; Anectine™) is a bistrimethylethanaminium derivative, a NICOTINIC CHOLINOCEPTOR AGONIST, a (depolarizing) NEUROMUSCULAR BLOCKING AGENT, which can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia relaxant. Its action is short-lived due to hydrolysis by plasma cholinesterase.

suxamethonium bromide ➡ **suxamethonium chloride**.

suxethonium chloride [INN] is an analogue of **suxamethonium**, and is a NICOTINIC CHOLINOCEPTOR AGONIST and (depolarizing) NEUROMUSCULAR BLOCKING AGENT. It is used as a SKELETAL MUSCLE RELAXANT in anaesthesia relaxant.

suxibuzone [INN, JAN] (AE 17) is an analogue of phenylbutazone, one of the indole acetic acid series, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It has been used systemically and topically for skeletomuscular pains.

Sweeta™ ➡ **saccharin**.

Swiss blue ➡ **methylthioninium chloride**.

Symmetrel™ ➡ **amantadine**.

SYMPATHOMIMETIC AGENTS mimic the actions of the sympathetic division of the autonomic nervous system. The effects of this system on the tissues and organs are mediated by **adrenaline** and **noradrenaline** – which act predominantly as hormone or neurotransmitter, respectively. These catecholamines act at one of two receptor types, α-adrenoceptor and β-adrenoceptor, to exert the actions of the system. Sympathomimetics are of two types.

(1) *Direct-acting sympathomimetics* are agonists at α-adrenoceptors or β-adrenoceptors. The actions exerted by these receptors are detailed at **α-ADRENOCEPTOR AGONISTS** and **β-ADRENOCEPTOR AGONISTS**. Such drugs may show great selectivity of action. Examples of α_1-adrenoceptor agonists are **metaraminol**, **methoxamine oxymetazoline**, **noradrenaline**, **phenylephrine** and **xylometazoline**. Examples of β_1-adrenoceptor agonists are **dobutamine**, **rimiterol** and **xamoterol**; and of β_2-adrenoceptor agonists, **fenoterol**, **salbutamol**, **salmeterol** and **terbutaline** (see individual entries for details).

(2) *Indirect sympathomimetics* mimic the actions of the sympathetic nervous system by the release of noradrenaline and adrenaline from nerves of the sympathetic nervous system and from the adrenal medulla, respectively. They consequently show little selectivity of action: they may have both α-adrenoceptor and β-adrenoceptor stimulating actions, depending on where innervation is relatively dense. They are used mainly for purposes such as nasal DECONGESTANTS. Some agents work by displacing noradrenaline from its storage sites (though they may also have other actions), e.g. **amphetamine**, **ephedrine**, **pseudoephedrine**, **tyramine**. Other agents interfere with the noradrenaline ($uptake_1$) re-uptake process (see UPTAKE INHIBITORS), e.g. **cocaine** and tricyclic ANTIDEPRESSANTS such as **imipramine** and **desipramine**. Other agents prevent autoinhibition of release of noradrenaline by acting as agonists at α_2-adrenoceptors on sympathetic nerve endings, e.g. **clonidine**. Within the CNS, MONOAMINE-OXIDASE INHIBITORS may enhance sympathetic activity.

Synacthen™ ➡ **tetracosactrin**.

Synalar™ ➡ **fluocinolone acetonide**.

Synarel™ ➡ **nafarelin**.

Syncurine™ ➡ **decamethonium iodide**.

syndyphalin (Syndyphalin 33) is a synthetic pseudopeptide enkephalin analogue, and is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

syndyphalin 25 (SD 25) is a synthetic pseudopeptide enkephalin analogue, and is a (μ) OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

Syndyphalin 33 ➡ **syndyphalin**.

Synflex™ ➡ **naproxen**.

Synkavit™ ➡ **menadiol sodium phosphate**.

Syntaris™ ➡ **flunisolide**.

synthetic capsaicin ➡ **nonivamide**.

Synthroid™ ➡ **thyroxine**.

Syntometrine™ ➡ **ergometrine**.

Syntopressin™ ➡ **lypressin**.

Syprine™ ➡ **trientine**.

Syscor™ ➡ **nisoldipine**.

T3 ➡ **liothyronine**.
T_4 ➡ **thyroxine**.
T 1824 ➡ **azovan blue**.
TA3 ➡ **tiratricol**.
TA 28 ➡ **benzethidine**.
TA 48 ➡ **furethidine**.

tabilautide [INN] (RP 56142) is a pseudopeptide with an oxododecyl tail, and has (IMMUNOSTIMULANT) IMMUNOMODULATOR activity. It exerts a hepatoprotective effect against paracetamol-induced toxicity.

TACE ➡ **chlorotrianisene**.

TACHYKININ RECEPTOR AGONISTS act at receptors that recognize the tachykinin peptides and analogues. This family, of which **substance P** is the best-known member, exert their major neurotransmitter, hormonal and other actions by acting as agonists at tachykinin NK_1, NK_2 and NK_3 receptors. Mammalian tachykinins are also referred to as neurokinins and correspondingly the receptors can be called neurokinin receptors. Tachykinins are a phylogenetically extended family that share a common *C*-terminal sequence homology (-Phe-X-Gly-Leu-MetNH_2) which is *N*-terminally extended, normally in a linear sequence. The most important endogenous mammalian tachykinins are substance P (SP; 11 residues), **neurokinin A** (NKA; previous names substance K, neurokinin α, neuromedin L; 10 residues) and **neurokinin B** (NKB; previous names neurokinin β, neuromedin K; 10 residues). There are also further *N*-terminal extended mammalian forms of NKA – **neuropeptide K** and **neuropeptide-γ**. These various peptides are produced by two different genes each coding for a similar preprotachykinin (PPT): PPT-A forms SP and/or NKA and its *N*-terminal extensions; PPT-B produces NKB. Substance P biological activity was first recognized in a peptidic powdered principle (*P*) isolated from equine intestine (1931), but was not sequenced until 1971. Non-mammalian tachykinins were isolated, studied pharmacologically and sequenced from 1965 onwards. Non-mammalian tachykinins were extensively used in earlier experimental pharmacology, especially in differentiating mammalian receptor subtypes, including **eledoisin**, **kassinin** and **physalaemin**. In nature, tachykinins are sometimes venoms or neurotoxins.

There are three distinct mammalian tachykinin receptors, termed NK_1, NK_2 and NK_3, all of which are of the 7-transmembrane G-protein-coupled superfamily, and which couple via the $InsP_3$/DAG ($G_{q/11}$) pathway. These are produced by three or more separate genes. The orders of potency of the three principal endogenous peptides at the three receptors are as follows: at NK_1 receptors, SP > NKA > NKB; At NK_2 receptors, NKA > NKB >> SP; at NK_3 receptors, NKB > NKA > SP. Thus each agonist can act at each receptor.

Selective agonists at the three receptor types are as follows: At NK_1 receptors: **SP methyl ester**, **[Pro^9]SP** and **[Sar^9,Met(O$_2$)^{11}]SP**. At NK_2 receptors: **[β-Ala^8]NKA_{4-10}**, **[Lys^5,MeLeu^9,Nle^{10}]NKA_{4-10}** and the pseudopeptide **GR 64349**. At NK_3 receptors: **senktide** is selective and **[MePhe^7]NKB** and **[Pro^7]NKB** have reasonable selectivity.

There are marked species-dependent variations in receptor recognition properties within a subtype, and there is also some evidence for within-species receptor isoforms produced by alternative splicing or post-translational processing. Furthermore, there is evidence of alternative binding sites (on the NK_1 receptor for peptides related to septide). Recently, an 'orphan' receptor, originally identified as an opioid receptor, has been proposed to be an NK_3 receptor variant ('NK_4'). There is also evidence for the existence of a receptor site for SP_{1-7} and other *N*-terminal fragments of substance P (but this is not classified as a tachykinin receptor because this peptide sequence does not contain the characteristic motif). Tachykinins are degraded in the body by peptidases, including neutral endopeptidase (NEP; neprilysin), ACE and several other endopepidases and aminopeptidases. Some of these degradation fragments may bind at the proposed *N*-terminal binding site mentioned above.

The classic effects of substance P are to cause contraction of intestinal smooth muscle, hypotension and salivation. Tachykinin receptors have a ubiquitous distribution in the body and there is an extensive distribution of nerves (central, autonomic, enteric) and neuroendocrine cells that contain and secrete substance P.

A number of end-effects are mediated by **nitric oxide** (NO) release (presumably calcium-induced), including widespread vasodilation. There is no fixed association of receptor type with the sort of effect it elicits, but NK_1 receptors are often involved in smooth muscle contraction, and NK_3 receptors are particularly associated with neural effects (including within the CNS), such as depolarization with neurotransmitter release. Neurokinins as neurotransmitters or neuromodulators are thought to have a central role in many physiological and pathophysiological processes. These include involvement in the control of pain processing, gastrointestinal motility, bladder motility, airways function, neurogenic inflammation and extravasation, and many other processes. Also, there are paracrine cells within the gut mucosa (argentochromaffin neuroendocrine cells that co-store SP and 5-HT) that may be involved in pathophysiology, e.g. after radiation or chemotherapy (e.g. by **cisplatin**) their disruption may be responsible for adverse effects including nausea and emesis, and 5-HT and tachykinin receptor antagonists may show part of their beneficial effects for this reason.

There are currently no established uses of tachykinin agonists, and little incentive to develop such ligands; though there have been trials using (largely natural) agents to treat gastrointestinal stasis and to aid diagnosis of salivation disorders.

Hall, J.M. (1994) Receptor function in the periphery, in *The Tachykinin Receptors*, (ed. S.H. Buck), Humana Press, Totowa, NJ., pp. 515-580.
Maggi, C.A. (1994) Evidence for receptor subtypes/species variants of receptors, in *The Tachykinin Receptors*, (ed. S.H. Buck), Humana Press, Totowa, NJ, pp. 395-470.
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TACHYKININ RECEPTOR ANTAGONISTS act at tachykinin receptors as discussed at TACHYKININ RECEPTOR AGONISTS. There is considerable therapeutic potential for tachykinin receptor antagonists and competitive antagonists are now available for all three receptor subtypes. First-generation agents are peptide analogues containing D-amino

acids and/or bulky, rigid or unnatural amino acids, e.g. **[DArg^1,DTrp^{7,9},Leu^{11}]SP$_{1-11}$** (spantide I) and [DArg^1,DPro^2,DTrp^{7,9},Leu^{11}]SP$_{1-11}$. Second-generation antagonists are pseudopeptides, cyclized peptides and analogues with improved enzyme stability and selectivity, e.g. GR 82334, MEN 10207. Third-generation antagonists are non-peptides, of which the first high-affinity ligand, produced from a chemical-library high-throughput binding screen, was the quinuclidine NK_1 antagonist **CP 96345**, which was not further developed because of Ca^{2+}-channel blocking activity. At NK_1 receptors antagonists include CP 99994, GR 82334, **RP 67580**, LY 303879. At NK_2 receptors antagonists include MEN 10207, SR 48968 (saredutant), GR 94800, GR 159897, MEN 10627. At NK_3 receptors antagonists include SR 142802 (**osanetant**), SB 223412, PD 157672, PD 161182. It should be noted that most antagonists have marked species-dependent differences in affinity; some with over 100-fold higher affinity at rodent receptors compared to human/ovine/guinea-pig receptors (e.g. SR 48968), and some with a reverse preference (e.g. CP 96345).

The distribution of tachykinin receptors in the body is widespread, and their blockade can have diverse actions. No antagonists are yet used in human therapeutics, though a number of trials are in progress. Proposed applications include as analgesics (particularly for arthritic and other inflammatory hyperalgesic pain), in the treatment of neurogenic inflammation and migraine, as antiemetics, as anxiolytics, antidepressants, for intestinal colic and inflammatory bowel disease, and for bladder hypermotility.

Maggi, C.A. *et al.* (1993) Tachykinin receptors and tachykinin receptor antagonists. *J. Auton. Pharmacol.*, **13**, 23-93.

Regoli, D. *et al.* (1994) Receptors and antagonists for substance P and related peptides. *Pharmacol. Rev.*, **46**, 551-599.

tacrine [BAN, INN] (tacrine hydrochloride [USAN]; THA; Cognex™) is an aminoacridinamine derivative, a reversible ANTICHOLINESTERASE, which can be used to promote mental alertness; reported to be useful in treatment of Alzheimer's disease as a cholinergic NOOTROPIC AGENT (cognition enhancer). It has RESPIRATORY STIMULANT actions, and has been used to prolong the duration of action of **suxamethonium** as an adjunct in general anaesthesia. It protects neuronal acetylcholinesterase from inhibitory effects of certain other organophosphorus compounds *in vivo*, so has potential use as a prophylaxis against 'nerve gases'. The *N*-butyl derivative is bucricaine [INN].

tacrine hydrochloride ➡ **tacrine**.

tacrolimus [INN, USAN] (Prograf™) is a (macrolide-related) ANTIBIOTIC isolated from *Streptomyces tsukubaensis* and *Streptomyces hygroscopicus yakushimaensis*. It is an IMMUNOSUPPRESSANT used orally or intravenously, particularly to limit tissue rejection during and following organ transplant surgery (especially of liver or kidney). It has been investigated for treatment of autoimmune chronic active hepatitis.

Tagamet™ ➡ **cimetidine**.

TAI 284 ➡ **clidanac**.

talampicillin [BAN, INN] (talampicillin hydrochloride [BAN, JAN, USAN]) is a semisynthetic (penicillin) ANTIBIOTIC (phthalidyl ester of **ampicillin**). It can be used clinically as an ANTIBACTERIAL to treat certain infections.

talampicillin hydrochloride ➡ **talampicillin**.

talinolol [INN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIHYPERTENSIVE properties.

talsaclidine [INN] (talsaclidine fumarate [USAN]; WAL 2014) is a quinuclidine derivative, a (M_1) MUSCARINIC CHOLINOCEPTOR AGONIST. It has been investigated for possible use in cholinergic-replacement therapy for Alzheimer's.

talsaclidine fumarate ➡ **talsaclidine**.

Talwin™ ➡ **pentazocine**.

Tamboco™ ➡ **flecainide**.

Tambocor™ ➡ **flecainide**.

Tamm-Horsfall protein ➡ **uromodulin**.

Tamofen™ ➡ **tamoxifen**.

tamoxifen [BAN, INN] (tamoxifen citrate [JAN, USAN]; ICI 46474; NSC 180973; Emblon™; Fentamox™; Nolvadex™; Oestrifen™; Opus™; Tamofen™ and many other names) is a non-steroid ANTIOESTROGEN (oestrogen-receptor antagonist); used extensively as an oral ANTICANCER AGENT in the treatment of breast cancer. The active drug is probably the 4-hydroxy-substituted derivative.

tamoxifen citrate ➡ **tamoxifen**.

tamsulosin [BAN, INN] (tamsulosin hydrochloride [USAN]; LY 253352; YM 12617; Flomax™) is an (α_1) α-ADRENOCEPTOR ANTAGONIST used for benign prostatic hyperplasia.

tamsulosin hydrochloride ➡ **tamsulosin**.

Tancolin™ ➡ **dextromethorphan**.

Tanderil™ ➡ **oxyphenbutazone**.

tandospirone [BAN, INN] (tandospirone citrate [USAN]; SM 3997) is one of the azaspirone group and similar to **buspirone**. It is a 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST (a partial agonist at the $5HT_{1A}$ receptor subtype) and is a novel ANXIOLYTIC under investigation for the treatment of anxiety and depression. It stimulates **prolactin** secretion.

tandospirone citrate ➡ **tandospirone**.

TAO™ ➡ **triacetyloleandomycin**.

TAP 031 ➡ **fertirelin**.

TAP 144 ➡ **leuprorelin**.

Tapazole™ ➡ **methimazole**.

taprostene [INN] (CG 4203) is a prostaglandin and synthetic analogue of **prostacyclin** (PGI_2). It is a PROSTANOID RECEPTOR AGONIST that is a PLATELET AGGREGATION INHIBITOR and claimed to be cardioprotective.

Targotid™ ➡ **teclozan**.

tarichatoxin ➡ **tetrodotoxin**.

Tarivid™ ➡ **ofloxacin**.

tartar emetic ➡ **antimony sodium tartrate**.

tasosartan [INN, USAN] (WAY-ANA-756) is a pyridopyrimidinone, an (AT_1) ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE activity.

tasuldine [INN] (HE 10004) is a thiopyrimidine and a MUCOLYTIC AGENT.

taurine [INN] (aminoethylsulphonic acid; ethylaminesulphonic acid) is an amino acid that occurs free in animal tissues, bacteria, red algae and some higher plants. It is an intermediate in the metabolism of cysteine. It is in high concentration in synaptosomes within the CNS, and is a putative neurotransmitter, but acts as a GLYCINE RECEPTOR AGONIST. It is involved in bile acid conjugation and is used as an adjunct in hypercholesterolaemia treatment.

taurocholic acid (cholyltaurine) is a steroid bile acid, a constituent of bile, with CHOLERETIC and hepatoprotectant actions.

tauromustine [INN] (LS 2667; TCNU) is a nitrosourea similar to **carmustine**, and has been investigated as an ANTICANCER AGENT for the treatment of malignant melanoma.

Tavegil™ ➡ **clemastine**.

Tavist™ ➡ **clemastine**.

Taxol™ ➡ **paclitaxel**.

Taxotere™ ➡ **docetaxel**.

tazifylline [INN] (tazifylline hydrochloride [USAN]; LN 2974; RS 49014) is a substituted piperazinylpurine, a HISTAMINE H_1-

RECEPTOR ANTAGONIST reported to have little sedative action.

tazifylline hydrochloride ➡ **tazifylline**.

tazobactam [INN] (tazobactam sodium [USAN]) is an ENZYME INHIBITOR active against the β-lactamase ('penicillinase') enzymes produced by Gram-positive and -negative bacteria. Clinically, it can be used co-administered with β-lactamase susceptible penicillins and cephalosporins, enhancing their antibacterial actions.

tazobactam sodium ➡ **tazobactam**.

Tazocin™ ➡ **piperacillin**.

tazolol [INN] (tazolol hydrochloride [USAN]) is a β-ADRENOCEPTOR AGONIST selective for the β_1-subtype. Therapeutically, it can be used as a CARDIAC STIMULANT.

tazolol hydrochloride ➡ **tazolol**.

TBPS (*tert*-butyl bicyclic thiophosphate) is a ($GABA_B$) GABA RECEPTOR ANTAGONIST, used as a tool for studying binding sites of the mammalian CNS (^{35}S labelled). It is a CNS STIMULANT and convulsant neurotoxin.

3TC ➡ **lamivudine**.

T-cell growth factor ➡ **interleukin-2**.

TCGF ➡ **interleukin-2**.

TCNU ➡ **tauromustine**.

TCP ➡ **tenocyclidine**.

TCV 3B ➡ **vinpocetine**.

teceleukin [BAN, INN, USAN] (BG 8301; Ro 23-6019) is more fully described as interleukin-2 (human clone pTG853 protein moiety reduced), and is a recombinant version of **interleukin-2**, a peptide cytokine inflammatory mediator, acting as a CHEMOKINE RECEPTOR AGONIST. It can be used in therapeutics as an IMMUNOMODULATOR, and is proposed as an ANTIVIRAL AGENT.

teclozan [INN, USAN] is an AMOEBICIDE.

Teejel™ ➡ **choline salicylate**.

tefazoline [INN] is an imidazole related to **naphazoline**, and is a SYMPATHOMIMETIC and an (α_1) α-ADRENOCEPTOR AGONIST. It is a VASOCONSTRICTOR that can be used as a nasal DECONGESTANT.

Tegapen™ ➡ **cloxacillin**.

Tegison™ ➡ **etretinate**.

Tegretol™ ➡ **carbamazepine**.

teicoplanin [BAN, INN, USAN] (Targotid™) is a glycopeptide ANTIBIOTIC complex active as an ANTIBACTERIAL against staphylococci and Gram-positive anaerobes.

telenzepine [INN] is a piperazinylthienobenzodiazepin derivative, a selective M_1-subtype MUSCARINIC CHOLINOCEPTOR ANTAGONIST, which can be used as an ANTIULCEROGENIC and ANTISPASMODIC in gastric ulcer treatment.

telepathine ➡ **harmine**.

Telfast™ ➡ **fexofenadine**.

Telmin™ ➡ **mebendazole**.

telmisartan (BIBR 277) is a benzimidazolylcarboxylic acid derivative, an (AT_1) ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE activity.

temarotene [INN] is an arotinoid under study as a topical DERMATOLOGICAL AGENT as an antiseborrheic and for acne.

temazepam [BAN, INN, USAN] (Restoril™) is one of the [1,4]benzodiazepines, and is a BENZODIAZEPINE BINDING-SITE AGONIST, methyl derivative of **oxazepam** with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity, and is used orally for anxiety and insomnia.

temefos [INN, USAN] is an (organophosphate group) ANTICHOLINESTERASE which can be used as a public health and agricultural INSECTICIDE.

temelastine [BAN, INN, USAN] (SKF 93944) is a pyrimidinone, a HISTAMINE H_1-RECEPTOR ANTAGONIST reported to have little SEDATIVE action.

Temaril™ ➡ **trimeprazine**.

Temgesic™ ➡ **buprenorphine**.

temocapril [BAN, INN] (temocapril hydrochloride [USAN]) is a thiazepine derivative, an ACE INHIBITOR and ANTIHYPERTENSIVE.

temocapril hydrochloride ➡ **temocapril**.

temocillin [BAN, INN, USAN] is a semisynthetic (penicillin) ANTIBIOTIC (the phthalidyl ester of **ampicillin**). It can be used clinically as an ANTIBACTERIAL to treat certain infections.

temoporfin [INN, USAN] (m-THPC) is a complex tetrakis compound, used as a photosensitizer in photodynamic ANTICANCER therapy for solid tumours.

Temovate™ ➡ **clobetasol**.

temozolomide [BAN, INN] (methazolastone; CCRG 81045; M 39831; NSC 362856) is thought to spontaneously generate the same active metabolite as **dacarbazine**. It is under investigation as an ANTICANCER AGENT, and has been tried for the treatment of brain tumours.

temurtide [BAN, INN, USAN] (RS 37449) is a derivative of the adjutant **muramyl dipeptide**, and is an (IMMUNOSTIMULANT) IMMUNOMODULATOR.

tenamfetamine [INN] (methylenedioxyamphetamine; MDA; EA 1299; SKF 5; 'Mellow Drug of America') is a phenylethylamine compound structurally related to **amphetamine** and **mescaline**. It is a potent PSYCHOTROPIC (hallucinogenic) and is not used in therapeutics, but it is a drug of abuse.

tendamistat [INN] (Hoe 467A) is produced by *Streptomyces tendae*, and is an α-amylase inhibitor ('starch blocker'). It has potential as an ANTIDIABETIC or an obesity treatment. Never marketed.

Tenex™ ➡ **guanfacine**.

tenidap [BAN, INN, USAN] (CP 66248) is an indolinecarboxamide with some similarities to **phenylbutazone** and **indomethacin**. It is a potent CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It has been used systemically and topically for rheumatoid arthritis and skeletomuscular pains. However, it has actions additional to those of typical NSAID agents, and may represent a new direction for novel synthesis. It inhibits the production of the pro-inflammatory cytokines, **interleukin-1**, **interleukin-6** and **tumour necrosis factor** in human cell lines, and inhibits a range of cytokine-mediated processes. It is an anion-transport inhibitor and cytoplasmic pH modulator, and inhibits antigen-induced Ca influx in tumour mast cells.

teniposide [BAN, INN, USAN] (EPT; NSC 122819; VM 26; Vumon™) is a semisynthetic **phyllotoxin** derivative similar to **etoposide**. It is a DNA synthesis and cell replication inhibitor (a DNA topoisomerase II inhibitor), an ANTICANCER AGENT which is used in combination therapies for lymphomas and refractory acute lymphoblastic leukaemia, and also some solid tumours.

tenocyclidine [INN] (TCP; TEP) is a cyclohexylpiperidine derivative and analogue of **phencyclidine**. It is a non-competitive (NMDA) GLUTAMATE RECEPTOR ANTAGONIST and also binds at further sites in the brain and spinal cord.

tenonitrozole [INN] is an imidazole with activity as an ANTIFUNGAL, ANTIPROTOZOAL and ANTITRICHOMONAL. It can be used in oral or topical antitrichomonal treatment.

Tenormin™ ➡ **atenolol**.

tenoxicam [BAN, INN, JAN, USAN] (Ro 12-0068; Clinoril™; Mobiflex™) is one of the oxicam series, a CYCLOOXYGENASE

INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It has a long duration of action and is used to treat pain and inflammation in rheumatic disease and other musculoskeletal disorders.

Tensilon™ ➡ **edrophonium chloride**.

Tensium™ ➡ **diazepam**.

Tenuate™ ➡ **diethylpropion**.

teoprolol [INN] is a β-ADRENOCEPTOR ANTAGONIST.

Teoptic™ ➡ **carteolol**.

TEP ➡ **tenocyclidine**.

tepoxalin [INN, USAN] (ORF 20485; RWJ 20485) is a pyrazole derivative, an ANTIINFLAMMATORY, CYCLOOXYGENASE INHIBITOR, LIPOXYGENASE INHIBITOR, IMMUNOSUPPRESSANT and inhibitor of T-cell proliferation. It has been used in the treatment of psoriasis.

TEPP ➡ **ethyl pyrophosphate**.

teprenone [INN, JAN] (tetraprenylacetone; E 671; GGA) is a nonadecatetraenone, with cytoprotective, ANTIULCEROGENIC and ANTIBACTERIAL activity.

teprotide [BAN, INN, USAN] (bradykinin potentiator B; bradykinin-potentiating peptide; BPP_{9a}; $BPP_{9\alpha}$; SQ 20881) is a nonapeptide initially found in the venom of the pit viper *Bothrops jararaca*. It is an ACE INHIBITOR, preventing the conversion of angiotensin I to angiotensin II, and also prevents degradation of bradykinin. It has been used parenterally as a diagnostic agent for renin-dependent hypertension, and for ANTIHYPERTENSIVE treatment.

Terazol™ ➡ **terconazole**.

terazosin [BAN, INN] (terazosin hydrochloride [JAN, USAN]; Hytrin™; Hytrin BPH™) contains a piperazinyl quinazolinyl nucleus and is similar to **prazosin**. It is an (α_1-subtype) α-ADRENOCEPTOR ANTAGONIST with ANTIHYPERTENSIVE actions. It is used particularly in the treatment of benign prostatic hyperplasia.

terazosin hydrochloride ➡ **terazosin**.

terbinafine [INN, USAN] (Lamisil™) is an allylamine derivative with broad-spectrum ANTIFUNGAL activity. Clinically, it can be used orally as well as topically, and particularly for various tinea infections of the skin and nails.

terbutaline [BAN, INN] (terbutaline sulfate [JAN, USAN]; Brethine™; Bricanyl™) is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype. The racemate is generally used, and there are number of other derivatives, including terbutaline diisobutyrate = ibuterol [INN]; terbutaline dipivalate = divabuterol [INN]; terbutaline di(*p*-toluate) = tobuterol [INN]; also terbutaline *bis*(dimethylcarbamate) = bambuterol [BAN, INN], which is a prodrug of terbutaline. Therapeutically, most forms can be used as BRONCHODILATORS in ANTIASTHMATIC treatment, as SMOOTH MUSCLE RELAXANTS to treat premature labour and for a number of other indications.

terbutaline sulfate ➡ **terbutaline**.

terconazole [BAN, INN, USAN] (Terazol™) is a triazole ANTIFUNGAL, used clinically mainly to treat candidiasis.

terfenadine [BAN, INN, USAN] (RMI 9918; Seldane™; Terfenor™; Triludan™ and many other names) is a recently developed piperidine compound, and is a HISTAMINE H_1-RECEPTOR ANTAGONIST with less sedative side-effects than some older members of its class. It can be used orally for the relief of allergic symptoms, such as hay fever and urticaria.

Terfenor™ ➡ **terfenadine**.

terguride [INN] (transdihydrolisuride) is an ergoline, or ergot alkaloid derivative, with (D_2) partial DOPAMINE RECEPTOR AGONIST activity, activity as an ANTIPARKINSONIAN AGENT and PROLACTIN RELEASE INHIBITOR for treating hyperprolactinaemia and other pituitary oversecretion states.

teriparatide [INN] (teriparatide acetate [JAN, USAN]; 1-34 parathormone (human); human PTH (1-34); Parathar™) is a synthetic peptide that consists of the biologically active *N*-terminal 1-34 fragment of human 84 residue native parathyroid hormone. It is a CALCIUM METABOLISM MODIFIER, a HYPERCALCAEMIC AGENT, used by injection as a diagnostic agent in distinguishing pseudohypoparathyroidism from hypoparathyroidism. It has been tried in the treatment of osteoporosis.

teriparatide acetate ➡ **teriparatide**.

terlakiren [INN, USAN] is a pseudopeptide, a RENIN INHIBITOR and (aspartyl) PROTEASE INHIBITOR, which is antihypertensive.

terlipressin [BAN, INN] (Glypressin™) is a triglycyl derivative of **lysine vasopressin**. It is a (V_1) VASOPRESSIN RECEPTOR AGONIST, used as a HAEMOSTATIC AGENT, a VASOCONSTRICTOR in the treatment of oesophageal bleeding from varices and sometimes uterine bleeding. It is also ANTIDIURETIC. It is an inactive prodrug, converted *in vivo* to **lypressin**.

terofenamate ➡ **meclofenamic acid**.

terpin [BAN] (terpinol; dipenteneglycol) is isolated from the leaves of *Cupressus torulosa* and fruits of *Schinus molle*, and has EXPECTORANT properties.

terpinol ➡ **terpin**.

Terramycin™ ➡ **oxytetracycline**.

tertatolol [BAN, INN] is a β-ADRENOCEPTOR ANTAGONIST with ($5\text{-}HT_{1A}$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST properties. It was formerly used for its ANTIHYPERTENSIVE and VASODILATOR properties.

tert-butyl bicyclic thiophosphate ➡ **TBPS**.

Tertroxin™ ➡ **liothyronine**.

Teslac™ ➡ **testolactone**.

Testoderm™ ➡ **testosterone**.

testolactone [INN, USAN] (NSC 23759; Teslac™) is a steroid derivative of testosterone transformed from progesterone and related steroids by *Aspergillus tamarii*. It has AROMATASE INHIBITOR (oestrogen synthetase inhibitor) activity, and is used as an oral ANTICANCER AGENT for breast cancer. It has also been used in the treatment of precocious puberty.

testosterone [BAN, INN, USAN] (testosterone enanthate [BAN, USAN]; testosterone decanoate [BAN]; testosterone isocaproate [BAN]; testosterone ketolaurate [INN, USAN]; testosterone phenylpropionate [BAN]; testosterone propionate [BAN, USAN]; testosterone acetate; testosterone hexahydrobenzoate; testosterone cyclohexylpropionate; testosterone cyclopentylpropionate; Androtest™; Andropatch™; Delatestryl™; Depot-Trestosterone™; Everone™; Primoteston Depot™; Restandol™; Sustenon™; Testoderm™; Virormone™ and many other names) is a steroid and ANDROGEN, and is the main male sex hormone. It is an animal pheromone. It is produced (in men) mainly in the testes with other androgens that promote the development and maintenance of the male sex organs and in the development of the secondary male sexual characteristics. It is also made in small amounts in women. Therapeutically, it can be administered to treat hormonal deficiency, e.g. for delayed puberty, in ANTICANCER treatment (e.g. breast cancer in women) and in HRT in menopausal women. Administration is either oral, or by injection or depot injection and by transdermal patches.

testosterone acetate ➡ **testosterone**.

testosterone cyclohexylpropionate ➡ **testosterone**.

testosterone cyclopentylpropionate ➡ **testosterone**.

testosterone decanoate ➡ **testosterone**.
testosterone enanthate ➡ **testosterone**.
testosterone hexahydrobenzoate ➡ **testosterone**.
testosterone isocaproate ➡ **testosterone**.
testosterone ketolaurate ➡ **testosterone**.
testosterone phenylpropionate ➡ **testosterone**.
testosterone propionate ➡ **testosterone**.
tetanus immunoglobulin ➡ **globulin, immune**.
tetrabenazine [BAN, INN] (Ro 1-9569; Nitoman™) is a benzoquinolizinone. It has some actions resembling **reserpine**, and may act though depleting CNS **dopamine**. It has SEDATIVE and minor tranquillizer actions. Its main remaining use is in treating a variety of neurological disorders, especially to assist in regaining voluntary control of movement, or to lessen the extent of involuntary movements, in Huntingdon's chorea, senile chorea and related disorders.
tetracaine ➡ **amethocaine**.
tetrachloroethylene [USAN] (perchloroethylene) is a widely used non-flammable solvent used in drycleaning etc. It also has ANTHELMINTIC activity, and is effective against hookworms and intestinal flukes.
tetracosactide ➡ **tetracosactrin**.
tetracosactide acetate ➡ **tetracosactrin**.
tetracosactrin [BAN] (tetracosactide [INN]; cosyntropin [USAN]; tetracosactide acetate [JAN]; Ba 30920; Synacthen™ and many other names) is a synthetic peptide, a structural CORTICOTROPHIN ANALOGUE, which acts on the adrenal glands to release corticosteroids, especially **hydrocortisone**. It is used clinically by injection to test adrenal function. See also **corticotrophin**.
tetracycline [BAN, INN] (tetracycline hydrochloride [USAN]; tetracycline phosphate complex [BAN, USAN]; Achromycin™; Topicycline™ and many other names) is a bacteriostatic (tetracycline) ANTIBIOTIC. It can be used clinically as a broad-spectrum, oral, systemic or topical ANTIBACTERIAL to treat a variety of infections. It is also active as an ANTIPROTOZOAL against certain organisms.
tetracycline hydrochloride ➡ **tetracycline**.
tetracycline phosphate complex ➡ **tetracycline**.
tetraethyl diphosphate ➡ **ethyl pyrophosphate**; **viroxime ethyl pyrophosphate**.
tetraethyl pyrophosphate ➡ **ethyl pyrophosphate**.
tetraethylthiuram disulfide ➡ **disulfiram**.
tetragastrin (CCK-4) is the terminal tetrapeptide amide of **cholecystokinin**. It is a CHOLECYSTOKININ RECEPTOR AGONIST, acting at both CCK_A and CCK_B receptor subtypes. It is a brain–gut peptide with a hormonal and neurotransmitter role in the gut, and a neurotransmitter role in the CNS. It is an experimental pharmacological tool and anxiogenic agent, and causes acute anxiety symptoms in patients with panic disorder.
Δ^1-tetrahydrocannabinol ➡ **Δ^9-tetrahydrocannabinol**.
Δ^8-tetrahydrocannabinol is one of the active principles of **cannabis** (constituent of **marijuana** or **hashish** from *Cannabis sativa*) with lower psychoactivity than **Δ^9-tetrahydrocannabinol**. It is a cannabinoid receptor agonist and has (euphoric) SEDATIVE and mild PSYCHOTROPIC (hallucinogenic) properties, and ANTIEMETIC activity.
Δ^9-tetrahydrocannabinol (**Δ^1**-tetrahydrocannabinol) is an active *cannabinoid*. It is a constituent of **marijuana**. The active (6aR,10aR)-(-)-trans-form = **dronabinol**. It is a CANNABINOID RECEPTOR AGONIST and has (euphoric) SEDATIVE and mild PSYCHOTROPIC (hallucinogenic) properties, and ANTIEMETIC activity.
tetrahydrodiazepam ➡ **tetrazepam**.
tetrahydrofurfuryl nicotinate ➡ **thurfyl nicotinate**.
tetrahydrozoline hydrochloride ➡ **tetryzoline**.
tetrallobarbital ➡ **butalbital**.
tetramethoxyaporphine ➡ **glaucine**.
tetramethrin [ANSI, BAN, BSI, INN, ISO] is a pyrethroid INSECTICIDE, used in public health practice.
tetramethylthiuram disulphide ➡ **thiram**.
tetramisole [BAN, INN] (tetramisole hydrochloride [USAN]) is the (±)-form of a phenylimidazothiazole derivative (the (*R*)-form is **levamisole**; both forms are in widespread use), showing ANTHELMINTIC and IMMUNOMODULATOR properties (it potentiates **fluorouracil** in ANTICANCER chemotherapy).
tetramisole hydrochloride ➡ **tetramisole**.
tetraprenylacetone ➡ **teprenone**.
tetrazepam [INN] (tetrahydrodiazepam; CB 4261) is one of the [1,4]benzodiazepines, a BENZODIAZEPINE BINDING-SITE AGONIST with most of its properties similar to **diazepam**. It has HYPNOTIC, ANTICONVULSANT and ANXIOLYTIC activity. It has been used as a (CNS-acting) SKELETAL MUSCLE RELAXANT.
tetrodontoxin ➡ **tetrodotoxin**.
tetrodotoxin (tarichatoxin; spheroidine; tetrodontoxin; fugu poison; maculotoxin; araregai toxin) is a potent SODIUM-CHANNEL BLOCKER and NEUROTOXIN, acting as a paralytic poison. It is found in the ovaries and liver of Japanese puffer fish (*Sphoeroides rubripes, Sphoeroides vermicularis, Sphoeroides phyreus*), the skin of Californian newt (*Taricha torosa*), from the Japanese ivory shell (*Babylonia japonica*) and *Tritus ensicauda*, and believed to be a metabolic product of a *Pseudomonas* sp. It is a highly potent toxin of practical significance as a source of accidental poisoning in Japan. It is used as a pharmacological tool in neurophysiological research.
tetroquinone [INN, USAN] (HPEK 1; NSC 112931) is a benzoquinone derivative, with KERATOLYTIC, ANTIMICROBIAL, ANTITRYPANOSOMAL, ANTIVIRAL and carcinostatic activity.
tetroxoprim [BAN, INN, USAN] is a DIHYDROFOLATE REDUCTASE INHIBITOR with ANTIBACTERIAL activity.
tetryzoline [INN] (tetrahydrozoline hydrochloride [USAN]; Tyzine™) is a tetrahydronaphthylimidazoline, a SYMPATHOMIMETIC with α-ADRENOCEPTOR AGONIST properties. It can be used as a VASOCONSTRICTOR in topical nasal DECONGESTANT preparations. It has adverse CNS effects if ingested.
TGF-α ➡ **transforming growth factor α**.
TGF-I ➡ **transforming growth factor α**.
THA ➡ **tacrine**.
thalidomide [BAN, INN, USAN] (NSC 66847 and many other names) is a phthalimide, and has SEDATIVE/HYPNOTIC actions, but is no longer used for this purpose since its withdawal in 1960s because of teratogenic effects. It has IMMUNOSUPPRESSANT properties and is used in the treatment of AIDS and autoimmune diseases, and leprosy. It inhibits production of tumour necrosis factor a *in vitro*, is an angiogenesis inhibitor and has proposed use as an ANTICANCER AGENT.
THAM™ ➡ **trometamol**.
THC 250 ➡ **α-amylase**.
thebacon [BAN, INN] (acetyldihydrocodeinone; demethyldihydrothebaine acetate) is one of the phenanthrene series, and is an OPIOID RECEPTOR AGONIST active as an OPIOID ANALGESIC and ANTITUSSIVE.
thebaine (codeinone methyl enol ether; paramorphine) is one of the phenanthrene series of alkaloid from *Papaver* spp., in particular *Papaver bracteatum* (Papaveraceae). It has OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC activity, but

is a CNS STIMULANT and causes seizures at relatively low doses. Synthetic thebaine variants, which differ from morphine/codeine variants only in small details of ring structure, include some very potent analgesics, notably **etorphine** and **bubrenorphine**.

thenium closilate ➡ **thenium closylate**.

thenium closylate [BAN, USAN] (thenium closilate [INN]) is a veterinary ANTHELMINTIC.

thenyldiamine [BAN, INN] (Win 2848) is one of the ethylaminediamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS. It has been used orally for the symptomatic relief of allergic symptoms, such as hay fever and urticaria.

thenylene ➡ **methapyrilene**.

thenylpyramine ➡ **methapyrilene**.

theobromine [BAN] (3,7-dimethylxanthine) is a naturally occurring purine found in tea leaves, cocoa, chocolate etc. It acts as a (P1 purinoceptor) ADENOSINE RECEPTOR ANTAGONIST. It has DIURETIC, SMOOTH MUSCLE RELAXANT, CARDIAC STIMULANT and VASODILATOR properties. Clinically, it can be used as a BRONCHODILATOR for obstructive airways disease.

theofibrate ➡ **etofylline clofibrate**.

theophylline [BAN, INN, JAN, USAN] (1,3-dimethylxanthine; Bronkodil™; Elixophyllin™; Nuelin™, Uniphyllin™ and many other names) is a naturally occurring purine found in tea leaves, cocoa, chocolate etc. It acts as a (P1 purinoceptor) ADENOSINE RECEPTOR ANTAGONIST. It has DIURETIC, SMOOTH MUSCLE RELAXANT, CARDIAC STIMULANT and VASODILATOR properties. Clinically, it can be used as a BRONCHODILATOR in treating obstructive airways disease, including as an ANTIASTHMATIC in acute attacks. It is often used in the form of derivatives, especially **aminophylline**.

theophylline ethylenediamine ➡ **aminophylline**.

theophylline sodium glycinate [USAN] is a compound of **theophylline** with sodium glycinate. It has CARDIAC STIMULANT, SMOOTH MUSCLE RELAXANT and VASODILATOR properties.

theophyllinylethyl sulphate ➡ **pyridofylline**.

thiabendazole [BAN, BSI, ISO, JMAF, USAN] (tiabendazole [INN] Mintezol™) is a benzimidazole ANTHELMINTIC and ANTIFUNGAL AGENT. Clinically, it can be used in the oral or topical treatment of infestations by worm parasites, particularly those of the *Strongyloides* species.

thialbarbital ➡ **thialbarbitone**.

thialbarbitone [BAN] (thialbarbital [INN]) is a barbiturate used for intravenous induction of anaesthesia or as an intravenous GENERAL ANAESTHETIC for short operations.

thiamazole ➡ **methimazole**.

thiamine [INN] (thiamine hydrochloride [USAN]; vitamin B_1; aneurine and many other names) is a water-soluble VITAMIN, a ubiquitous constituent of biological materials, and is produced by numerous bacterial spp. It is an essential coenzyme in carbohydrate metabolism. Deficiency is rare with a balanced diet, but thiamine is incorporated into many multivitamin preparations. In therapy, thiamine can be replaced by various ring-opened analogues, e.g. **benfotiamine**.

thiamine hydrochloride ➡ **thiamine**.

thiamphenicol [BAN, INN, JAN, USAN] is a **chloramphenicol**-like broad-spectrum ANTIBACTERIAL used orally. (The (±)-form is racephenicol [USAN]; racefenicol [INN]).

thiamylal [USAN] (thiamylal sodium [USAN]; thioquinalbarbitone) is a barbiturate used for intravenous induction of anaesthesia, or as an intravenous GENERAL ANAESTHETIC for short operations.

thiamylal sodium ➡ **thiamylal**.

thiazosulfone [INN] is a SULPHONAMIDE with ANTIBACTERIAL activity, formerly used in the treatment of leprosy.

thiethylperazine [BAN, INN, USAN] (thiethylperazine maleate [USAN]; tietylperazine maleate [JAN]; GS 95; NSC 130004; Torecan™ and many other names) is a phenothiazine with general properties similar to **chlorpromazine**. It is a SEDATIVE and ANTIEMETIC, and is used as an antinauseant and ANTIEMETIC.

thiethylperazine maleate ➡ **thiethylperazine**.

thimerosal ➡ **thiomersal**.

2-thioadenosine (2-mercaptoadenosine) is an *adenosine derivative*, a (P1 purinoceptor) ADENOSINE RECEPTOR AGONIST. It is used as a tool in adenosine receptor studies.

thioallopurinol ➡ **tisopurine**.

thiocolchicoside [INN] is reported to possess ($GABA_B$) GABA RECEPTOR AGONIST and GLYCINE RECEPTOR AGONIST activity. It has been used as a centrally-acting SKELETAL MUSCLE RELAXANT for a variety of spastic states.

thioethanolamine ➡ **cysteamine**.

thioguanine [BAN, USAN] (tioguanine [INN]; Wellcome U3B; NSC 752; Lanvis™) is an analogue of guanidine, the natural purine involved in protein synthesis and cell replication. It is a cytotoxic ANTICANCER AGENT, used orally in the treatment of acute leukaemias.

thioimidazole ➡ **carbimazole**.

thioinosine (tioinosine; NSC 4911) is the riboside of **mercaptopurine**, and similarly is an antimetabolite cytotoxic ANTICANCER AGENT which is used in the treatment of acute leukaemias.

Thiola™ ➡ **tiopronin**.

thiomersal [BAN, INN] (thimerosal [JAN, USAN]) is an organic mercurial DISINFECTANT and ANTISEPTIC with ANTIFUNGAL properties. It can be used topically.

thiomucase ➡ **hyalosidase**.

thiomuscimol is a conformationally-restricted GABA analogue. It is a ($GABA_A$) GABA RECEPTOR AGONIST. It is used as a pharmacological tool.

thiopental ➡ **thiopentone**.

thiopental sodium ➡ **thiopentone**.

thiopentobarbital ➡ **thiopentone**.

thiopentone [BAN] (thiopental sodium [INN, USAN]; thiopentobarbital; penthiobarbital; thiopental; Pentothal™; Pentothal Sodium™; Intraval Sodium™) is a barbiturate used for intravenous induction of anaesthesia, or as an intravenous GENERAL ANAESTHETIC for short operations. It is also used as an ANTICONVULSANT in short-term control of convulsive states.

thioperamide is a substituted imidazolylpiperidine carbothioamide, a HISTAMINE H_3-RECEPTOR ANTAGONIST. It is used as a pharmacological tool.

thiophanate [BAN, BSI] is a ANTHELMINTIC superseded for veterinary use, and an ANTIFUNGAL.

thioproperazine [BAN, INN] (7843 RP; SKF 5883) is a phenothiazine with general properties similar to **chlorpromazine**. It has SEDATIVE/TRANQUILLIZER and ANTIEMETIC properties. It has been used as an ANTIPSYCHOTIC in the management of schizophrenia.

thiopurinol ➡ **tisopurine**.

thioquinalbarbitone ➡ **thiamylal**.

thioridazine [BAN, INN, JAN, USAN] (Melleril™; Rideril™) is a phenothiazine, a recently introduced ANTIPSYCHOTIC, which is used orally to treat and tranquillize psychotic patients, particularly those experiencing behavioural disturbances. The drug may also be used for the short-term treatment of anxiety and to calm agitated, elderly patients.

thiorphan is a mercapto-glycine derivative, usually used in the racemic form, and is a NEUTRAL ENDOPEPTIDASE INHIBITOR ('enkephalinase' inhibitor). It has extensive use as an analytical tool in biochemistry and pharmacology. It is the active form of the prodrug **acetorphan**, and both compounds have ANALGESIC activity in humans.

thiosalicylic acid is a member of the salicylate series, and is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It is used by intramuscular injection for muscle pain and inflammation.

thiosemicarbazone ➡ **ambazone**.

Thiosulfil™ ➡ **sulphamethizole**.

thiotepa [BAN, INN] (triethylenethiophosphoramide; NSC 6396; Thiotepa™ and many other names) is a polyfunctional alkylating cytotoxic ANTICANCER AGENT that interferes with the DNA of new-forming cells, so preventing cell replication. It is used as an IMMUNOSUPPRESSANT in the treatment of tumours in the bladder (by instillation) and sometimes for breast cancer. It is also an insect chemosterilant.

Thiotepa™ ➡ **thiotepa**.

thioxolone [BAN] (tioxolone [INN]; HBT; OL 1; OL 110) has KERATOLYTIC and ANTIFUNGAL properties, and has been used as DERMATOLOGICAL AGENT for antiseborrheic treatment.

THIP ➡ **gaboxadol**.

thiram [INN, USAN] is tetramethylthiuram disulphide and is converted *in vivo* into **disulfiram**. It has ANTIFUNGAL, INSECTICIDAL and ANTIBACTERIAL activity. It acts as an ENZYME INHIBITOR by being a DOPAMINE β-HYDROXYLASE INHIBITOR and an ALDEHYDE DEHYDROGENASE INHIBITOR. Industrial use is as a rubber vulcanization accelerator, and exposure to it can lead to alcohol intolerance.

threonyllysylprolylarginine ➡ **tuftsin**.

threosulphan ➡ **treosulfan**.

thrombin [INN, JAN, USAN] (Trombistat™) is a 36 residue peptide that is a (serine) PROTEASE present in blood plasma in the precursor form of **prothrombin**. It can be used as a local HAEMOSTATIC AGENT. It is a potent mitogen with a possible role in tumour promotion.

thromboxane A_2 (TXA_2) is an eicosanoid, formed naturally from arachidonic acid, through the action of thromboxane synthase at a terminal stage. It is a PROSTANOID RECEPTOR AGONIST selective for the TP-subtype ('thromboxane receptors'). Physiologically, it is formed predominantly in platelets, and acts as a PLATELET AGGREGATION INDUCER and VASOCONSTRICTOR of coronary arteries. It is highly unstable in aqueous solution ($t_{1/2}$ = 37 sec at 37°) and is rapidly hydrolized to thromboxane B_2. Consequently, the stable TX-A_2-mimetic analogue U 46619 is generally used in its place as a pharmacological tool.

THROMBOXANE SYNTHASE INHIBITORS act to block prodution of thromboxanes, which are a subclass of the prostanoids, and are members of the **eicosanoid** family of phospholipid mediators (comprised of the thromboxanes and the **prostaglandins**). Eicosanoids are mainly derived from **arachidonic acid**. The other members of the eicosanoid family are the **leukotrienes** – which are formed by the lipoxygenase system (see LIPOXYGENASE INHIBITORS). Thromboxanes and the prostaglandins are formed by the cyclooxygenase system, and share a common precursor in the form of a series of unstable cyclic endoperoxides. The first stage of the transformation of arachidonic acid has enzyme endoperoxide synthase oxygenate arachidonate, followed by cyclization to give a cyclic endoperoxide, called **PGG_2**. This is then converted by a peroxidase action to **PGH_2**. (Some of these reactions are thought to be by a rather involved autocatalysis.) This is a common precursor for a number of different pathways forming **prostacyclin** (by prostacyclin synthase), the various prostaglandins or thromboxane (by thromboxane synthase): see CYCLOOXYGENASE INHIBITORS. The conversion depends somewhat on the cell type, and the conversion of PGH_2 to thromboxane, by thromboxane synthase, is a prominent feature of the blood platelets. The eicosanoids are synthesized and released on demand. The thromboxane released from the platelets plays an important part in the clotting process, and is discussed in more detail under another heading: see PLATELET AGGREGATION INHIBITING AGENTS.

Agents acting as thromboxane synthase inhibitors are consequently being investigated with a view to their use as antiplatelet drugs, and also for a number of other actions. There have been two isoenzymes demonstrated, and this may allow more selectivity of drug action. A large number of inhibitors have now been developed, some of which combine other actions, including thromboxane receptor antagonism. Some examples of these are **dazoxiben**, **isbogrel**, **ozagrel**, picotamide, rolafagrel and WK 38485.

Gresele, P. *et al.* (1991) Thromboxane synthase inhibitors, thromboxane receptor antagonists and dual blockers in thrombotic disorders. *Trends Pharmacol. Sci.*, **12**, 158-163.

Armstrong, R.A. *et al.* (1995) Aspects of the thromboxane receptor system. *Gen. Pharmacol.*, **26**, 463-472.

Tanabe, T. *et al.* (1995) Prostacyclin and thromboxane synthases. *J. Lipid Mediat. Cell Signal.*, **12**, 243-255.

thurfyl nicotinate [BAN] (tetrahydrofurfuryl nicotinate) is a topical VASODILATOR, which can be used in symptomatic antirheumatic treatment.

thymalfasin [INN, USAN] (thymosin α_1 (ox); thymosin α_1 (human)) is a 28 residue peptide originally isolated from calf thymus. It has (IMMUNOSTIMULANT) IMMUNOMODULATOR and vaccine-enhancement activity. It can be used in ANTICANCER treatment, and also for hepatitis and other infectious diseases.

thymin ➡ **thymopoietin**.

thymocartin [INN] (thymopoietin 32-35; RGH 0206; TP-4) is a tetrapeptide, a **thymopentin** analogue with IMMUNOMODULATOR properties.

thymopentin [BAN, INN, USAN] (TP-5; thymopoietin pentapeptide; thymopoietin II (32-34); ORF 15244) is a pentapeptide, a **thymopoietin** fragment that represents the key five sequences for activity. It has IMMUNOMODULATOR or immunoregulator activity, inducing differentiation of T-lymphocytes. It has been used to treat rheumatoid arthritis and for respiratory (viral) infections. It also modulates nicotinic acetylcholine receptors.

thymopoietin (thymin, tymus hormone) is a 49 amino acid residues peptide hormone, originally discovered by its effect on neuromuscular transmission, where it modulates nicotinic acetylcholine receptors. Importantly, it has IMMUNOMODULATOR or immunoregulator activity, plays a central role in cell-mediated immunity, immunoregulatory balance and in inducing differentiation of T-lymphocytes. There are variants differing in substituents in 4 positions: thymopoietin I and thymopoietin II (from bovine thymus); thymopoietin III (from bovine spleen). A number of other thymic immunoregulatory principles and thymopoietin fragments have been isolated or synthesized: see also **nonathymulin**, **thymalfasin**, **thymocartin**, **thymopentin**, **thymotrinan**, **thymostimulin**.

thymopoietin I ➡ **thymopoietin**.

thymopoietin II ➡ **thymopoietin**.

thymopoietin II (32-34) ➡ **thymopentin**.

thymopoietin III ➡ **thymopoietin.**
thymopoietin 32-34 ➡ **thymotrinan.**
thymopoietin 32-35 ➡ **thymocartin.**
thymopoietin pentapeptide ➡ **thymopentin.**
thymosin α_1 fagment 25-28 is a tetrapeptide with IMMUNOMODULATOR properties
thymosin α_1 (human) ➡ **thymalfasin.**
thymosin α_1 (ox) ➡ **thymalfasin.**
thymostimulin [INN] (TPI) is a polypeptide factor extracted from calf thymus. It can be used as an (IMMUNOSTIMULANT) IMMUNOMODULATOR in immunodeficiency disorders, and as an adjunct in the treatment of malignant disease.
thymotrinan [INN] (thymopoietin 32-34; RGH 0205; TP-3) is a tripeptide fragment of **thymopoietin**. It shows activity as an IMMUNOMODULATOR and ANTICANCER AGENT.
thymoxamine [BAN] (moxisylyte [INN]; Opilon™) is a methylethylphenol derivative. It is an (α_1-subtype) α-ADRENOCEPTOR ANTAGONIST with VASODILATOR properties that can be used to treat peripheral vascular disease and male impotence.
Thyrel™ ➡ **thyrotrophin-releasing hormone.**
thyreotrophic hormone ➡ **thyrotrophin.**
thyrocalcitonin ➡ **calcitonin.**
α-thyrocalcitonin ➡ **calcitonin (pork).**
thyroglobulin [INN, USAN] is obtained from thyroid glands of *Sus scrofa* (hog), and contains >0.7% total iodine. It acts as a THYROID HORMONE, and was formerly used in the treatment of hypothyroidism.
THYROID HORMONES are endocrine hormones secreted by the thyroid gland. There are two major forms of thyroxine that circulate in the bloodstream to control function throughout the body, and these hormones are needed for normal development and for metabolic processes. The two forms, each containing iodine, are **thyroxine** (T_4) and **triiodothyronine** (T_3). Both these hormones, in the forms of their sodium salts, are used therapeutically to make up for a hormonal deficiency on a regular maintenance basis, and to treat associated symptoms; and may also be used in the treatment of goitre and thyroid cancer, myxoedema and cretinism.

A second type of hormone, **calcitonin**, is secreted by a different cell type (C-cells) in follicles of the thyroid gland (see CALCITONIN RECEPTOR AGONISTS). In carcinomas of the C-cells of the thyroid, a third type of hormone, **calcitonin gene-related peptide** (CGRP), an alternative gene-product of the calcitonin gene, is expressed. This mediator has marked vasodilator actions and contributes to the pathology of these conditions. The presence of this peptide in the blood can be used for diagnostic purposes: see CALCITONIN GENE-RELATED PEPTIDE RECEPTOR AGONISTS.

Takami, H. *et al.* (1992) Calcitonin gene-related peptide as a tumour marker for medullary thyroid carcinoma. *Int. Surg.*, **77**, 181-185.
Feldt-Rasmussen, U. *et al.* (1993) Reassessment of antithyroid drug therapy of Graves' disease. Annu. *Rev. Med.*, **44**, 323-334.
Toft, A.D. (1994) Thyroxine therapy. *N. Engl. J. Med.*, **331**, 174-180.

thyroid-stimulating hormone thyrotrophin ➡ **thyrotrophin.**
thyroliberin ➡ **thyrotrophin-releasing hormone.**
thyrotrophin [BAN, INN] (thyrotropic hormone; thyrotropin; thyroid-stimulating hormone; TSH; thyreotrophic hormone; TTH; Thytropar™) is a peptide (anterior) PITUITARY HORMONE. The bovine form consists of 2 chains – TSH-α (96 residues; MW =13,600) and TSH-β (containing 112-113 residues; MW=14,700). TSH-α contains 2 oligosaccharide moieties, TSH-β 1. It controls the release of THYROID HORMONES (**thyroxine** and **triiodothyronine**) from the thyroid gland, and is itself controlled by the HYPOTHALAMIC HORMONE **thyroid-releasing hormone** (**protirelin**), and by high levels of thyroid hormone in the blood. Thyrotrophin may be used as a diagnostic agent in testing for clinical defects in this process. It has been used as an adjunct for treatment of some thyroid cancers.
thyrotrophin-releasing factor ➡ **thyrotrophin-releasing hormone.**
thyrotrophin-releasing hormone (protirelin [BAN, INN, JAN, USAN]; protirelin tartrate [JAN]; thyroliberin; TSH-releasing hormone; TRH; thyrotrophin-releasing factor; TRF; Thyrel™; TRH-Cambridge™) is a tripeptide, a HYPOTHALAMIC HORMONE that modulates the release of **thyrotrophin** (and **prolactin**) from the pituitary, and thence of thyroid hormone from the thyroid gland. Therapeutically, protirelin is used oral or by injection as a diagnostic agent to assess thyroid disorders and function in patients who suffer from hypopituitarism or hyperthyroidism.
thyrotropic hormone ➡ **thyrotrophin.**
thyrotropin ➡ **thyrotrophin.**
thyroxine [BAN] (thyroxine sodium; levothyroxine sodium [INN, USAN]; sodium L-throxine; T_4; Eltroxin™; Levothroid™; Levoxyl™; Synthroid™ and many other names) is a diiodophenyldiiodotyrosine derivative, and in its native form is one of the two main natural endocrine THYROID HORMONES (together with **triiodothyronine**) released into the bloodstream by the thyroid gland. It is used orally to make up a hormonal deficiency on a regular maintenance basis and to treat associated symptoms. It can also be used in the treatment of goitre and thyroid cancer. The labelled ^{125}I and ^{131}I compounds are used as radioactive diagnostic agents for thyroid function, and treatment of thyroid cancers.
Dextrothyroxine is the dextrorotatory form of thyroxine, and has a different use, as a treatment for hyperlipidaemia.
thyroxine sodium ➡ **thyroxine.**
Thytropar™ ➡ **thyrotrophin.**
tiabendazole ➡ **thiabendazole.**
tiadenol [INN] (LL 1558) is a diethanol derivative, and has been used as an ANTIHYPERLIPIDAEMIC.
tiadenol clofibrate ➡ **tiafibrate.**
tiafibrate [INN] (tiadenol clofibrate) is one of the fibrate group, and is an ANTIHYPERLIPIDAEMIC.
tiagabine [INN] is a piperidinecarboxylic acid derivative, an UPTAKE INHIBITOR of GABA reuptake. It acts as an ANTICONVULSANT and ANTIEPILEPTIC.
tiamenidine [BAN, INN] (tiamenidine hydrochloride [USAN]) is an imidazoline with properties similar to **clonidine**. It is an (α_2) α-ADRENOCEPTOR AGONIST that can be used as an ANTIHYPERTENSIVE.
tiamenidine hydrochloride ➡ **tiamenidine.**
tiapamil [BAN, INN] (tiapamil hydrochloride [USAN]) is a verapamil analogue that acts as a CALCIUM-CHANNEL BLOCKER, and which has been tried in ANTIANGINAL treatment, as an ANTIARRHYTHMIC and as an ANTIHYPERTENSIVE.
tiapamil hydrochloride ➡ **tiapamil.**
tiaprofenic acid [BAN, INN, JAN] (FC 3001; RU 15060; Surgam™) is a thienylpropanoic acid derivative, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It is used orally to treat pain and inflammation in rheumatic disease and other musculoskeletal disorders.
tiaprost [INN] (HR 837) is a prostaglandin and PROSTANOID RECEPTOR AGONIST. It can be used in veterinary medicine as an oxytocic agent to aid parturition.
tiaramide [BAN, INN] (tiaramide hydrochloride [JAN, USAN];

NTA 194; FK 1160) is a benzothiazolone derivative, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

tiaramide hydrochloride ➡ **tiaramide**.

tibenelast [INN] (tibenelast sodium [USAN]; LY 186655) is a benzothiophenecarboxylic acid derivative, a selective PHOSPHODIESTERASE INHIBITOR which inhibits histamine release from human lung and cutaneous mast cells *in vitro*. It has potential as a BRONCHODILATOR and ANTIASTHMATIC.

tibenelast sodium ➡ **tibenelast**.

tibolone [BAN, INN, USAN] (Org OD 14; Livial™) is a steroid, reported to have OESTROGEN, PROGESTOGEN and weak ANDROGEN properties. It is used orally to treat menopausal problems in HRT.

ticarcillin [BAN, INN] (ticarcillin sodium [JAN, USAN]; ticarcillin cresyl sodium [USAN]) is an ester, a semisynthetic (penicillin) ANTIBIOTIC (the phthalidyl ester of **ampicillin**). It can be used clinically as an ANTIBACTERIAL to treat certain infections.

ticarcillin cresyl sodium ➡ **ticarcillin**.

ticarcillin sodium ➡ **ticarcillin**.

Ticlid™ ➡ **ticlopidine**.

ticlopidine [BAN, INN] (ticlopidine hydrochloride [JAN, USAN]; Ticlid™ and many other names) is a pyridine derivative, an analogue of **clopidogrel**, and is a PLATELET AGGREGATION INHIBITOR. It works by interfering with ADP-induced platelet–fibrin binding and subsequent platelet–platelet interaction. It is used in the prevention of thrombotic stroke and peripheral arterial occlusion.

ticlopidine hydrochloride ➡ **ticlopidine**.

ticrynafen ➡ **tienilic acid**.

tiemonium iodide [BAN, INN, JAN] is a quaternary ammonium compound with MUSCARINIC CHOLINOCEPTOR ANTAGONIST and ANTISPASMODIC activity.

tienilic acid [BAN, INN] (ticrynafen [USAN]) was formerly used as a DIURETIC, URICOSURIC and ANTIHYPERTENSIVE, but was withdrawn in many countries due to hepatotoxicity.

tienoxolol [INN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIHYPERTENSIVE and DIURETIC properties.

tietylperazine maleate ➡ **thiethylperazine**.

tifluadom [INN] (KC 5103) is a benzodiazepine, a (κ) OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC. It is also a (CCK_A) CHOLECYSTOKININ RECEPTOR ANTAGONIST.

tiflucarbine [INN] is a thienoindole, and shows activity as a calmodulin antagonist, a PROTEIN KINASE INHIBITOR (protein kinase C), a ($5\text{-}HT_1$ and $5\text{-}HT_2$) and a 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST, and also has ANTIDEPRESSANT properties.

Tigan™ ➡ **trimethobenzamide**.

tigemonam [INN] (tigemonam dicholine [USAN]) is a semisynthetic (monobactam/β-lactam) ANTIBIOTIC. Clinically, it shows ANTIBACTERIAL activity against Gram-negative bacteria.

tigemonam dicholine ➡ **tigemonam**.

tigloyltropeine ➡ **tropigline**.

Tilade™ ➡ **nedocromil**.

Tilarin™ ➡ **nedocromil**.

tilbroquinol [INN] is a quinolinol with AMOEBICIDAL and ANTIBACTERIAL properties.

tilefrine hydrochloride ➡ **etilefrine**.

tilidate [BAN] (tilidine [INN]; tilidine hydrochloride [USAN]) is one of the phenylpiperidine series, and is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

tilidine ➡ **tilidate**.

tilidine hydrochloride ➡ **tilidate**.

tilisolol [INN] is a β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically in ANTIHYPERTENSIVE, ANTIARRHYTHMIC, ANTIANGINAL and ANTIGLAUCOMA TREATMENT.

tilomisole [INN, USAN] (NSC 310633; Wy 18251) is a thiazolobenzimidazole derivative, with IMMUNOMODULATOR and ANTIINFLAMMATORY activity.

tilsuprost [INN] (Hoe 892) is a synthetic prostaglandin and PROSTANOID RECEPTOR AGONIST. It has a transient HYPOTENSIVE effect, is a CARDIAC STIMULANT and PLATELET AGGREGATION INHIBITOR with ANTICOAGULANT activity.

tiludronic acid [BAN, INN] (tiludronate disodium [USAN]; Skelid™) is one of the bisphosphonate series of CALCIUM METABOLISM MODIFIERS, used to treat disorders of bone metabolism and reducing calcium calcium-resorption from the bone. It is used orally to treat tumour-induced hypercalcaemia, and specifically to treat Paget's disease of the bone and osteoporosis.

timepidium bromide [INN, JAN] is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST, and can be used as a visceral ANTISPASMODIC.

timiperone [INN, JAN] (DD 3480) is a butyrophenone with general properties similar to **haloperidol**. It has ANTIEMETIC and ANTIPSYCHOTIC activity, and can be used in the treatment of schizophrenia.

timnodonic acid ➡ **icosapent**.

timolol [BAN, INN, USAN] (timolol maleate [JAN, USAN]; Blocadren™; Timoptic™ and many other names) is a (subtype-non-selective) β-ADRENOCEPTOR ANTAGONIST, which is relatively lipophilic. It can be used therapeutically in ANTIHYPERTENSIVE, ANTIARRHYTHMIC, ANTIANGINAL and ANTIGLAUCOMA TREATMENT.

timolol maleate ➡ **timolol**.

timoprazole [INN] is a benzimidazole derivative, a GASTRIC PROTON PUMP INHIBITOR, a (H^+/K^+) ATPASE INHIBITOR. Potentially, it can be used as an ANTIULCEROGENIC in the treatment of gastric ulcers and other gastric acid-related gastrointestinal disorders.

Timoptic™ ➡ **timolol**.

TIMP ➡ **razoxane**.

Tinaderm™ ➡ **tolnaftate**.

tinidazole [BAN, INN, JAN, USAN] is a nitroimidazole ANTIMICROBIAL, used as an ANTITRICHOMONAL.

tinoridine [INN] (tinoridine hydrochloride [JAN]; Y 3642) is a thienopyridinecarboxylate, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity. It has ANTIOXIDANT properties.

tinoridine hydrochloride ➡ **tinoridine**.

tinzaparin ➡ **heparin**.

tinzaparin sodium [BAN, INN, USAN] (Innohep™) is a (parenteral) ANTICOAGULANT, chemically a low-molecular weight form of **heparin**. It can be used therapeutically in the treatment of deep-vein thrombosis.

TiO_2 ➡ **titanium dioxide**.

tioclomarol [INN] is an (oral) ANTICOAGULANT, a synthetic agent chemically of the coumarin group. It can be used therapeutically to prevent the formation of clots in thromboembolytic disease.

tioconazole [BAN, INN, JAN, USAN] is an imidazole ANTIFUNGAL. Clinically, it can be used topically against infection by a range of fungi and yeasts.

tioguanine ➡ **thioguanine**.

tioinosine ➡ **thioinosine**.

tiopronin [INN, JAN] (SF 572; Thiola™ and many other names) is a mercaptoglycine derivative, with properties similar to those of D-penicillamine. It is a reducing and compexing thiol compound used in a similar way to metal CHELATING AGENTS. It is used clinically as an ANTIDOTE for

heavy metal poisoning, as a radioprotective agent, as an ANTIINFLAMMATORY for the treatment of rheumatoid arthritis and for cystinuria.

Tiorfan™ ➡ **acetorphan**.

tiospirone [INN] (tiospirone hydrochloride [USAN]; BMY 13859) is one of the azaspirone group, and is a 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It is an 'atypical' ANTIPSYCHOTIC.

tiospirone hydrochloride ➡ **tiospirone**.

tioxaprofen [BAN, INN] (EMD 26644) is a propionic acid group CYCLOOXYGENASE INHIBITOR, and is a NSAID ANALGESIC, ANTIINFLAMMATORY and PLATELET AGGREGATION INHIBITOR. It is an uncoupler of mitochondrial respiration.

tioxolone ➡ **thioxolone**.

tipepidine [INN] (tipepidine hibenzate [JAN]) is a thienylpiperidine, and an ANTITUSSIVE and EXPECTORANT.

tiprenolol [BAN, INN] (tiprenolol hydrochloride [USAN]) is a β-ADRENOCEPTOR ANTAGONIST.

tiprenolol hydrochloride ➡ **tiprenolol**.

tiprostanide [BAN, INN, USAN] (EMD 33290) is a synthetic prostaglandin and PROSTANOID RECEPTOR AGONIST, with HYPOTENSIVE, potential GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC activity.

tiquizium bromide [INN, JAN] is a quaternary ammonium compound with MUSCARINIC CHOLINOCEPTOR ANTAGONIST, ANTISPASMODIC and reported cytoprotective and ANTIULCEROGENIC activity.

tiratricol [INN] (triodothyroacetic acid; TA3; triac) is a metabolite of the THYROID HORMONE **triiodothyronine**. It can be given by mouth to suppress the secretion of TSH, and thus act as an ANTITHYROID AGENT. It also has ANTIHYPERLIPIDAEMIC properties.

tirofiban [BAN, INN] (MK 383; L 700462) is a piperidylphenylalanine derivative, a platelet fibrinogen receptor glycoprotein IIb/IIIa antagonist, which acts as a PLATELET AGGREGATION INHIBITOR with potential as an antithrombotic agent.

tisopurine [INN] (thiopurinol; thioallopurinol) is an inhibitor of guanosine monophosphate reductase, thus affecting ATP synthesis, and is an inhibitor of RNA biosynthesis. It is a potent XANTHINE-OXIDASE INHIBITOR and has been used in antigout treatment. It also shows antiparasitic and ANTITHROMBOTIC activity.

titanium dioxide [USAN] (titanium(IV) oxide; TiO_2; C.I. 77891; E171; C.I. pigment white 6 and many other names) is a white pigment incorporated into several preparations as a SUNSCREEN AGENT. It provides some degree of protection from ultraviolet UVA and UVB radiation. As a topical DERMATOLOGICAL AGENT it has actions similar to **zinc oxide** as a mild ASTRINGENT, and is used in protective ointment to treat skin disorders, such as nappy rash, urinary rash and eczema. It is also used in dentistry and cosmetics.

titanium(IV) oxide ➡ **titanium dioxide**.

tixocortol [BAN, INN] (tixocortol pivalate [USAN]) is a CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is used topically in the treatment of a number of allergic conditions. It has also been used in labelling corticosteroid receptors.

tixocortol pivalate ➡ **tixocortol**.

T-kinin (Ile-Ser-bradykinin) is a naturally occurring *N*-terminally extended homologue of **bradykinin** found in rats.

TM 723 ➡ **aclatonium napadisylate**.

TMK 688 ➡ **linetastine**.

TMPEA ➡ **mescaline**.

TMQ ➡ **trimetrexate**.

TMTX ➡ **trimetrexate**.

TN 912 ➡ **milnacipran**.

TNF ➡ **tumour necrosis factor**.

TNF-α ➡ **tumour necrosis factor**.

TNF-β ➡ **tumour necrosis factor**.

TNO 6 ➡ **spiroplatin**.

Tobramycetin™ ➡ **tobramycin**.

tobramycin [BAN, INN, JAN, USAN] (nebramycin VI; Tobramycetin™ etc.) is an (aminoglycoside) ANTIBIOTIC. Clinically, it has ANTIBACTERIAL properties, and is mainly used against Gram-negative organisms by systemic administration (it is not absorbed orally).

tobuterol ➡ **terbutaline**.

tocainide [BAN, INN, USAN] (tocainide hydrochloride [USAN]; Tonocard™) is an aminopropanamide, a LOCAL ANAESTHETIC and ANTIARRHYTHMIC.

tocainide hydrochloride ➡ **tocainide**.

tocamphyl [INN, USAN] is a cyclopentanedicarboxylic acid and a CHOLERETIC AGENT. It stimulates pancreatic exocrine secretion and bile flow.

tocinoic acid is a synthetic hexapeptide analogue of **oxytocin**, and is a VASOPRESSIN RECEPTOR AGONIST with OXYTOCIC and natriuretic activity.

tocofersolan ➡ **α-tocopherol**.

tocofibrate [INN] is one of the fibrate group, and has been used as an ANTIHYPERLIPIDAEMIC.

α-tocopherol (vitamin E; antisterility vitamin; E 307) is a *benzopyran structure with a long aliphatic tail*, a constituent of many vegetable oils. It is a fat-soluble VITAMIN, and its primary role is the prevention of oxidation of polyunsaturated fatty acids *in vivo*. Though plentiful in a normal diet and deficiency is rare, it can be given as a dietary vitamin supplement. It has ANTIOXIDANT properties, and prevents oxidative damage to cell membranes. It also possesses antisterility properties. Other forms include; α-tocopherol succinate; α-tocopherol nicotinate (**vitamin E nicotinate**); and an *ester with polyethylene glycol succinate* = tocophersolan [USAN], tocofersolan, [INN].

α-tocopherol nicotinate ➡ **α-tocopherol**.

α-tocopherol succinate ➡ **α-tocopherol**.

β-tocopherol (cumotocopherol; neotocopherol; *p*-xylotocopherol) has been isolated from vegetable sources, e.g. spinach chloroplasts (*Spinacea oleracea*), soybean oil, corn oil. It is an ANTIOXIDANT and VITAMIN, a member of the vitamin E group, not normally used as a dietary supplement.

γ-tocopherol (7,8-dimethyltocol; E308) is a VITAMIN that occurs in many nut and other vegetable oils. A member of the vitamin E group, it is used as an ANTIOXIDANT in foodstuffs.

δ-tocopherol (8-methyltocol; E309) is a VITAMIN widely available in vegetable oils. A member of the vitamin E group, it is used as an ANTIOXIDANT in foodstuffs.

α-tocopherolquinone (α-tocoquinone; α-tocopheryl quinone) can be isolated from spinach (*Spinacea oleracea*) chloroplasts and many other plant sources. It has ANTIHYPERTENSIVE and PLATELET AGGREGATION INHIBITOR actions.

tocophersolan ➡ **α-tocopherol**.

α-tocopheryl quinone ➡ **α-ocopherolquinone**.

α-tocoquinone ➡ **α-tocopherolquinone**.

tofisopam [INN, JAN] (SD 19050) is a 2,3-benzodiazepine, structurally related to the [1,4]benzodiazepines, and is a BENZODIAZEPINE BINDING-SITE AGONIST. It has most properties similar to **diazepam**, but has less ANTICONVULSANT, SEDATIVE and SKELETAL MUSCLE RELAXANT properties. It has ANXIOLYTIC activity and has been used in anxiety disorders and preoperative medication.

Tofranil™ ➡ **imipramine**.

tolamolol [BAN, INN, USAN] is a **β-ADRENOCEPTOR ANTAGONIST**.

Tolanase™ ➡ **tolazamide**.

tolazamide [BAN, INN, JAN, USAN] (Tolanase™) is one of the sulphonylurea group of (oral) **HYPOGLYCAEMICS**. It increases insulin secretion from the pancreas by acting as a **POTASSIUM-CHANNEL BLOCKER** at certain ATP-sensitive K^+-channels. It can be used as an **ANTIDIABETIC** for Type 2 diabetes mellitus.

tolazoline [BAN, INN] (tolazoline hydrochloride [USAN]; Priscoline™) is an imidazole **α-ADRENOCEPTOR ANTAGONIST** with direct **VASODILATOR** activity. Clinically, it can be used systemically as an **ANTIHYPERTENSIVE** to treat persistent pulmonary hypertension of the newborn.

tolazoline hydrochloride ➡ **tolazoline**.

tolbutamide [BAN, INN] (tolbutamide sodium [USAP]; Rastinon™ etc.) is one of the sulphonylurea group of (oral) **HYPOGLYCAEMICS**. It increases insulin secretion from the pancreas by acting as a **POTASSIUM-CHANNEL BLOCKER** at certain ATP-sensitive K^+-channels. It can be used as an **ANTIDIABETIC** in Type 2 diabetes mellitus.

tolbutamide sodium ➡ **tolbutamide**.

tolciclate [INN, JAN, USN] is a squalene epoxidase inhibitor, and is an **ANTIFUNGAL AGENT**.

Tolectin™ ➡ **tolmetin**.

tolfamide [INN, USAN] (EU 4584) is a benzamide, and is a **UREASE INHIBITOR**.

tolfenamic acid [BAN, INN, JAN] (GEA 6414) is one of the fenamate series. It is a **CYCLOOXYGENASE INHIBITOR** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity.

toliprolol [INN] is a **β-ADRENOCEPTOR ANTAGONIST**. It can be used in **ANTIHYPERTENSIVE** and **ANTIARRHYTHMIC** treatment.

tolmetin [BAN, INN, USAN] (tolmetin sodium [JAN, USAN]; McN 2559; Tolectin™) is one of the heteroaryl acetic acid series of **CYCLOOXYGENASE INHIBITORS** with **NSAID ANALGESIC, ANTIINFLAMMATORY** and **ANTIPYRETIC** activity. It is used orally to treat the pain of rheumatic disease and other musculoskeletal disorders, including juvenile arthritis.

tolmetin sodium ➡ **tolmetin**.

tolnaftate [BAN, INN, JAN, USAN] (Mycil™; Tinaderm™) is a naphthylthioacarbanilate **ANTIFUNGAL**. Clinically, it is used topically to treat tinea and other skin infections.

tolonidine [INN] is an imidazoline with properties similar to **clonidine**. It is an (α_2) **α-ADRENOCEPTOR AGONIST** which can be used as an **ANTIHYPERTENSIVE**.

tolonium chloride [INN] (blutene chloride) is a dye, used as a redox indicator and diagnostic agent.

tolperisone [BAN, INN] (tolperisone hydrochloride [JAN]) is a piperidinotolylpropanone derivative, a centrally acting **SKELETAL MUSCLE RELAXANT** which can be used to treat musculospasm conditions.

tolperisone hydrochloride ➡ **tolperisone**.

tolpropamine [BAN, INN] is one of the alkylamine series of **HISTAMINE H_1-RECEPTOR ANTAGONISTS**. It has been used topically as an antipruritic and for the relief of allergic symptoms, such as urticaria.

tolrestat [BAN, INN, USAN] (AY 27773) is a naphthalene substituted *N*-methylglycine derivative, an **ALDOSE REDUCTASE INHIBITOR** (ARI). These agents inhibit the enzyme that catalyses the conversion of glucose to sorbital. It is thought that in hyperglycaemic states there may be an accumulation of sorbital, leading to hyperosmotic pathology. ARI agents are under trial for use in the treatment of peripheral diabetic neuropathies, retinopathy and nephropathies.

toluene diisocyanate is a sensory irritant which potently evokes the signs of neurogenic inflammation. It is an industrial pollutant agent, studied particularly in relation to its airways toxicity. It is used as a pharmacological tool.

toluidine blue (C.I. Basic blue 17; toluidine blue O; C.I. 52040) is a dye used as a diagnostic agent.

toluidine blue O ➡ **toluidine blue**.

tolycaine [BAN, INN] is an amide series **LOCAL ANAESTHETIC** which has been used mainly in dentistry.

tomelukast [INN, USAN] is a tetrazole derivative, a **LEUKOTRIENE RECEPTOR ANTAGONIST** with **BRONCHODILATOR** and **ANTIASTHMATIC** properties.

tomoglumide [INN] (CR 1392) is a benzoyloxopentanoic acid derivative, a **CHOLECYSTOKININ RECEPTOR ANTAGONIST**. It has possible use in the treatment of pancreatitis.

Tomudex™ ➡ **raltitrexed**.

tonazocine [INN] (tonazocine mesylate [USAN]; Win 42156-2) is a benzazocin derivative, a mixed **OPIOID RECEPTOR AGONIST** and **OPIOID RECEPTOR ANTAGONIST** with **OPIOID ANALGESIC** activity.

tonazocine mesylate ➡ **tonazocine**.

Tonocard™ ➡ **tocainide**.

Topamax™ ➡ **topiramate**.

Topicort™ ➡ **desoxymethasone**.

Topicycline™ ➡ **tetracycline**.

topiramate [INN, USAN] (MCN 4853; RWJ 17021; Topamax™) is a fructopyranose derivative, an **ANTICONVULSANT** and **ANTIEPILEPTIC** recently introduced to treat partial seizures not satisfactorily controlled with other antiepileptics.

topotecan [INN, USAN] (topotecan hydrochloride [USAN]; NSC 609699; SKF 104864; Hycamtin™) is a synthetic analogue of **camptothecin**. It is a topoisomerase I inhibitor class of **ANTICANCER AGENT** for metastatic ovarian cancer.

topotecan hydrochloride ➡ **topotecan**.

Topotecin™ ➡ **irinotecan**.

Toradol™ ➡ **ketorolac trometamol**.

toramazoline hydrochloride ➡ **tramazoline**.

torasemide [BAN, INN] (torsemide [USAN]; Demadex™) is a sulfonylurea derivative, which acts as a (loop) **DIURETIC**. It can be used as an **ANTIHYPERTENSIVE** and to treat oedema, especially in renal failure.

torbugesic ➡ **butorphanol**.

Torecan™ ➡ **thiethylperazine**.

toremifene [BAN, INN] (toremifene citrate [USAN]; FC 1157; NK 622) is a non-steroid, an **ANTIOESTROGEN** which has been tried as an **ANTICANCER AGENT** for breast cancer.

toremifene citrate ➡ **toremifene**.

Tornalate™ ➡ **bitolterol**.

torsemide ➡ **torasemide**.

tosactide ➡ **octacosactrin**.

tosylchloramide sodium [INN] (chloramine T) is an **ANTIBACTERIAL AGENT**, used for radiiodination of peptides.

Totacillin™ ➡ **ampicillin**.

β-toxin ➡ **muscimol**.

toxin F ➡ **κ-bungarotoxin**.

TOXINS are taken here to be substances that have a deleterious action on another organism, and archetypal toxins were originally of natural origin. This classification is necessarily somewhat discretionary, and toxins with a predominant action on neurons are grouped under another heading: see **NEUROTOXINS**. Toxins may be used defensively (bitter and poisonous alkaloids in skin or leaves), or offensively (venoms injected or administered to the prey by means of specialized apparatus), or are the proteolytic enzymes elaborated by infecting parasites. Some typical or

important non-natural toxins are also discussed – largely for the purposes of comparison – but their coverage is not exhaustive. Toxins in general are potent poisons. Nevertheless, the selectivity of action of many of these toxins means they have been harnessed in medical therapeutics (more so in experimental pharmacology and physiology). Toxins that have been, or still are, used in medicine include: **atropine** and **hyoscine**, **botulinum toxin**, **colchicine**, digitalis alkaloids, **eserine**, **morphine**, **ouabain**, **picrotoxin**, **strychnine**, **veratridine**, vinca alkaloids and many more. These work by an action at a defined molecular site, whether ion channel, neurotransmitter receptor, enzyme, carrier molecule (pump) or intracellular organelle. Several of these particular examples have their most obvious effects on neurotransmission, and are dealt with under neurotoxins.

Carrier molecules – pump inhibitors. Digitalis alkaloids (including **digitoxin**, **digoxin** etc.) from the foxglove (*Digitalis purpurea*) are cardiac glycosides that act to block the Na^+,K^+-ATPase by inhibiting dephosphorylation. They are cardiotonic and correct certain abnormal rhythms in appropriate dose, but are dangerously toxic in overdose: see ANTIARRHYTHMIC AGENTS; ATPASE INHIBITORS; CARDIAC STIMULANTS. Bufadienolides from toad skin (e.g. *Bufo marinus*) are cardiac glycosides that act like digitalis and are potent vasoconstrictors. **Ouabain** (strophanthin G) has as its chief source seeds or wood of certain African shrubs. It is a cardiac glycoside that acts like digitalis, and is sufficiently active to have been used for tipping poisonous arrows. Thapsigargan from a plant (*Thapsia garganica*) is a sesquiterpene lactone that causes release of Ca^{2+} from intracellular stores through block of Ca^{2+}-ATPase in the endoplasmic reticulum.

Protein phosphatases inhibitors. **Okadaic acid** from marine dinoflagellates that accumulates in a black sponge (*Halichondria okadai*) and mussels, is a polyether fatty acid derivative. It causes a contracture of smooth and cardiac muscle, is a tumour promoter and selectively inhibits protein phosphatase-1 and phosphatase-2A. It is a causative agent in diarrhoretic shellfish poisoning.

G-protein activators and inactivators. **Cholera toxin** (CTX) elaborated by a bacterium (*Vibrio cholerae*) is a multimeric A–B toxin that binds specifically to the G_s protein, and catalyses a conjugation reaction (ADP-ribosylation) on the α-subunit, resulting in persistent activation of G_s, which explains many of the symptoms of cholera, particularly the excess secretion of electrolytes in the intestine, often resulting in lethal dehydration. As well as being a major cause of disease in many areas of the world, this toxin is of considerable importance as an analytical tool in mechanistic studies. **Pertussis toxin** (PTX) elaborated by a bacterium (*Bordetella pertussis*) is a hexameric A–B toxin. It binds to the ADP-ribosylation regulatory site of the G_i/G_o family of subunits which couple negatively to adenylyl cyclase. The cellular responses blocked by PTX are very varied, and typically include α_2 and opioid receptor types. The inactivation of this key regulatory unit explains some of the side-effects of whooping cough (caused by *Bordetella pertussis*) in which production of this toxin is a prime factor in the pathology. **Mastoparan** from venom of the wasp (*Vespa basalis*) is a strongly cationic amphipathic peptide that activates G-proteins including G_o. It also stimulates vesicle secretion, causes histamine release and has mast cell degranulating activity.

Ionophores. There are a number of toxins that form membrane pores that are permeable to physiological inorganic ions, and are very toxic in all cells, including neurons (e.g. **monensin**, **palytoxin**, A23187, α-toxin, melittin and pardaxin). However, they generally are not selective.

A–B Toxins are bacterial toxins composed of two peptide chains; one (B) that binds to the invaded cell surface, and the other (A) containing the toxin which is then taken-up into the cell. Some examples of exotoxins secreted by the bacteria into the surrounding medium and highly toxic to certain tissues are pathogens causing botulism (*Clostridium botulinum*), tetanus (*Clostridium tetani*) and diptheria (*Corynebacterium diphtheriae*). An example of an A–B endotoxin is *Vibrio cholerae.* Botulinum toxin and tetanus toxin have their main toxic actions on neuronal tissues, so are described at NEUROTOXINS.

Endotoxins are poisons contained within the cell wall of many Gram-negative and some Gram-positive bacteria, and are released on disintegration or death of the bacterium. They are generally toxic to most body tissues, and are less potent than exotoxins. They are typified by the following, *Escherichia coli* (wound infection and septicaemia), *Klebsiella pneumoniae* (urogenital tract infections), *Shigella dysenteriae* (dysentery), *Salmonella typhosa* (typhoid fever), *Pasteurella pestis* (bubonic plague) and *Pseudomonas aeruginosa* (wound infections and septicaemia). Not all of these endotoxins are fully characterized, and some toxic mechanisms are obscure.

Mycotoxins are ubiquitous, mould-produced toxins that contaminate a wide range of foodstuffs and can lead to many different toxic conditions from acute toxicity to long-term or chronic health disorders in both humans and domestic animals. The major fungi responsible for producing these toxins are species of *Aspergillus, Penicillium, Fusarium* and *Alternaria*, though other genera are involved as well, e.g. *Claviceps, Diplodia* and *Arthrinium.* Important compounds include the **aflatoxins**, cyclopiazonic acid, tenuazonic acid, zearalenone, the trichothecenes, wortmannin, fumonisins B1 and B2, patulin, ochratoxin A, diplodiatoxin and diplosporin. Aflatoxins remain as a threat to the health of livestock as well as humans by their continuing intermittent occurrence in both feeds and foods. The finding that aflatoxin-contaminated feeds, and eventually purified aflatoxins, were carcinogenic in rats and trout initiated many studies in search of the role of these toxins (especially aflatoxin B1) in human liver disease, including hepatocarcinogens. Poisonous mushrooms may cause serious intoxication and even fatalities. Humans may become symptomatic after a mushroom meal for various reasons: ingestion of mushrooms containing toxins, immunological reactions to mushroom-derived antigens, ingestion of mushrooms causing ethanol-intolerance.

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TP-3 ➡ **thymotrinan**.
TP-4 ➡ **thymocartin**.
TP-5 ➡ **thymopentin**.
TPI ➡ **thymostimulin**.
TR 3369 ➡ **indorenate**.
TR 4979 ➡ **butaprost**.
TR 5109 ➡ **conorfone**.
Tracrium™ ➡ **atracurium besylate**.
tramadol [BAN, INN] (tramadol hydrochloride [JAN, USAN];

Tramake™; Tramal™; Zydol™) is a phenylcyclohexanol derivative, a (μ) OPIOID RECEPTOR AGONIST with partial OPIOID ANALGESIC activity. It is also a monoamine (serotonin and noradrenaline) re-UPTAKE INHIBITOR, and this mechanism is thought independantly to contribute a component to analgesic activity.

tramadol hydrochloride ➡ **tramadol**.

Tramake™ ➡ **tramadol**.

Tramal™ ➡ **tramadol**.

tramazoline [BAN, INN] (tramazoline hydrochloride [USAN]; toramazoline hydrochloride [JAN]; Dexa-Rhinaspray™) is an imidazoline derivative similar to **naphazoline**, acting as an (α_1-subtype) α-ADRENOCEPTOR AGONIST with VASOCONSTRICTOR properties. It can be used as a nasal DECONGESTANT.

tramazoline hydrochloride ➡ **tramazoline**.

Trandate™ ➡ **labetalol**.

trandolapril [BAN, INN] (Gopten™; Odrik™) is a captopril-like ACE INHIBITOR, which can be used as an ANTIHYPERTENSIVE. It is an ethyl ester prodrug which is converted *in vivo* to the active drug trandolaprilat [INN].

trandolaprilat ➡ **trandolapril**.

tranexamic acid [BAN, INN, JAN, USAN] (Cyclokapron™) is a substituted cyclohexanecarboxylic acid, a competitive inhibitor of plasminogen activation and a noncompetitive inhibitor of plasmin, thus acting as an ANTIFIBRINOLYTIC and HAEMOSTATIC AGENT. It can be used parenterally or orally when haemorrhage cannot easily be staunched (e.g. in gastrointestinal haemorrhage, prostatectomy, menorrhagia and dental extractions in haemophiliacs). It may also be used in **streptokinase** overdose.

tranilast [INN, JAN, USAN] is a cinnamoylanthranilic acid derivative, an ANTIALLERGIC AGENT and mediator release inhibitor similar to **cromoglycic acid**. It can be used for prophylaxis of allergic conditions, including as an ANTIASTHMATIC.

TRANQUILLIZERS are, literally, agents that make the patient tranquil. The need for the term came with the introduction of drugs having rather more subtle effects on mood and behaviour than the likes of the barbiturates. However, it soon became necessary to divide the category into minor tranquillizers and major tranquillizers. Currently, it is thought simpler to describe the drugs largely according to usage. The term minor tranquillizers is used more or less synonymously with ANXIOLYTIC AGENT. The major tranquillizers have had other words coined to describe their sort of activity – neuroleptic, thymoleptic – but are largely used as ANTIPSYCHOTIC AGENTS (though certainly some members have actions making them valuable for tranquillizing severely agitated patients). See HYPNOTICS; SEDATIVES.

transclomiphene ➡ **clomiphene**.

transdihydrolisuride ➡ **terguride**.

transforming growth factor α (transforming growth factor I; TGF-α; TGF-I) is a structure comprised of a single chain of 50 amino acid residues with 3 intramolecular disulphide bridges. There are slight differences in amino-acid sequences between different mammals. It shows sequence homology with the epidermal growth factor (EGF) family of peptides, and is secreted by a number of mammalian cell lines. It induces the transformation of non-transformed cell lines. It is an IMMUNOMODULATOR; promotes wound healing. It is a possible marker for altered hepatic foci in rodent hepatocarcinogenesis.

transforming growth factor I ➡ **transforming growth factor α**.

Tranxene™ ➡ **clorazepic acid**.

tranylcypromine [BAN, INN] (Parnate™) is a phenylcyclopropane derivative, a non-hydrazine-type slowly reversing MONOAMINE-OXIDASE INHIBITOR (MAOI) and is used as an ANTIDEPRESSANT. It is a non-hydrazine group compound and has a weak CNS STIMULANT action leading to insomnia.

Trasicor™ ➡ **oxprenolol**.

Trasylol™ ➡ **aprotinin**.

Travase™ ➡ **sutilains**.

Travogyn™ ➡ **isoconazole**.

Traxam™ ➡ **felbinac**.

trazodone [BAN, INN] (trazodone hydrochloride [USAN]; Desyrel™; Molipaxin™) is a triazolopyridine derivative, sometimes referred to as a tricylic-related agent, with similar ANTIDEPRESSANT activity.

trazodone hydrochloride ➡ **trazodone**.

trefentanil [INN] (trefentanil hydrochloride [USAN]; A 3665) is one of the phenylpiperidine series, and is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

trefentanil hydrochloride ➡ **trefentanil**.

tremorine is a pyrrolidinone tertiary amine derivative, a MUSCARINIC CHOLINOCEPTOR AGONIST and PARASYMPATHOMIMETIC, which gains access to the CNS and is important as a convulsive pharmacological tool in the study of Parkinsonism. Its active metabolite is **oxotremorine**.

trenbolone [BAN, INN] (trenbolone acetate [USAN]; RU 1697; R 2580; Finaplix™; Finaject™) is a steroid, an ANABOLIC AGENT, used as a veterinary androgen as a growth promoter.

trenbolone acetate ➡ **trenbolone**.

trengestone [INN] (Ro 4-8347) is a synthetic steroid PROGESTOGEN, formerly used for menstrual problems.

Trental™ ➡ **oxpentifylline**.

treosulfan [BAN, INN] (threosulphan; dihydroxybusulfan; Leo 40067; NSC 39069) is an ANTICANCER AGENT reported to act by alkylation after exposure to epoxide compounds. It has been tried in the treatment of ovarian cancer.

treoxytocin ([Thr^4]oxytocin) is a synthetic analogue of **oxytocin** and agonist at oxytocin receptors ((OT) VASOPRESSIN RECEPTOR AGONIST). It has oxytocic activity and is more potent than oxytocin.

trepibutone [INN, JAN] (AA 149) is a benzenebutanoic acid derivative, and has been used as a CHOLERETIC and ANTISPASMODIC AGENT.

tretinoin [BAN, INN, USAN] (vitamin A acid; NSC 122758; Retin-A™ and many other names) is a retinoid reported to inhibit sebaceous gland function and keritanization. It is used as a topical DERMATOLOGICAL AGENT to treat acne vulgaris. Various derivatives are used, e.g. **isoetretin**, **tretinoin tocoferil**.

tretinoin tocoferil [INN] is an ester of the retinoid **tretinoin** with **α-tocopherol**. It has anticancer activity.

tretoquinol [INN] (trimetoquinol hydrochloride [JAN]) is an isoquinoline derivative, reported to be a PROSTANOID RECEPTOR ANTAGONIST and SYMPATHOMIMETIC. It is a BRONCHODILATOR and PLATELET AGGREGATION INHIBITOR.

Trexan™ ➡ **naltrexone**.

TRF ➡ **interleukin-5**; **thyrotrophin-releasing hormone**.

TRH ➡ **thyrotrophin-releasing hormone**.

TRH-Cambridge™ ➡ **thyrotrophin-releasing hormone**.

triac ➡ **tiratricol**.

triacetin [INN, USAN] is a synthetic ANTIFUNGAL AGENT. Clinically, it can be used in multidrug preparations.

triacetyloleandomycin [BAN] (troleandomycin [INN, USAN]; TAO™) is a semisynthetic (macrolide) ANTIBIOTIC (the triacetyl derivative of **oleandomycin**) with broad-spectrum

of ANTIBACTERIAL and ANTIMICROBIAL activity. It is used for streptococcal and other infections.

triamcinolone [BAN, INN] (triamcinolone diacetate [JAN, USAN]; triamcinolone acetonide [BAN, USAN]; triamcinolone acetonide sodium phosphate [USAN]; triamcinolone hexacetonide [BAN, INN, USAN]; triamcinolone benetonide [INN]; triamcinolone furetonide [INN]; Adcortyl™; Audicort™; Aureocort™; Aristocort™; Kenalog™; Ledercort™) is a CORTICOSTEROID, a GLUCOCORTICOID with ANTIINFLAMMATORY and ANTIALLERGIC properties. It is most commonly used in the form of the **acetonide**, to suppress the symptoms of inflammation, especially when it is caused by allergic disorders. It is sometimes used systemically to relieve conditions such as hay fever and asthma. It is commonly given by local injection to treat skin inflammation due to rheumatoid arthritis and bursitis. There are a number of topical preparations to treat severe, non-infective skin inflammation, such as eczema, or for treating inflammation in the mouth and ears.

triamcinolone acetonide ➡ **triamcinolone.**

triamcinolone acetonide sodium phosphate ➡ **triamcinolone.**

triamcinolone benetonide ➡ **triamcinolone.**

triamcinolone diacetate ➡ **triamcinolone.**

triamcinolone furetonide ➡ **triamcinolone.**

triamcinolone hexacetonide ➡ **triamcinolone.**

triamterene [BAN, INN, USAN] (Dyrenium™; Dytac™; Dytide™; Frusene™) is both a (potassium-sparing) DIURETIC and an ANTIMALARIAL AGENT.

triazolam [BAN, INN, JAN, USAN] (Halcion™) is a triazolodiazepine, one of the [1,4]benzodiazepines, and is a BENZODIAZEPINE BINDING-SITE AGONIST with most of its properties similar to **diazepam**. It is a HYPNOTIC and ANTICONVULSANT with ANXIOLYTIC properties. Its main used is as an oral short-term hypnotic (it has a dependence tendancy in patients, and alters circadian rhythms in animal models). It has PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST activity.

tribavirin [BAN] (ribavirin [INN, USAN]; Virazid™; Virazole™) is a synthetic nucleoside analogue ANTIVIRAL AGENT. Clinically, it can be used in viral bronchitis and is administered as an aerosol.

tribendilol [INN] is a β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically in ANTIHYPERTENSIVE treatment.

tribenoside [INN, JAN, USAN] (Glyvenol™) is a glucofuranoside, with ANTIINFLAMMATORY properties and can be used as an antirheumatic and antiarthritic.

tribromoethanol was formerly used as an inhalation GENERAL ANAESTHETIC and HYPNOTIC.

tribromsalan [BAN, INN, USAN] is an ANTIBACTERIAL and ANTIFUNGAL used in soaps.

tricarbocyanine II ➡ **indocyanine green.**

Trichloran™ ➡ **trichloroethylene.**

trichlorfon [BSI, ISO] is an ANTICHOLINESTERASE, used as an agricultural INSECTICIDE and ectoparasiticide, and as an ANTHELMINTIC.

trichlormethiazide [INN, JAN, USAN] (Naqua™; Metahydrin™) is a (thiazide) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.

trichlormethine ➡ **trimustine.**

trichloroacetaldehyde monohydrate ➡ **chloral hydrate.**

trichloroethene ➡ **trichloroethylene.**

trichloroethylene [INN] (trichloroethene, R 1120; Tri-Clene™; Trichloran™ and many other names) is an industrial solvent and veterinary inhalation GENERAL ANAESTHETIC.

trichloromethane ➡ **chloroform.**

trichlorphon ➡ **metriphonate.**

triclabendazole [INN] is an ANTHELMINTIC.

triclacetamol [INN] is the trichloroacetyl derivative of **paracetamol**, one of the *para*-aminophenol series, and is a weak CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC and ANTIPYRETIC activity.

Tri-Clene™ ➡ **trichloroethylene.**

triclofos [BAN, INN] is a trichloroethanol derivative, used orally as a HYPNOTIC to treat insomnia.

triclosan [BAN, INN, USAN] (Ster-Zac™ etc.) is a chlorinated bisphenol used as an ANTIBACTERIAL in soaps, dentifrices and deodorants.

tricosactide [INN] is a synthetic peptide, a structural CORTICOTROPHIN ANALOGUE. See also **corticotrophin.**

Tridesilon™ ➡ **desonide.**

tridihexethyl chloride [BAN, JAN, USAN] (tridihexethyl iodide [INN]) is a quaternary ammonium MUSCARINIC CHOLINOCEPTOR ANTAGONIST. It can be used as a visceral ANTISPASMODIC and as an adjunct in the treatment of ulcers.

tridihexethyl iodide ➡ **tridihexethyl chloride.**

Tridione™ ➡ **troxidone.**

trientine [INN] (trientine dihydrochloride [BAN, USAN]; MK 681; Syprine™) is an organic base, a CHELATING AGENT used orally in the treatment of Wilson's disease (to aid copper excretion).

trientine dihydrochloride ➡ **trientine.**

trieoxyethylrutin ➡ **troxerutin.**

triethylcholine is a choline UPTAKE INHIBITOR (it competes with choline for the carrier), so eventually acts as a NEUROTRANSMITTER-RELEASE-MODIFYING AGENT which decreases release of the neurotransmitter **acetylcholine**. It has general peripheral anticholinergic actions and is a NEUROMUSCULAR BLOCKING AGENT. It also is a NEUROTOXIN and pharmacological tool for studying choline transport.

triethylene glycol diglycidyl ether ➡ **ethoglucid.**

triethylenethiophosphoramide ➡ **thiotepa.**

trifenagrel [INN, USAN] (BW 325U) is an imidazolphenoxyethanamine derivative, a PLATELET AGGREGATION INHIBITOR and ANTITHROMBOTIC.

trifluomeprazine [BAN, INN] (triflutrimeprazine) is a phenothiazine, used as a SEDATIVE in veterinary practice.

trifluoperazine [BAN, INN] (trifluoperazine hydrochloride [USAN]; trifluoroperazine; trifluperazine; triphthazinum; Stelazine™ and many other names) is a phenothiazine with a piperazine side chain, with general properties similar to **chlorpromazine**, though with less SEDATIVE, HYPOTENSIVE and MUSCARINIC CHOLINOCEPTOR ANTAGONIST actions. It has (I_{KCa}) POTASSIUM-CHANNEL BLOCKER, TRANQUILLIZER and ANTIEMETIC actions. It is used orally or by injection as an ANTIPSYCHOTIC to treat and tranquillize psychotic patients (such as schizophrenics), particularly those experiencing some form of behavioural disturbance. It can also be used for the short-term treatment of severe anxiety and as an ANTIEMETIC and antinauseant for severe nausea and vomiting caused by underlying disease or drug therapies.

trifluoperazine hydrochloride ➡ **trifluoperazine.**

trifluoromethylphenothiazine ➡ **fluphenazine.**

trifluoromethylphenylhistamine is a histamine analogue, a HISTAMINE H_1-RECEPTOR AGONIST (the most potent and selective reported; 1995), used as a pharmacological tool.

2-(3-trifluoromethyl)phenylhistamine ➡ **trifluoromethylphenylhistamine.**

1-(2-trifluoromethylphenyl)imidazole ➡ **TRIM.**

trifluoroperazine ➡ **trifluoperazine.**

trifluoropromazine™ ➡ fluopromazine.
trifluperazine ➡ trifluoperazine.
trifluperidol [BAN, INN, USAN] (trifluperidol hydrochloride [JAN]; Triperidol™ and many other names) is one of the butyrophenones with general properties similar to **haloperidol**. It is used as an oral ANTIPSYCHOTIC to treat and tranquillize psychotic patients, such as schizophrenics, experiencing manic, behavioural disturbances.
trifluperidol hydrochloride ➡ trifluperidol.
triflupromazine ➡ fluopromazine.
triflupromazine hydrochloride ➡ fluopromazine.
trifluridine [INN, USAN] (Viroptic™) is a halogenated pyrmimidine nucleoside ANTIVIRAL, used in the treatment of herpes keratitis.
triflusal [INN] is a salicylic acid derivative, a PLATELET AGGREGATION INHIBITOR used for the prophylaxis of thromboembolic disorders.
triflutrimeprazine ➡ trifluomeprazine.
trifosfamide ➡ trofosfamide.
triglycidylurazole ➡ anaxirone.
trihexyphenidyl ➡ benzhexol.
trihexyphenidyl hydrochloride ➡ benzhexol.
trihydroxyanthracene ➡ dithranol.
triiodothyronine ➡ liothyronine.
Trilafon™ ➡ perphenazine.
triletide [INN] (Zami 420) is a tripeptide derivative which shows cytoprotective and ANTIULCEROGENIC activity. It is a THROMBOXANE SYNTHASE INHIBITOR.
trilostane [BAN, INN, JAN, USAN] (Win 24540; Modrenal™) is a steroid which reversibly inhibits 3β-hydroxysteroid dehydrogenase /δ5-4 isomerase in the adrenal cortex, and this results in inhibition of the synthesis of MINERALOCORTICOIDS and GLUCOCORTICOIDS. It may be useful as an adrenocortical suppressant in Cushing's syndrome and primary hyperaldosteronism. It has also been used in ANTICANCER treatment for post-menopausal breast cancer that has relapsed following initial oestrogen antagonist (**tamoxifen**) therapy.
Triludan™ ➡ terfenadine.
TRIM (1-(2-trifluoromethylphenyl)imidazole) is a NITRIC OXIDE SYNTHASE INHIBITOR active on neuronal sites, and is used as a pharmacological tool.
trimazosin [BAN, INN] (trimazosin hydrochloride [USAN]) contains a piperazinyl quinazolinyl nucleus and is similar to **prazosin**. It is an (α_1-subtype) α-ADRENOCEPTOR ANTAGONIST with structure and actions. It is an ANTIHYPERTENSIVE, and can be used in combination with other drugs in HEART FAILURE TREATMENT.
trimazosin hydrochloride ➡ trimazosin.
trimecaine [INN] (LL 31) is an amide series LOCAL ANAESTHETIC with ANTIARRHYTHMIC activity.
trimedoxime bromide [INN] is an oxime CHOLINESTERASE REACTIVATOR. It can be used parenterally as an ANTIDOTE adjunct to **atropine** in treating human or animal (organophosphate group) ANTICHOLINESTERASE pesticide toxicity.
trimeperidine [BAN, INN] is one of the phenylpiperidine series, and is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.
trimeprazine [BAN] (alimemazine [INN]; trimeprazine tartrate [USAN]; alimemazine tartrate [JAN]; Vallergan™; Temaril™ and many other names) is one of the phenothiazine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS. It has pronounced SEDATIVE/TRANQUILLIZER and ANTIEMETIC properties, and has been used in preoperative medication. It is used as an ANTITUSSIVE, ANTIALLERGIC, antipruritic and antiurticaria agent.
trimeprazine tartrate ➡ trimeprazine.
trimetaphan camsilate ➡ trimetaphan camsylate.
trimetaphan camsylate [BAN] (trimetaphan camsilate [INN, JAN]; Arfonad™) is a complex sulphonium derivative and is a short-acting GANGLION BLOCKING AGENT with ANTIHYPERTENSIVE actions, which can be used parenterally in controlled blood pressure surgery.
trimetazidine [BAN, INN] (trimetazidine hydrochloride [JAN]) is a piperazine derivative, and is an antiischaemic agent used in ANTIANGINAL treatment. It is a potential agent for the treatment of cyclosporin A-induced nephrotoxicity.
trimethadione ➡ troxidone.
trimethidinium methosulphate [BAN, INN] is a bisquaternary amine GANGLION BLOCKING AGENT with ANTIHYPERTENSIVE actions.
trimethobenzamide [INN] (trimethobenzamide hydrochloride [USAN]; Ro 2-9578; Tigan™ and many other names) is a benzamide, and is an ANTIEMETIC (probably through acting as a DOPAMINE RECEPTOR ANTAGONIST).
trimethobenzamide hydrochloride ➡ trimethobenzamide.
trimethoprim [BAN, INN, JAN, USAN] (Trimpex™) is a sulphonamide-like agent, an ANTIBACTERIAL with DIHYDROFOLATE REDUCTASE INHIBITOR actions against the form of enzymes from bacterial sources and malaria parasites. It is widely used as a mixture with various sulphonamides, e.g. **sulphamethoxazole** + trimethoprim is called co-trimoxazole.
trimethoxybenzeneethanamine ➡ mescaline.
trimethylene ➡ cyclopropane.
trimethylolaminomethane ➡ trometamol.
trimethylxanthine ➡ caffeine.
trimetoquinol hydrochloride ➡ tretoquinol.
trimetrexate [BAN, INN, USAN] (trimetrexate glucuronate [USAN]; TMQ; TMTX; CI 898; JB 11; NSC 249008; Neutrexin™) is a DIHYDROFOLATE REDUCTASE INHIBITOR, which has been used as an antimetabolite ANTICANCER AGENT. Recently it has been used for the treatment of *Pneumocystis carinii* pneumonia in AIDS patients.
trimetrexate glucuronate ➡ trimetrexate.
trimipramine [BAN, INN, USAN] (trimipramine maleate [JAN, USAN]; RP 7162; Surmontil™ and many other names) is one of the tricyclic class of monoamine UPTAKE INHIBITORS and is used as an oral ANTIDEPRESSANT with SEDATIVE properties.
trimipramine maleate ➡ trimipramine.
trimoprostil [INN, USAN] (Ro-21-6937) is a prostaglandin and PROSTANOID RECEPTOR AGONIST, with potential GASTRIC SECRETION INHIBITOR and ANTIULCEROGENIC activity.
Trimpex™ ➡ trimethoprim.
trimustine [BAN] (trichlormethine [INN]; trimustine hydrochloride; Nitrogen Lost; Agent HD; NSC 30211) *tris*(2-chloroethyl)amine, is a chemical warfare agent with SENSORY IRRITANT, vesicant and eye-irritant actions. It is a biological alkylating agent with mutagenic and cytotoxic activity and has been used as a (cytotoxic) ANTICANCER AGENT.
trimustine hydrochloride ➡ trimustine.
triodothyroacetic acid ➡ tiratricol.
trioxifene [INN] (trioxifene mesylate [USAN]; Lilly 133314) is a non-steroid, an ANTIOESTROGEN which has been tried as an ANTICANCER AGENT in the treatment of breast cancer.
trioxifene mesylate ➡ trioxifene.
trioxsalen ➡ trioxysalen.
trioxysalen [INN, JAN] (trioxsalen [USAN]; Trisoralen™) is

one of the psoralen group, a phytotoxic metabolite of pink rot disease, produced by *Sclerotinia sclerotiorum*. As a topical DERMATOLOGICAL AGENT it is used as a photosensitizer, a medicinal pigmentation agent that crosslinks with DNA in the presence of UV light. It can be used to treat vitiligo and psoriasis in photodynamic therapy. It is a tool used in molecular biology for labelling and isolating nascent DNA fragments. It is a PLATELET AGGREGATION INHIBITOR in the presence of UV light.

tripelennamine [BAN, INN] (tripelennamine citrate [USAN]; Pyribenzamine™; Vetibenzamine™ and many other names) is one of the ethylaminediamine series of HISTAMINE H_1-RECEPTOR ANTAGONISTS, with MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity and SEDATIVE side-effects. It can be used orally for the symptomatic relief of allergic symptoms, such as rhinitis and urticaria. It is also used in veterinary practice. It has been subject to abuse.

tripelennamine citrate ➡ **tripelennamine**.

Triperidol™ ➡ **trifluperidol**.

triphthazinum ➡ **trifluoperazine**.

triprolidine [BAN, INN] (triprolidine hydrochloride [USAN]; BW 295C51) is a pyridine, a HISTAMINE H_1-RECEPTOR ANTAGONIST, with MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity and SEDATIVE side-effects. It can be used orally for the symptomatic relief of allergic symptoms, such as rhinitis and urticaria. It is used as an EXPECTORANT in cough and 'cold-cure' prearations (e.g. with **pseudoephedrine hydrochloride** in Actifed™).

triprolidine hydrochloride ➡ **triprolidine**.

triptorelin [INN] (AY 25650; CL 118532; De-capeptyl sr™) is a peptide derivative of luteinizing hormone-releasing factor (pig) and analogue of gonadorelin, (**gonadotrophin-releasing hormone**), and is an LH-RH RECEPTOR AGONIST with similar properties. It is used by injection as an ANTICANCER AGENT in the treatment of prostate cancer.

Trisoralen™ ➡ **trioxysalen**.

Tritace™ ➡ **ramipril**.

tritoqualine [INN] is a quinolinylphthalide, a HISTIDINE DECARBOXYLASE INHIBITOR. It has been used like an antihistamine as an ANTIALLERGIC. It has hepatoprotective activity.

Trobicin™ ➡ **spectinomycin**.

trofosfamide [INN] (trifosfamide; A 4828; NSC 109723) is an analogue of **ifosfamide** and is also an alkylating cytotoxic ANTICANCER AGENT.

troglitazone [BAN, INN, USAN] (Romglizone™, Romozint™, Ronglitazone™) is an (oral) HYPOGLYCAEMIC, and is chemically a thiazolidinedione. It can be used as a Type 2 ANTIDIABETIC AGENT. It was recently withdrawn in some countries because of hepatotoxicity.

troleandomycin ➡ **triacetyloleandomycin**.

tromantadine [INN] is an ANTIVIRAL AGENT, used topically for the treatment of herpes simplex infections.

Trombate™ ➡ **antithrombin III**.

Trombistat™ ➡ **thrombin**.

trometamol [BAN, INN, JAN] (tromethamine [USAN]; trimethylolaminomethane; THAM™) is an (osmotic) DIURETIC and a parenteral systemic alkalizer. It is also a constituent of 'Tris' buffer solution.

tromethamine ➡ **trometamol**.

tropatepine [INN] is a benzothiepintropane quaternary ammonium derivative, with MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity, used as an ANTIPARKINSONIAN AGENT.

tropicamide [BAN, INN, USAN] (Mydriacyl™) is a tertiary amine with MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity, and can be used as a topical MYDRIATIC and cycloplegic agent.

tropigline [BAN, INN] (tigloyltropeine) is an alkaloid from *Datura ferox* and other *Datura* spp., *Physalis alkekengi* roots, *Mandragora vernalis, Mandragora autumnalis, Hyoscyamus* spp. etc. (Solanaceae). It is an atropine-like agent with MUSCARINIC CHOLINOCEPTOR ANTAGONIST, ANTIPARKINSONIAN and CENTRAL DEPRESSANT properties.

tropine tropate ➡ **atropine**; **hyoscyamine**.

tropisetron [BAN, INN] (tropisetron hydrochloride [BAN]; ICS 205-930; Navoban™) is a tropanyl derivative, a (5-HT_3) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It is an ANTIEMETIC and antinauseant for chemotherapy-induced emesis.

tropisetron hydrochloride ➡ **tropisetron**.

Trosyl™ ➡ **tioconazole**.

troxerutin [BAN, INN] (trieoxyethylrutin; vitamin P_4; posorutin) is a biflavonoid that is the principal component of a mixture which contains about mono, di and tetrakis(hydroxyethyl)rutins. It can be used as a HAEMOSTATIC AGENT for venous disorders (e.g. oozing in haemorrhoids).

troxidone [BAN] (trimethadione [INN, JAN, USAN]; Tridione™ and many other names) is an oxazolidinedione, an ANTICONVULSANT that can be used as an ANTIEPILEPTIC for the control of absence seizures (petit mal).

troxypyrrolium tosylate [BAN, INN] is a pyrrolidinium derivative with activity as an anticholinergic (inhibits acetylcholine synthesis) and GANGLION BLOCKING AGENT. It was formerly used as an ANTIHYPERTENSIVE.

Trusopt™ ➡ **dorzolamide**.

Try-bradykinin (N^2-L-tyrosine-bradykinin) is an *N*-terminally extended analogue of **bradykinin** and a (B_2) BRADYKININ RECEPTOR AGONIST. It is a HYPOTENSIVE active on a range of vascular and extravascular smooth muscle. It is used as a pharmacological tool.

trypsin [BAN, JAN] is an ENZYME extracted from the pancreatic gland of *Bos taurus* (ox). It is a proteolytic enzyme that has been used topically for the debridement of wound and burns. As a DIGESTIVE AGENT it can also be combined with **chymotrypsin**, and taken by mouth for digestive insufficiency. It has also been inhaled into the lungs to liquefy viscous sputum.

trypsin inhibitor (ox pancreas basic) ➡ **aprotinin**.

Tryptizol™ ➡ **amitryptyline**.

tryptophan [USAN] (Optimax™) is an amino acid present in an ordinary, well-balanced diet and from which the natural mediator serotonin (5-hydroxytryptamine; 5-HT) is derived. Dysfunction of serotonin, in its neurotransmitter role in nerve-tracts in the CNS, is thought to contribute to depression. Therapeutic administration of tryptophan has been used in ANTIDEPRESSANT treatment, but was withdrawn from use because of an association with a dangerous side-effect called eosinophilia-myalgia syndrome. It has been reintroduced for use in patients only where no alternative treatment is suitable and with registration and constant blood-monitoring.

TSH ➡ **thyrotrophin**.

TSH-releasing hormone ➡ **thyrotrophin-releasing hormone**.

TTH ➡ **thyrotrophin**.

TTPG ➡ **stepronin**.

tuaminoheptane [BAN, INN] (2-aminoheptane) is a volatile liquid SYMPATHOMIMETIC with VASOCONSTRICTOR activity, formerly used as a nasal DECONGESTANT.

Tubarine™ ➡ **tubocurarine chloride**.

tuberculin [USAN] is isolated from *Mycobacteria tuberculosis* or *Mycobacteria bovis*, and is used as a

DIAGNOSTIC AGENT as a dermal reactivity indicator for tuberculoprotein hypersensitivity.

tubocurarine chloride [BAN, INN, JAN, USAN] (d-tubocurarine chloride; (+)-tubocurarine chloride; Tubarine™) is a quaternary ammonium alkaloid from Amazon curare (*Chondodendron tomentosum*) (Menispermaceae). It acts as a NICOTINIC CHOLINOCEPTOR ANTAGONIST, a (competitive) NEUROMUSCULAR BLOCKING AGENT, which can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia. Also, it is a ($I_{SK(Ca)}$) POTASSIUM-CHANNEL BLOCKER.

d-tubocurarine chloride ➡ **tubocurarine chloride**.

(+)-tubocurarine chloride ➡ **tubocurarine chloride**.

tubotoxin ➡ **rotenone**.

tucaresol [BAN, INN] (BWA 589C; BW 589C80) is a phenoxymethylbenzoic acid derivative, an ANTISICKLING AGENT, with potential for the treatment of sickle-cell disease. It increases oxygen affinity of haemoglobin.

tuftsin is a tetrapeptide present in γ-globulin and is an (IMMUNOSTIMULANT) IMMUNOMODULATOR. It stimulates phagocytosis, induces NO synthesis in murine macrophages, and has other pharmacological properties associated with macrophage functions. It has potential ANTICANCER activity

Tuinal™ ➡ **amylobarbitone**.

tulobuterol [BAN, INN] (tulobuterol hydrochloride [JAN]; Respacal™) is a β-ADRENOCEPTOR AGONIST. It can be used as a BRONCHODILATOR in ANTIASTHMATIC treatment.

tulobuterol hydrochloride ➡ **tulobuterol**.

tulopafant [INN] (RP 59227) is a pyrrolothiazole derivative, a PLATELET-ACTIVATING FACTOR RECEPTOR ANTAGONIST. It extends rejection times in experimental cardiac xenotransplants.

tumour necrosis factor (TNF) is a cytokine peptide, containing 157 amino acid residues (two forms known). It is a (TNF I and II) CYTOKINE RECEPTOR AGONIST, a mediator in pathogenesis of infection, tissue injury and inflammation. Elevated serum levels are found in AIDS patients. It has activity as an IMMUNOMODULATOR and ANTICANCER AGENT. Forms include TNF-α (cachectin), produced mainly by macrophages, which has haemopoietic regulatory activity (*inter alia*); TNF-β (lymphotoxin), produced mainly by lymphocytes. There is also a clone, sonermin [INN] (3-157-tumour necrosis factor (human)) with anticancer activity.

turosteride [INN] is a 4-azasteroid and analogue of **finasteride**, which acts as a **5α-REDUCTASE INHIBITOR** and is used in the treatment of benign prostatic hypertrophy.

Tussogest™ ➡ **caramiphen**; **phenylpropanolamine hydrochloride**.

TUT 7 ➡ **menogaril**.

TVX 1764 ➡ **cinmetacin**.

TXA_2 ➡ **thromboxane A_2**.

TxIA ➡ **δ-conotoxins TxVIA**.

TYB 5220 ➡ **epoetin gamma**.

tybamate [BAN, INN, USAN] is a carbamate similar to **meprobamate**. It is a SEDATIVE that was formerly used as a SKELETAL MUSCLE RELAXANT for treating spasm.

Tylenol™ ➡ **paracetamol**.

Tylex™ ➡ **codeine**.

tymazoline [BAN] is a SYMPATHOMIMETIC, an α-ADRENOCEPTOR AGONIST that can be used as a VASOCONSTRICTOR and nasal DECONGESTANT.

tymus hormone ➡ **thymopoietin**.

type-C natriuretic peptide ➡ **atrial natriuretic peptides**.

tyramine (4-hydroxyphenethylamine; tyrosamine; *p*-tyramine; *p*-hydroxyphenylethylamine) is a widespread biogenic amine, found in several plant species, in mescal (*Lophophora williamsii*) and other Cactaceae, *Cannabis sativa*, *Piper nigrum* and other plant spp., in putrefied animal tissues, also in ripe cheeses, yeast extracts and some pickled foods etc. (important in relation to clinical interaction with MAO inhibitors where a hypertensive crisis can be precipitated). It is an (indirect-acting) SYMPATHOMIMETIC amine with marked vasopressor and hypertensive actions that acts by release of noradrenaline from sympathetic nerve endings. It is used as a diagnostic agent and experimental tool in the testing function of sympathetic nerves, and in investigating foodstuff–MAOI interactions.

***p*-tyramine** ➡ **tyramine**.

tyrosamine ➡ **tyramine**.

tyrothricin [BAN, INN, USAN] is an antibiotic mixture, containing mainly **gramicidin** and tyrocidine, produced by *Bacillus brevis*. It is an ANTIBACTERIAL incorporated into numerous topical preparations.

Tyzine™ ➡ **tetryzoline**.

U

U 4191 ➡ **ethoxzolamide**.
U 8344 ➡ **uramustine**.
U 9558 ➡ **normethadone**.
U 10387 ➡ **isocarboxazid**.
U 11100A ➡ **nafoxidine**.
U 19763 ➡ **bolasterone**.
U 22550 ➡ **calusterone**.
U 24973A ➡ **melitracen**.
U 26597A ➡ **colestipol**.
U 28774 ➡ **ketazolam**.
U 32070 ➡ **calcifediol**.
U 42842 ➡ **arbaprostil**.
U 46785 ➡ **meteneprost**.
U 49562 ➡ **calcitriol**.
U 50488H is a pyrrolidinycyclohexylbenzenacetamide and analogue of **spiradoline**. It is a selective (κ-subtype) OPIOID RECEPTOR AGONIST and OPIOID ANALGESIC. It is a useful pharmacological tool.
U 52047 ➡ **menogaril**.
U 53059 ➡ **itazigrel**.
U 53217 ➡ **epoprostenol**.
U 62066E ➡ **spiradoline**.
U 69689 ➡ **fertirelin**.
U 92016A is a benzindole derivative, a potent and selective (5-HT_{1A}-subtype) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST. It is used as a pharmacological tool.
ubenimex ➡ **bestatin**.
Ubretid™ ➡ **distigmine bromide**.
UCB 3983 ➡ **mesna**.
Ucerax™ ➡ **hydroxyzine**.
UDP (uridine diphosphate) is a natural nucleotide and acts as a PURINE P2 RECEPTOR AGONIST that acts preferentially at the pyrimidine/uridine-preferring receptors, preferentially at the $P2Y_3$ and $P2Y_6$ but also at the $P2Y_4$ subtype. The fact that nucleotides other than the purines bind to these receptors has led to the whole class being sometimes referred to as 'nucteotide P2 receptors'. It is used as a pharmacological tool.
UF 021 ➡ **unoprostone**.
ufiprazole [INN] is a substituted benzimidazole and metabolite of **omeprazole**, and is a GASTRIC PROTON PUMP INHIBITOR, a (H^+/K^+) ATPASE INHIBITOR. It is a potential ANTIULCEROGENIC for gastric ulcers and other gastric acid-related gastrointestinal disorders.
UGD ➡ **zolimidine**.
UH AC 62 ➡ **meloxicam**.
UK 14304 ➡ **brimonidine**.
UK 37248 ➡ **dazoxiben**.
UK 38485 ➡ **dazmegrel**.
UK 66914 is a piperazinylsulphonamide, a POTASSIUM-CHANNEL ANTAGONIST with (class III agent) ANTIARRHYTHMIC activity.
UK 68798 ➡ **dofetilide**.
UK 69578 ➡ **candoxatril**.
UK 80067 ➡ **modipafant**.
UK 116044 ➡ **eletriptan**.
Ukidan™ ➡ **urokinase**; **saruplase**.
ulinastatin [INN, JAN] is a glycoprotein (MW *c.* 67,000) isolated from human urine and is a proteolytic ENZYME INHIBITOR. It has ANTIINFLAMMATORY activity and has been given in acute pancreatitis and circulatory insufficiency.
Ultiva™ ➡ **remifentanil**.
Ultralanum™ ➡ **fluocortolone**.
UM 407 ➡ **cyclazocine**.
UM 495 ➡ **etorphine**.
UM 501 ➡ **acetorphine**.
UM 792 ➡ **naltrexone**.
umbelliferone (7-hydroxycoumarin) occurs widely in plants and has ANTIFUNGAL activity. It can also been used in SUNSCREEN lotions and creams.
Uniparin™ ➡ **heparin sodium**.
Unipen™ ➡ **nafcillin**.
Uniphyllin™ ➡ **theophylline**.
Univasc™ ➡ **moexipril**.
Univer™ ➡ **verapamil**.
unoprostone [INN] (UR 021; isopropyl ester = UF 021) is a synthetic prostaglandin analogue of $PGF_{2\alpha}$ and is a PROSTANOID RECEPTOR AGONIST. It is a novel ANTIGLAUCOMA TREATMENT, introduced for topical use in open-angle glaucoma and ocular hypertension.
UP 83 ➡ **niflumic acid**.
UP 164 ➡ **morniflumate**.
UP 1677 ➡ **mipitroban**.
UP 2696 ➡ **ripisartan**.
UP 34101 ➡ **propacetamol**.
u-PA ➡ **urokinase**.
uperolein is a naturally occurring 10 amino acid residue *C*-terminally amidated peptide. It is a tachykinin from the skin of *Uperoleia rugosa* and *Uperoleia Marmorata*. It acts as a potent TACHYKININ RECEPTOR AGONIST, stimulates extravascular smooth muscle and is a powerful VASODILATOR and transient HYPOTENSIVE. It is used as a pharmacological tool.
UPTAKE INHIBITORS are important mediators involved in a number of uptake processes in the body, and can be manipulated pharmacologically. Commonly, the uptake process uses Na^+ and Cl^- as counter ions.

Noradrenaline is transported by uptake systems that have been extensively studied. On release of noradrenaline from sympathetic nerve varicosities in the peripheral nervous system, it is subject to two uptake systems. Uptake 1 (U_1) is a reuptake process where the noradrenaline is recovered by the nerve via a process that has a high affinity but relatively low maximum rate, whereas a second process, uptake 2 (U_2), clears noradrenaline from the tissues into extraneuronal sites by a low affinity, but fast, process (which is inhibited by GLUCOCORTICOIDS, **phenoxybenzamine** and **normetanephrine**). The first – the neuronal system – has been studied in detail, and is essentially the same process as used for **dopamine** and **5-hydroxytryptamine** in the CNS. The U_1 transport protein has now been cloned, and is one of a family of transporter proteins which act as co-transporters for Na^+, Cl^- and the amine, driven by the ATP-generated electrochemical gradient for Na^+. This U_1 noradrenaline reuptake process is inhibited by **cocaine** and **amphetamine** (thus accounting for some of their actions, particularly within the CNS), **phenoxybenzamine** and the extensive class of tricyclic and related compounds that are used as ANTIDEPRESSANTS (e.g. **desipramine**).

The dopamine uptake and the 5-hydroxytryptamine uptake systems are very similar to the noradrenaline uptake

system. This is shown by the fact that nerves readily take up the 'wrong' neurotransmitter, and by the difficulty in devising uptake-blockers that have some selectivity for one amine over the other.

The older tricyclic agents show less than a ten-fold selectivity in inhibiting noradrenaline uptake over that for 5-HT (e.g. desipramine, **imipramine**, **nortriptyline**) to members such as **amitryptyline** which shows virtually no selectivity, through to members such as **trazodone**, **clomipramine** and **zimelidine** (which are somewhat 5-HT selective).

The newer 'Serotonin-Selective Reuptake Inhibitors (SSRIs) show a higher selectivity for inhibition of 5-HT reuptake in the brain, and have a different pharmacology. Examples clinically used include **fluoxetine**, **paroxetine**, **sertraline fluvoxamine**, **venlafaxine**, **nefazodone** and **trazodone**. Experimental agents include alaproclate, litoxetine, indatraline, 6-nitroquipazine and β-CIT.

The dopamine uptake system – or dopamine transporter system – is inhibited by the following clinically used agents: **amfonelic acid**, **bupropion**, **mazindol**: or experimental agents, **nomifensine**, indatraline, β-CFT, β-CIT-FP, GYKI 52895 and LR 5182.

In the case of cholinergic neurotransmission, a somewhat different principle applies. Acetylcholine is not reuptaken, instead the degradation product from the action of cholinesterase – choline – is taken up. The choline uptake process is blocked by **hemicholinium-3** (HC3) and **triethylcholine**. An irreversible action is produced by the coupling of a choline mustard to the uptake inhibitor molecule, e.g. **ethylcholine aziridinium** (AF64A) and hemicholinium mustard.

Adenosine uptake into cells can also be inhibited, and this prevents metabolism of this mediator (which prevents platelet aggregation), thus prolonging the action of endogenous adenosine. **Dipyridamole** acts as an uptake inhibitor, and this allows it to be used therapeutically as an antiplatelet drug to prevent aggregation (see **PLATELET AGGREGATION INHIBITING AGENTS**). Experimental adenosine transporter protein inhibitors include NBTI and NBTG.

Amara, S.G. *et al.* (1993) Neurotransmitter transporters: recent progress. *Annu. Rev. Neurosci.*, **16**, 73-93.

Blakely, R.D. *et al.* (1994) Molecular physiology of norepinephrine and serotonin transporters. *J. Exp. Biol.*, **196**, 263-281.

Gu, H. *et al.* (1994) Stable expression of biogenic amine transporters reveals differences in inhibitor sensitivity, kinetics, and ion dependence. *J. Biol. Chem.*, **269**, 7124-7130.

Humphreys, C.J. *et al.* (1994) Ligand binding to the serotonin transporter: equilibria, kinetics, and ion dependence. *Biochemistry*, **33**, 9118-9125.

Wong, D.T. *et al.* (1995) Prozac (fluoxetine, Lilly 110140), the first selective serotonin uptake inhibitor and an antidepressant drug: Twenty years since its first publication. *Life Sci.*, **57**, 411-441.

UR 021 ➡ **unoprostone**.

UR 336 ➡ **hexaprofen**.

UR 12592 ➡ **rupatadine**.

uracil-6-carboxylic acid ➡ **orotic acid**.

uracil mustard ➡ **uramustine**.

uralenic acid ➡ **enoxolone**.

uramustine [BAN, INN] (uracil mustard [USAN]; NSC 34462; U 8344) is derived from **mustine**, and is an alkylating **ANTICANCER AGENT** used orally to treat lymphomas and leukaemias.

urapidil [BAN, INN, JAN] is a novel piperazinyl pyrimidinedione derivative with mixed (α_1-subtype) **α-ADRENOCEPTOR ANTAGONIST**, CNS and (5-HT_{1A}) **5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST** properties. It has been used as an **ANTIHYPERTENSIVE**.

urea [USAN] (carbamide) is a constituent of all vertebrate tissues, concentrated in urine. It can be used topically as a **DERMATOLOGICAL AGENT** in a number of skin preparations, e.g. to treat eczema and psoriasis (as a hydrating agent). It can be given intravenously as a hypertonic dehydrating (osmotic) **DIURETIC** to reduce intracranial pressure in controlling cerebral oedema.

UREASE INHIBITORS act to inhibit the enzyme urease, which has a wide distribution in nature. It catalyses the hydrolysis of urea to ammonia and carbon dioxide. Many inhibitors of the enzyme are known, and some can be used in therapeutics, e.g., **acetohydroxamic acid**, **benurestat**, **flurofamide** and **tolfamide**. One use of these agents is used in treating urinary tract infection with urinary calculi (stones). There is a causal relationship between 'infection stones' and the presence of urinary infection with urease-producing organisms. Treatment and preventive measures can be based on antimicrobial treatment and urease inhibition, and by eradication of the calculi. The development of endourological and extracorporeal shock-wave lithotripsy techniques for removing stones may expand the importance of the pharmacological control of recurrence and stone growth. The agents may be useful in the treatment of a number of urinary tract infections. A second putative use is in treatment of peptic ulcers associated with *Helicobacter pylori* infection. The mechanism of the hypergastrinaemia associated with *Helicobacter pylori* infection is unknown, but may be an effect of the ammonia produced by the bacterium near the antral epithelial surface. To prevent this, trials have been made with urease inhibitors (e.g. acetohydroxamic acid). Other proposed uses for urease inhibitors include prevention of urinary catheter incrustations, and in bowel cleansing.

Munakata, K. *et al.* (1980) Quantitative structure-activity relationships between hydroxamic acids and their urease inhibitory potency. *J. Pharmacobiodyn.*, **3**, 457-462.

Bagley, D.H. (1987) Pharmacologic treatment of infection stones. *Urol. Clin. North Am.*, **14**, 347-352.

Kobashi, K. (1992) Urease activity of *Helicobacter pylori*. *J. Clin. Pathol.*, **45**, 367-368.

Urecholine™ ➡ **bethanechol chloride**.

urethane [INN] (ethyl carbamate; ethyl aminoformate; ethyl urethane; NSC 746) was formerly used clinically as a **HYPNOTIC**, and can be used as a **GENERAL ANAESTHETIC** in small animals. It has been used as an **ANTICANCER AGENT** in treating chronic myeloid leukaemia.

Uriben™ ➡ **nalidixic acid**.

URICOSURIC AGENTS increase uric acid excretion by a direct action on the renal tubule. A major use of such drugs is to treat gout. Established examples include **probenecid** and **sulfinpyrazone**. Some newer agents of value are uricosuric diuretics. Hyperuricaemia and gout may have numerous causes (metabolic, neoplastic, renal disease, idiopathic), but depend either on overproduction, or under-excretion, of urate. This then leads to deposition of purine-derived sodium urate in the joints. Gout manifests itself as intermittent attacks of arthritis. A number of mediators may be involved in the inflammatory component, particularly kinins (**bradykinin** and **kallidin**), **leukotriene** (LTB_4) with induced **IL-1** (interleukin-1). Local accumulation of neutrophils engulf the crystals by phagocytosis, with generation of cytotoxic oxygen metabolites and lysis of cells by proteolytic enzymes. A number of drugs can be used in treatment.

Probenecid inhibits the active transport of organic anions across the renal tubule, preventing both reabsorption from the tubular fluid and secretion into it, and inhibition of urate absorption increases its excretion in the urine. Sulfinpyrazone is structurally related to phenylbutazone and acts like probenecid. It is a potent uricosuric, though it can cause serious gastrointestinal upsets.

DIURETICS tend to precipitate acute gout since vigorous diuresis results in reabsorption of substances normally partially reabsorbed in the proximal tubule, including urate. Of the earlier diuretics, **spironolactone** did not have this action. Latterly some novel diuretics have been developed that do not precipitate gout and may improve uricosuric activity. They probably block urate transport in the proximal tubules, and show diuretic and saluretic activities by inhibiting water and sodium reabsorption in the distal segment of the nephron. It is not yet clear which of these agents will prove most effective. **Benzbromarone** is a potent uricosuric by virtue of inhibiting tubular reabsorption of urate. **Allopurinol** acts not as a uricosuric, but instead decreases synthesis of uric acid, acting as a competitive XANTHINE-OXIDASE INHIBITOR. The result of its action is a decrease in blood and tissues of the relatively insoluble xanthates and of xanthic acid, so there is less formation of renal stones, and some reversal of existing crystals in tissues. This drug is only suitable for the long-term treatment of gout. **Colchicine** is used in the treatment of gout, but is not a uricosuric agent and instead inhibits the migration of leucocytes into the joint. It is thought to act by binding to tubulin, a protein of the microtubules.

NSAID ANALGESICS are of value in treating some inflammatory aspects of gout. Aspirin in low dose precipitates gout, by increasing urate retention, though in high doses may be of value. More specific inhibitors of COX-2 with little activity at the COX-1 form of cyclooxygenase may prove more valuable in relation to minimizing such undesirable actions.

Angiotensin receptor antagonists, such as **losartan**, have some uricosuric actions in humans and offer the prospect of a new type of antigout treatment.

Fam, A.G. (1991) Strategies and controversies in the treatment of gout and hyperuricaemia. *Baillieres. Clin. Rheumatol.*, **4**, 177-192.

Vawter, R.L. *et al.* (1992) Rational treatment of gout. Stopping an attack and preventing recurrence. *Postgrad. Med.*, **91**, 115-118, 127.

Emmerson, B.T. (1996) The management of gout. *N. Engl. J. Med.*, **334**, 445-451.

uridine diphosphate ➡ **UDP**.

uridine triphosphate ➡ **UTP**.

Urispas™ ➡ **flavoxate**.

urocortin is a recently identified mammalian (rat) peptide that has 45% sequence identity with mammalian **corticotrophin-releasing factor** (CRF), and which is related to fish **urotensin I** (63% identity) and amphibian peptide **sauvagine**. Urocortin is a CORTICOTROPHIN-RELEASING FACTOR RECEPTOR AGONIST that is more active than CRF itself at CRF_2 receptors. In the CNS the distribution of urocortin corresponds closely with the CRF_2 receptor distribution, and it has prompted the suggestion that urocortin is the preferred endogenous at the CRF_2 receptor subtype. It is used as a pharmacological tool.

urodilatin (CDD/ANF-(95–126) is also described as Thr-Ala-Pro-Arg-atrial natriuretic factor (1–28), and is a 32 amino acid peptide, originally isolated from human urine. It is a potent VASODILATOR and ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONIST that belongs to the natriuretic-vasodilator family of peptides found earlier in heart atrial tissue (**atrial natriuretic factor**). It comprises residues (95–126) of the human cardiodilatin-atrial natriuretic factor precusor molecule. See ATRIAL NATRIURETIC PEPTIDES.

urofollitrophin ➡ **follicle-stimulating hormone**.

urofollitropin ➡ **follicle-stimulating hormone**.

urogastrone ➡ **epidermal growth factor**.

α-urogastrone ➡ **epidermal growth factor**.

β-urogastrone ➡ **epidermal growth factor**.

γ-urogastrone human urinary protein ➡ **epidermal growth factor**.

urokinase [BAN, INN, JAN, USAN] (u-PA; Abbokinase™, Ukidan™, Uronase™) is an endogenous proteolytic ENZYME of the plasminogen activator group, forming plasmin which degrades fibrin and so breaking up thrombi, thus acting as a THROMBOLYTIC AGENT. It is a protein present on monocytes in mammalian blood (and in the kidney) as a single-chain pro-enzyme (scu-PA) from which the active two-chain enzymic plasmogen (tcu-PA) activator is derived by proteolysis: it is the tcu-PA form derived from human kidney cells by tissue culture that is used clinically. Therapeutically, it has the advantage of not being immunogenic, and can be used to treat venous thrombosis in the heart and eye, and in arteriovenous shunts.

Uromitexan™ ➡ **mesna**.

uromodulin (Tamm-Horsfall protein) is a cytokine peptide containing 616 amino acid residues. It was isolated from human urine (reported to be the most abundant protein in mammalian urine). It has ANTIINFLAMMATORY and IMMUNOMODULATOR activity, and is chemotactic for neutrophils.

Uronase™ ➡ **urokinase**; **saruplase**.

urotensin I is a 41 amino-acid peptide isolated from the urophysis, the hormone storage-secretion organ of the caudal neurosecretary system of teleost fish, e.g. *Cyprinus carpio* (carp) and *Catostomus commersoni* (white sucker). It shows sequence homology with mammalian **corticotrophin-releasing factor** and acts as a CORTICOTROPHIN-RELEASING FACTOR RECEPTOR AGONIST. It shows potent HYPOTENSIVE activity (mammals and birds) and corticotrophin-releasing activity (fish and mammals). It is used as a pharmacological tool.

ursodeoxycholic acid [BAN, INN] (ursodiol; Actigall™ and many other names) is a steroid bile acid that occurs in small amounts in human bile and found in larger amounts in bear bile. It inhibits intestinal absorption of dietary and biliary cholesterol and possibly reduces any compensatory increase in hepatic cholesterol synthesis. As a CHOLERETIC it is used as a gallstone dispersing agent. A combination of **chenodeoxycholic acid** and ursodeoxycholic acid (Combidol™) is also used to dissolve gallstones.

ursodiol ➡ **ursodeoxycholic acid**.

USAN ➡ **nafoxidine**.

utibapril [BAN, INN] (FPL 63547) is an ethylester prodrug converted *in vivo* to utibaprilat [BAN, INN], which is an ACE INHIBITOR and ANTIHYPERTENSIVE AGENT.

utibaprilat ➡ **utibapril**.

Uticort™ ➡ **betamethasone**.

Utinor™ ➡ **norfloxacin**.

Utovlan™ ➡ **norethisterone**.

UTP (uridine triphosphate) is a natural nucleotide, a PURINE P2 RECEPTOR AGONIST that acts preferentially at the pyrimidine/uridine-preferring receptors, preferentially at the $P2Y_2$ and $P2Y_4$ subtypes but also at the $P2Y_6$ subtype (though less potent than **UDP**). The fact that nucleotides other than the purines bind to these receptors has led to the whole class being sometimes referred to as 'nucteotide P2 receptors'. It is used as a pharmacological tool.

V

vadocaine [INN] (OR K 242) is an amide series LOCAL ANAESTHETIC with ANTITUSSIVE activity.

Vagifem™ ➡ **oestradiol**.

valaciclovir [INN] (valacyclovir hydrochloride [USAN]; Valtrex™) is the L-valine ester of **aciclovir**, and is a synthetic nucleoside analogue ANTIVIRAL. Clinically, it can be used orally for herpes.

valacyclovir hydrochloride ➡ **valaciclovir**.

valitocin ([valine^8]oxytocin) is a natural nonapeptide **oxytocin** analogue, a neurohypophysial hormone isolated from the spiny dogfish (*Squalus acanthias*).

Valium™ ➡ **diazepam**.

Vallergan™ ➡ **trimeprazine**.

Valoid™ ➡ **cyclizine**.

valproate pivoxil ➡ **valproic acid**.

valproate sodium ➡ **valproic acid**.

valproic acid [BAN, INN, USAN] (semisodium valproate [BAN]; divalproex sodium [USAN]; valproate sodium [USAN]; sodium valproate [BAN, [JAN]; Abbott 44090; Convulex™ Epilim™; Depakene™; Depakote™ and many other names) is a monocarboxylic acid and an ANTICONVULSANT thought to work by interacting with GABA systems in the CNS. It is used orally or by injection as an ANTIEPILEPTIC widely used in treating all forms of epilepsy, particularly tonic–clonic seizures (grand mal) in primary generalized epilepsy. It is used in various forms; the semisodium valproate/divalproex sodium form is a stable coordination compound of sodium valproate and valproic acid. The amide valpromide [INN]; and a methyl ester derivative is valproate pivoxil [INN].

valpromide ➡ **valproic acid**.

valsartan [BAN, INN, USAN] (Diovan™) is a pseudopeptide ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE properties.

Valtrex™ ➡ **valaciclovir**.

Vanceril™ ➡ **beclomethasone**.

Vancocin™ ➡ **vancomycin**.

vancomycin [BAN, INN] (vancomycin hydrochloride [JAN]; Vancocin™) is a glycopeptide ANTIBIOTIC, and is an ANTIBACTERIAL against Gram-positive bacteria.

vancomycin hydrochloride ➡ **vancomycin**.

VANILLOID RECEPTOR AGONISTS act at the (as yet unofficially named) receptors that are activated by **capsaicin** and some vanillylamide analogues. Capsaicin itself is a pungent diterpene found in hot peppers (*Capsicum* spp.), which pharmacologically has many properties in common with **resiniferatoxin**, also a diterpene but additionally containing a phorbol related moiety. Some other analogues are **nonivamide** and **olvanil**. Vanilloid receptors are found in mammals located on cell membranes of sensory ganglia, peripheral nerves, the dorsal horn of the spinal cord and some nuclei in the CNS receiving sensory input. Activation of these receptor causes opening of a cation-selective ion channel-receptor complex that admits Ca^{2+} and Na^{+}, leading to depolarization of nerves and the release of stored sensory neurotransmitters. The receptor has been cloned and shown to be a non-selective cation channel that is structurally related to members of the TRP family of ion channels. The cloned capsaicin receptor is also activated by increases in temperature in the noxious range, suggesting that it functions as a transducer of painful thermal stimuli *in vivo*. Also, low pH produces a similar and synergistic activation of sensory neurons to capsaicin, and protons have been proposed to be physiological 'endogenous ligands'.

The action of capsaicin at these sites can be antagonized competitively by **capsazepine** (see VANILLOID RECEPTOR ANTAGONISTS). Capsaicin is a specific SENSORY IRRITANT in its stimulation of sensory neurons at low doses, though it readily causes desensitization and depletion of neurotransmitters, and at high doses acts as a NEUROTOXIN causing neuron degeneration (especially in neonates, and this is particularly marked with resiniferatoxin). Agonists at these sites can be used as pharmacological tools providing selective probes for studying neurogenic inflammation (i.e. inflammation that involves sensory neurotransmitters, such as the tachykinins and CGRP) and the role of nociceptors in animal and human pathophysiology. Clinically, some are used as counter-irritants (rubefacients or topical analgesics) in topical preparations for certain painful skin conditions.

Maggi, C.A. (1991) Capsaicin and primary afferent neurons: From basic science to human therapy. *J. Auton. Nerv. Syst.*, **33**, 1-14.

Bevan, S. *et al.* (1994) Protons: Small stimulants of capsaicin-sensitive sensory nerves. *Trends Neurosci.*, **17**, 509-512.

Geppetti, P *et al.* (eds) (1996) *Neurogenic Inflammation*, CRC Press, Boca Raton, FL, USA.

Caterina, M.J. *et al.* (1997) The capsaicin receptor: a heat-activated ion channel in the pain pathway. *Nature*, **389**, 816-824.

VANILLOID RECEPTOR ANTAGONISTS act at sites activated by sensory irritants, e.g. **capsaicin**: see VANILLOID RECEPTOR AGONISTS. **Capsazepine**, a synthetic compound developed out of vallinoids such as capsaicin, is a high-affinity competitive vanilloid receptors antagonist. It is used as a pharmacological tool. There is some variation in affinity between different sites and species, suggesting receptor subtypes and species variants. Ruthenium Red also acts as an inhibitor at these sites in a non-competitive manner.

Szallasi, A. (1994) The vanilloid (capsaicin) receptor: Receptor types and species differences. *Gen. Pharmacol.*, **25**, 223-243.

Walpole, C.S.J. *et al.* (1994) The discovery of capsazepine, the first competitive antagonist of the sensory neuron excitants capsaicin and resiniferatoxin. *J. Med. Chem.*, **37**, 1942-1954.

Dray, A. *et al.* (1996) New pharmacological strategies for pain relief. *Annu. Rev. Pharmacol. Toxicol.*, **36**, 253-280.

***N*-vanillylnonanamide** ➡ **nonivamide**.

***N*-vanillyloleamide** ➡ **olvanil**.

Vansil™ ➡ **oxamniquine**.

Vantin™ ➡ **cefpodoxime proxetil**.

vapiprost [BAN, INN] (vapiprost hydrochloride [USAN]) is a prostaglandin-related structure, a (thromboxane A_2) PROSTANOID RECEPTOR ANTAGONIST. It acts as a PLATELET AGGREGATION INHIBITOR and BRONCHODILATOR.

vapiprost hydrochloride ➡ **vapiprost**.

Vapona™ ➡ **dichlorvos**.

vapreotide [INN, USAN] (octastatin; BMY 41606; RC 160) is a peptide, a **somatostatin** analogue and SOMATOSTATIN RECEPTOR AGONIST. It inhibits growth hormone release, and can be used as an adjunct in ANTICANCER therapy.

varicella-zoster immunoglobulin ➡ **globulin, immune**.

Varidase™ ➡ **streptodornase; streptokinase**.

Vascor™ ➡ **bepridil**.

vasoactive intestinal octacosapeptide ➡

vasoactive intestinal polypeptide.

vasoactive intestinal peptide ➡ **vasoactive intestinal polypeptide.**

VASOACTIVE INTESTINAL PEPTIDE RECEPTOR AGONISTS act at receptors recognizing vasoactive intestinal peptide (vasoactive intestinal polypeptide; VIP) and other members of a family of peptides that have some pharmacological actions in common, which has led to a proposed family of receptors. These peptides include **VIP**, **helodermin**, **pituitary adenylate cyclase-activating peptide** (PCAP), **peptide histidine isoleucineamide** (PHI) and **peptide histidine methionamide** (PHM).

VIP itself was originally found in pancreatic islets of the gastrointestinal tract and was regarded as a gut hormone involved in ion transport by the epithelium. Later studies showed an extensive network of VIP-immunoreactive fibres within the autonomic nervous system and it is now regarded as an important non-adrenergic non-cholinergic (NANC) neurotransmitter acting as cotransmitter with acetylcholine in certain parasympathetic nerves, as well as a putative CNS neurotransmitter. The receptors activated are thought to have some sites in common with PACAP (where $PACAP_{1-27}$ and $PACAP_{1-38}$ have differential agonist properties). Currently, three or more seven-transmembrane G-protein-coupled receptors have been cloned and sequenced, and they all show positive-coupling to adenylyl cyclase. The three types have been termed VIP_1 (or VIP), VIP_2 (or $PACAP_3$) and PACAP (or PACAP type 1; of which there are multiple isoforms through alternative splicing). They are differentiated by the rank order of potency of natural agonists (there are as yet no selective highly synthetic agonists) and by radioligand-binding affinity measurements.

At VIP_1 and VIP_2 receptors the rank order of potency is: VIP = PACAP > PHI; and at PACAP receptors, PACAP > VIP > PHI.

Harmar, T. *et al.* (1994) Multiple receptors for PACAP and VIP. *Trends Pharmacol. Sci.*, **15**, 97-99.

Arimura, A. *et al.* (1995) Pituitary adenylate cyclase activating polypeptide (PACAP) and its receptors: neuroendocrine and endocrine interaction. *Front. Neuroendocrinol.*, **16**, 53-88.

Maggi, C.A. *et al.* (1995) Neuropeptides as regulators of airway function: Vasoactive intestinal peptide and the tachykinins. *Physiol. Rev.*, **75**, 277-322.

Alexander, S.P.H. *et al.* (1998) Receptors and ion channel nomenclature supplement. Ninth Edition. *Trends Pharmacol. Sci., Suppl.*, **19**, 1-98.

VASOACTIVE INTESTINAL PEPTIDE RECEPTOR ANTAGONISTS act at receptors recognizing vasoactive intestinal peptide and PACAP; see **VASOACTIVE INTESTINAL PEPTIDE RECEPTOR AGONISTS**. To date, few such ligands have been developed. $PACAP_{6-27}$ has affinity for PACAP receptors; also **[AcTyr^1,DPhe^2]GRF$_{1-29}$** and **[DPhe^6,Leu^{17}]VIP** are weak partial agonists.

vasoactive intestinal polypeptide (VIP; vasoactive intestinal octacosapeptide; vasoactive intestinal peptide) is a linear 28 residue amino acid peptide originally isolated from mammalian intestines. VIP from dogs, goats, humans, oxen, rabbit and sheep is identical to that from pig, but guinea-pig VIP differs at 4 positions from pig VIP. VIPs from chickens, dogfish and opossum have also been sequenced. It is distributed widely in the central and peripheral nervous systems, and is thought to act there as a neurotransmitter. It is a **VASOACTIVE INTESTINAL PEPTIDE RECEPTOR AGONIST**, and has **VASODILATOR** activity. It also has biological activity on nervous, digestive, cardiovascular, respiratory, reproductive, exocrine, endocrine, neuroendocrine, immunological and renal functions.

VASOCONSTRICTORS have a constricting action on blood vessels and thus normally cause a reduction in blood flow in the affected region together with an increase in blood pressure (if not opposed by physiological compensatory mechanisms). They may be used to increase blood pressure in circulatory disorders, in cases of shock or in cases where pressure has fallen during lengthy or complex surgery. Vasoconstrictors can act in a number of ways, but several are sympathomimetics, acting either directly (see **α-ADRENOCEPTOR AGONISTS**), or indirectly – as indirect sympathomimetics (see **SYMPATHOMIMETICS**). Sympathomimetic vasoconstrictors act on the vasculature of mucous membranes, and may be used locally or systemically as nasal **CONGESTANTS**, e.g. **oxymetazoline** and **xylometazoline** (direct), or **ephedrine** and **pseudoephedrine** (indirect). Vasoconstrictors can be used to prolong the effects of local anaesthetics (e.g. **adrenaline**) when the two agents are injected together. Some sympathomimetics are used in circulatory shock, e.g. **noradrenaline**, **methoxamine** and **phenylephrine**. Other medically used vasoconstrictor actions include **angiotensin II** (see **ANGIOTENSIN RECEPTOR AGONISTS**). Also **vasopressin** analogues mediate powerful vasoconstriction via the V_1-receptors, and agents used include vasopressin itself, as **terlipressin** which has a prolonged action, or as **felypressin**. These drugs can be used to reduce bleeding from oesophageal varices. There are a number of other endogenous agents with vasoconstrictor actions, e.g. **endothelins** (the most potent vasoconstrictors known), **neuropeptide Y** analogues, **5-HT** analogues: see **ENDOTHELIN RECEPTOR AGONISTS**; **5-HYDROXYTRYPTAMINE RECEPTOR AGONISTS**; **NEUROPEPTIDE Y RECEPTOR AGONISTS**; **VASOPRESSIN RECEPTOR AGONISTS**.

VASODILATORS dilate blood vessels and thus may increase blood flow in a region. Many of them are drugs that act predominantly to relax smooth muscle (see **SMOOTH MUSCLE RELAXANTS**); where their effects on blood vessels are but one aspect of their overall action. On the whole they lack specificity of action and selective actions are difficult or impossible to achieve in practice.

Nitrates and similar vasodilators are used particularly to treat angina attacks, but are not specific coronary vasodilators. They work by redistributing blood flow in the periphery and so beneficially reduce load on the heart. There is a perceived need for cerebral vasodilators that may have a potential use in certain neurological disorders (dementia), and some agents are thought to be active here, e.g. **nimodipine** and **co-dergocrine mesylate**.

Vasodilators have a number of different mechanisms of action. Some are smooth muscle relaxants that act directly on the blood vessels, e.g. **glyceryl trinitate**, **hydralazine**, **isosorbide dinitrate**, **pentaerythritol tetranitrate**, **sodium nitroprusside** and other nitrite and nitrate drugs, which are thought to mimic the actions of the endogenous mediator **nitric oxide**, which relaxes smooth muscle through elevation of cGMP (see **NITRERGIC STIMULANTS**).

The **CALCIUM-CHANNEL BLOCKERS**, e.g. **diltiazem**, **nimodipine** and **verapamil**, act to block a subset of voltage-sensitive calcium channels, so reducing Ca^{2+}-influx into smooth muscle cells. The **POTASSIUM-CHANNEL ACTIVATORS**, e.g. **cromakalim**, **diazoxide**, **minoxidil**, **nicorandil** and **pinacidil**, are thought to work by opening a subset of K^+-channels which leads to membrane stabilization.

Some other vasodilators act by blocking, mimicking or modifying the action of various hormones or neurotransmitters, e.g. **α-ADRENOCEPTOR ANTAGONISTS** (e.g. **indoramin**), **β-ADRENOCEPTOR AGONISTS** and **ACE INHIBITORS** (e.g. **captopril**). **Calcitonin gene-related peptide** is a

neuropeptide which has very potent vasodilator actions, and has been used to counteract the vasoconstriction common in subarachnoid haemorrhage. Vasodilators are used for a number of purposes, including as ANTIANGINAL AGENTS (e.g. **glyceryl trinitrate**), in acute hypertensive crisis (e.g. **sodium nitroprusside**), as ANTIHYPERTENSIVE AGENTS to treat chronic raised blood pressure (e.g. **hydralazine**, **nifedipine**) and to treat poor circulation in the extremities, such as peripheral vascular disease or Raynaud's Phenomenon (e.g. **inositol nicotinate**).

vasonatrin (VNP) is a 27 amino acid residue peptide that is a chimera of ATRIAL NATRIURETIC PEPTIDE (ANP) and **C-type natriuretic peptide** (CNP). Its sequence comprises the 22 amino acids of CNP plus the 5 C-terminal residues of ANP. It appears to be an ATRIAL NATRIURETIC PEPTIDE RECEPTOR AGONIST, and has the venodilating actions of CNP, the natriuretic actions of ANP and unique arterial vasodilating actions associated with neither CNP or ANP. See ATRIAL NATRIURETIC PEPTIDES.

vasopressin (antidiuretic hormone, ADH; β-hypophamine) comprises two differing forms of cyclic nonapeptides linked through a sulphydryl bridge linking residues 1 and 6. Mammalian vasopressin, including human, has an Arg^8 residue (**argipressin**; arginine vasopressin; AVP), except in the pig which has a Lys^8 residue (**lypressin**; lysine vasopressin; 8-L-lysine vasopressin). Vasopressin and **oxytocin** are released from the posterior pituitary gland (oxytocin differs from vasopressin in having Leu^8 and Ile^3 substitutions). Vasopressin used clinically, was formerly obtained from porcine or bovine glands, but these two forms and various analogues are now obtained synthetically. Therapeutically, vasopressin (ADH and certain analogues) is a (V) VASOPRESSIN RECEPTOR AGONIST and has ANTIDIURETIC activity. It is used in pituitary-originated DIABETES INSIPIDUS TREATMENT. It is a powerful VASOCONSTRICTOR and can be used as a HAEMOSTATIC to treat bleeding from varices of the oesophagus.

deamino[Phe^2,Δ^3-Pro^7]arginine vasopressin ➡ **argipressin**.

deamino[Δ^3-Pro^7]arginine vasopressin ➡ **argipressin**.

deamino[Val^4,D-Homoarginyl^8]vasopressin ➡ **argipressin**.

deamino[Val^4,D-Homolysyl^8]vasopressin ➡ **argipressin**.

[Orn^8]vasopressin ➡ **ornipressin**.

[Phe^2,Lys^8]vasopressin ➡ **felypressin**.

VASOPRESSIN RECEPTOR AGONISTS act at one or other type of vasopressin receptor, and so have rather different effects. Vasopressin receptors are closely related to oxytocin receptors at which the close homologue oxytocin acts and will be dealt with together. **Vasopressin** and **oxytocin** are posterior PITUITARY HORMONES, formed as precursor molecules in the paraventricular nucleus of the hypothalamus, and transported down axons to be secreted into the portal capillaries and thence the bloodstream. They are cyclic nonapeptides linked through a sulphydryl bridge linking residues 1 and 6. Mammalian vasopressin has an Arg^8 residue (**arginine vasopressin**; **AVP**), except in the pig which has a Lys^8 residue (**lysine vasopressin**). Oxytocin differs from vasopressin in having leucine at position 8 and isoleucine at position 3. Vasopressin and oxytocin analogues with some degree of receptor subtype selectivity have been synthesized and have antidiuretic or vasoconstrictor or oxytocic (uterus-contracting) activity.

Vasopressin receptors have been divided into several subtypes: V_{1a}, V_{1b} and V_2, and one form of oxytocin receptors, OT, is recognized. All these receptors are of the seven-transmembrane G-protein-coupled superfamily and most have been cloned. The V_{1a} and V_{1b} subtypes require relatively high concentrations of vasopressin to activate them, are coupled to the $InsP_3$/DAG Ca^{2+}-mobilizing system, and notably cause vasoconstriction, which raises blood pressure; hence the name vasopressin. The V_2 receptors couple positively to adenylyl cyclase and notably effect electrolyte transport in the kidney so that there is an antidiuretic effect – thus this hormone may be called **antidiuretic hormone** (ADH). Oxytocin acts on OT receptors, which are coupled to the $InsP_3$/DAG Ca^{2+}-mobilizing system, and notably cause the uterus to contract. With respect to ligands that distinguish between these receptor subtypes, agonists show less selectivity than antagonists (see VASOPRESSIN RECEPTOR ANTAGONISTS). At all vasopressin receptors, vasopressin is more active than oxytocin; and vice versa at oxytocin receptors. The following unnatural peptide agonist ligands show some selectivity. At V_{1a} receptors, **[Phe^2,Orn^8]vasotocin**; and at V_{1b} receptors, **[des-amino,D-3′-(pyridyl)-Ala^2]arginine vasopressin**. At V_2 receptors, desmopressin, **dDAVP** ([des-amino,$DArg^4$]-vasopressin, **dVDAVP** ([des-amino,Val^4,D-Arg^8]vasopressin) and **VDAVP** ([Val^4,$DArg^8$]vasopressin). At OT receptors, [Thr^4,Gly^7]oxytocin.

Vasopressin analogues are used in medicine for their ANTIDIURETIC actions at the V_2-receptors of the kidney, and in the treatment of diabetes insipidus, where they are used to counteract the underproduction of ADH peptide secreted by the posterior pituitary gland – which is characteristic of this disease. Agents used include vasopressin itself, or analogues including **lypressin** (Lys^8-vasopressin) and **desmopressin** ([des-amino-$DArg^8$]vasopressin); all can be given topically in the form of a nasal spray (from which they are absorbed into the circulation) or by injection. Desmopressin is also used to diagnose pituitary originated diabetes insipidus, to test renal function and it may be used to treat bed-wetting (nocturnal enuresis), and though a peptide, it may be given by mouth.

Vasopressin analogues may also be used medically for their profound smooth muscle VASOCONSTRICTOR effects mediated via the V_1-receptors (principally V_{1b}-receptors), which normally results in a vasopressor action. It may be used in the form of vasopressin itself, **terlipressin** (triglyceryl-lysine vasopressin), which has a prolonged action (and is used to reduce bleeding in certain circumstances, e.g. to treat bleeding from varices in the oesophagus, or **felypressin** ([Phe^2,Lys^8]vasopressin), which is predominantly a vasopressor and vasoconstrictor (and used for the latter action in combination with local anaesthetic injections to prolong their action). Other V_1-receptor mediated effects include aggregation and degranulation of platelets, and increased hydrocortisone release. V_2-receptor mediated effects include an increase in the concentration of factor VIII of the blood coagulation cascade. Oxytocin is used in its natural sequence, but is available in a synthetic form (Syntocinon), for the induction of labour, when it is given by intravenous infusion or sublingually.

Hruby, V.J. *et al.* (1990) Conformational and structural considerations in oxytocin-receptor binding and biological activity. *Annu. Rev. Pharmacol. Toxicol.*, **30**, 501-534.

Lolait, S.J. *et al.* (1995) Molecular biology of vasopressin receptors. *Ann. N. Y. Acad. Sci.*, **771**, 273-292.

Mohr, E. *et al.* (1995) Vasopressin and oxytocin: molecular biology and evolution of the peptide hormones and their receptors. *Vitam. Horm.*, **51**, 235-266.

Barberis, C. *et al.* (1996) Vasopressin and oxytocin receptors in the central nervous system. *Crit. Rev. Neurobiol.*, **10**, 119-154.

VASOPRESSIN RECEPTOR ANTAGONISTS block the actions of natural and synthetic agonists at **vasopressin** receptors. Vasopressin receptors are closely related to oxytocin receptors at which the close homologue **oxytocin** acts. See VASOPRESSIN RECEPTOR AGONISTS. Vasopressin receptors are divided into several subtypes: V_{1a}, V_{1b} and V_2, and one form of oxytocin receptor, OT, is recognized. With respect to ligands that distinguish between these receptor subtypes, agonists show less selectivity than antagonists. It should be noted that there are species differences in affinity. The following antagonist ligands show some selectivity: at V_{1a} receptors, the nonpeptide **OPC 21268** (at rat but not human receptors) and **SR 49059** also **[desGly^9-D(CH$_2$)^5]arginine vasopressin**; at V_{1b} receptors, no nonpeptides are known, but the peptide **dP[Tyr(Me)^2]arginine vasopressin**; at V_2, the nonpeptide **OPC 31260** (5-dimethylamino-1-(4-[2-methylbenzoylamino]benzoyl)-2,3,4,5-tetrahydro-1H-benzazepine), also the peptide **D(CH^2)5[D-Ile^2,Ile^4]-arginine vasopressin**. At OT receptors, selective antagonists include the nonpeptide **L 368899** and the peptides cyc(D1-Nal,Ile,DPip,Pip,DHis,Pro) and **desGly(NH$_2$)^9-D(CH$_2$)^5[Tyr(Me)$_2$Thr^4,Orn^8]vasotocin**.

Clinical uses of antagonists will depend on receptor subtype selectivity; including use as antivasospastics for preventing AVP-induced cardiac damage, against hypertension and congestive heart failure, in the treatment of various conditions characterized by water retention, or to delay labour.

Thibonnier, M. (1990) Vasopressin agonists and antagonists. *Horm. Res.*, **34**, 124-128.
Laszlo, F.A. *et al.* (1991) Pharmacology and clinical perspectives of vasopressin antagonists. *Pharmacol. Rev.*, **43**, 73-108.

Vasotec™ ➡ **enalapril**.
Vasotran™ ➡ **isoxsuprine**.
Vasoxine™ ➡ **methoxamine**.
V-Cillin™ ➡ **phenoxymethylpenicillin**.
Vectavir™ ➡ **penciclovir**.
vecuronium bromide [BAN, INN, USAN] (Norcuron™) is a monoquaternary amine analogue of **rocuronium**. It acts as a NICOTINIC CHOLINOCEPTOR ANTAGONIST, a (competitive) NEUROMUSCULAR BLOCKING AGENT, which can be used as a SKELETAL MUSCLE RELAXANT in anaesthesia.
vegetable pepsin ➡ **papain**.
velaresol [BAN, INN] (BW 12C) is a haemoglobin binding agent used in the treatment of sickle-cell anaemia. It has also been used in ANTICANCER therapy (induces tumour hypoxia), and is a radioprotective.
Velban™ ➡ **vinblastine**.
Velbe™ ➡ **vinblastine**.
velnacrine [BAN, INN] (velnacrine maleate [USAN]; HP 029; P83 6029A) is a metabolite of **tacrine**, and is an ANTICHOLINESTERASE being studied as a NOOTROPIC AGENT (cognition enhancer) in the treatment of Alzheimer's disease.
velnacrine maleate ➡ **velnacrine**.
Velosef™ ➡ **cephradine**.
venlafaxine [BAN, INN] (venlafaxine hydrochloride [USAN]; Wy 45030; Effexor™) has a bicyclic phenylethylamine structure unrelated to other classes of selective SSRIs, tricyclics or MAOI agents. It is a novel SSRI, a serotonin (re-) UPTAKE INHIBITOR that also inhibits noradrenaline reuptake (but is weaker against dopamine uptake), and is thought to increase neurotransmitter activity in the CNS. It is used orally as an ANTIDEPRESSANT with minimal sedative actions.
venlafaxine hydrochloride ➡ **venlafaxine**.
Venoglobulin-I™ ➡ **globulin, immune**.
Ventolin™ ➡ **salbutamol**.
Vepesid™ ➡ **etoposide**.
veralipride [INN] (LIR 1660) is one of the substituted benzamides, and is a DOPAMINE RECEPTOR ANTAGONIST which has been used in the treatment of menopausal syndromes.
verapamil [BAN, INN, JAN, USAN] (verapamil hydrochloride [USAN]; Cordilox™; Univer™; Verelan™) is a phenylalkylamine that acts as a CALCIUM-CHANNEL BLOCKER and (class IV) ANTIARRHYTHMIC. It is a SMOOTH MUSCLE RELAXANT and coronary VASODILATOR. It can be used as an ANTIHYPERTENSIVE and ANTIANGINAL, and in ANTIMIGRAINE prophylaxis.
verapamil hydrochloride ➡ **verapamil**.
veratridine is an alkaloid from *Schoenocaulon officinale* (Liliaceae), and is a NEUROTOXIN and SODIUM-CHANNEL ACTIVATOR that binds to Na^+-channels, leading to depolarization. It has similar but weaker actions to **batrachotoxin**.
Vercyte™ ➡ **pipobroman**.
Verelan™ ➡ **verapamil**.
verlukast [INN, USAN] is a prostaglandin-related structure, a selective (D_4) LEUKOTRIENE RECEPTOR ANTAGONIST. It is an orally active ANTIASTHMATIC under evaluation.
Vermox™ ➡ **mebendazole**.
Veronal™ ➡ **barbitone**.
Versed™ ➡ **midazolam**.
verteporfin [USAN] (CL 318952; FF 18) is a complex tetrakis compound, used as a photosensitizer in photodynamic ANTICANCER therapy for solid tumours.
Vesprin™ ➡ **fluopromazine**; **trifluoperazine**.
Vetalar™ ➡ **ketamine**.
Vetibenzamine™ ➡ **tripelennamine**.
Viagra™ ➡ **sildenafil citrate**.
Vibramycin™ ➡ **doxycycline**.
vidarabine [BAN, INN, JAN, USAN] (adenine arabinoside; Ara-A; Vira-A™) is a purine nucleoside ANTIVIRAL isolated from the marine gorgonian *Eunicella cavolini* and *Streptomyces* spp. Clinically, it may be used to treat herpes simplex and vaccinia infections.
Videx™ ➡ **didanosine**.
vigabatrin [BAN, INN, USAN] (γ-vinyl GABA; GVG; MDL 71754; RMI 71754) is an analogue of GABA that irreversibly inhibits the enzyme GABA-transaminase, which degrades endogenous GABA, thereby having an inhibitory and ANTICONVULSANT action within the brain. It may be effective as an ANTIEPILEPTIC in generalized clonic-tonic seizures that are unresponsive to other drugs.
viloxazine [BAN, INN] (viloxazine hydrochloride [USAN]; ICI 58834) is an oxazine chemically distinct from the tricyclics and tetracyclics monoamine UPTAKE INHIBITORS, and has been used as an oral ANTIDEPRESSANT.
viloxazine hydrochloride ➡ **viloxazine**.
viminol [INN] is a pyrrole, and is a NSAID ANALGESIC and ANTIPYRETIC.
vinaxanthone (Ro 09-1450; antibiotic Ro 09-1450; 411F; xanthone 411F) is a polycyclic ANTIBIOTIC produced by *Penicillium vinaceum* and *Penicillium glabrum*. It acts as a PHOSPHOLIPASE INHIBITOR (phospholipase C) and also shows CD4-binding activity. It is used as a pharmacological tool.
vinblastine [BAN, INN] (vinblastine sulfate [JAN, USAN]; vincaleukoblastine; VLB; vincaleucoblastine; LE 29060; NSC 49842; Velban™; Velbe™) is one of the vinca alkaloids from *Vinca rosea* (*Catharanthus roseus*) (Apocynaceae). It is a cytotoxic ANTICANCER AGENT used by injection for acute leukaemias, lymphomas and some solid tumours.
vinblastine sulfate ➡ **vinblastine**.
vincaleucoblastine ➡ **vinblastine**.
vincaleukoblastine ➡ **vinblastine**.
Vincasar™ ➡ **vincristinez**.
vincristine [BAN, INN] (vincristine sulphate; leurocristine;

L 37231; Oncovin™; Vincasar™) is one of the vinca alkaloids from *Vinca rosea* (*Catharanthus roseus*) (Apocynaceae). It is a cytotoxic ANTICANCER AGENT used by injection for acute leukaemias, lymphomas and some solid tumours.

vincristine sulphate ➡ **vincristine**.

vindesine [BAN, INN, USAN] (NSC 24567; Eldisine™) is a derivative of vinblastine, one of the vinca alkaloids from *Vinca rosea* (*Catharanthus roseus*) (Apocynaceae). It is cytotoxic ANTICANCER AGENT used by injection for acute leukaemias, lymphomas and some solid tumours.

vinmegallate [INN] (RGH 4417) is a benzoate which has been tried as a topical DERMATOLOGICAL AGENT in the treatment of psoriasis. It is also a PHOSPHODIESTERASE INHIBITOR.

vinorelbine [BAN, INN] (vinorelbine tartrate [USAN]; NVB; KW 2307; Navelbine™) is a semisynthetic vinca alkaloid related to **vincristine** and **vinblastine**. It is a cytotoxic ANTICANCER AGENT used by injection for the treatment of non-small cell lung cancer and advanced breast cancer.

vinorelbine tartrate ➡ **vinorelbine**.

vinpocetine [INN, JAN, USAN] (AY 27255; RGH 4405; TCV 3B) is an apovincaminoate, a cerebral VASODILATOR which has been used as a NOOTROPIC AGENT (cognition enhancer) and a gastroprotective agent.

vinylbital ➡ **vinylbitone**.

vinylbitone [BAN] (vinylbital [INN]; JD 96) is a barbiturate with general HYPNOTIC/SEDATIVE and CNS DEPRESSANT properties similar to **amylobarbitone**. It has been used to treat insomnia.

vinyl ether [BAN, USAN] (divinyl ether; divinyl oxide; diethenyl ether) is a volatile liquid that has been used as an inhalation GENERAL ANAESTHETIC.

γ-vinyl GABA ➡ **vigabatrin**.

Vioform™ ➡ **clioquinol**.

viomycin [BAN, INN] is a cyclic peptide ANTIBIOTIC and is an ANTIBACTERIAL active against Gram-positive and Gram-negative bacteria; formerly used as an ANTITUBERCULAR AGENT.

viosterol ➡ **ergocalciferol**.

VIP ➡ **vasoactive intestinal polypeptide**.

viprostol [BAN, INN, USAN] (CL 115347) is a synthetic prostaglandin analogue of $PGF_{2\alpha}$, and is a PROSTANOID RECEPTOR AGONIST, VASODILATOR and transient HYPOTENSIVE AGENT. It has been used transdermally in the treatment of Raynaud's phenomenon.

viprynium embonate [BAN] (pyrvinium pamoate [USAN]) is an ANTHELMINTIC used against intestinal threadworms.

Vira-A™ ➡ **vidarabine**.

Viraferon™ ➡ **interferon α**.

Viramune™ ➡ **nevirapine**.

Virazid™ ➡ **tribavirin**.

Virazole™ ➡ **tribavirin**.

Viridium™ ➡ **phenazopyridine**.

Viroptic™ ➡ **trifluridine**.

Virormone™ ➡ **testosterone**.

viroxime [INN, USAN] is an ANTIVIRAL, active against a range of rhinoviruses.

Visclair™ ➡ **methyl cysteine**.

Viscotears™ ➡ **carbomer**.

Viskaldix™ ➡ **clopamide**.

Visken™ ➡ **pindolol**.

Vistaril™ ➡ **hydroxyzine**.

vitamin A ➡ **retinol**.

vitamin A_1 ➡ **retinol**.

vitamin A acid ➡ **tretinoin**.

vitamin B_1 ➡ **thiamine**.

vitamin B_2 ➡ **riboflavine**.

vitamin B_3 ➡ **nicotinamide**.

vitamin B_4 ➡ **adenine**.

vitamin B_5 ➡ **pantothenic acid**.

vitamin B_6 ➡ **pyridoxine**.

vitamin B_7 ➡ **biotin**.

vitamin B_{12} ➡ **cyanocobalamin**.

vitamin B_{12a} ➡ **hydroxycobalamin**.

vitamin B_{13} ➡ **orotic acid**.

vitamin Bc ➡ **folic acid**.

vitamin B_T ➡ **carnitine**.

vitamin D_2 ➡ **ergocalciferol**.

vitamin D_3 ➡ **cholecalciferol**.

vitamin C ➡ **ascorbic acid**.

vitamin E ➡ **α-tocopherol**.

vitamin E nicotinate ➡ **α-tocopherol**.

vitamin G ➡ **riboflavine**.

vitamin H ➡ **biotin**.

vitamin H′ ➡ **aminobenzoic acid**.

vitamin K_1 ➡ **phytomenadione**.

vitamin K_4 ➡ **menadiol**; **acetomenaphthone**.

vitamin K_4 diacetate ➡ **acetomenaphthone**.

vitamin K_4 potassium ➡ **potassium menaphthosulfate**.

vitamin K_4 sodium ➡ **menadiol sodium phosphate**.

vitamin M ➡ **folic acid**.

vitamin P_4 ➡ **troxerutin**.

VITAMINS are substances required, normally in small quantities, for numerous aspects of healthy growth, development and metabolism. Lack of any given vitamin causes a specific deficiency disorder. Because they cannot usually be synthesized by the body, most vitamins are absorbed or ingested from external sources, such as food.

Vitamin A is now normally referred to as **retinol**. It is a fat-soluble vitamin found in meats, milk products and halibut-liver oil, and is also synthesized in the body from constituents in green vegetables and carrots. It is essential for growth and the maintenance of mucous surfaces and skin, and is particularly necessary in conferring photosensitivity to the retina of the eye. Conversely, an excess may cause hair loss, peeling of the skin, joint pain and liver damage. It can be administered therapeutically to make up for vitamin deficiency – now rare in Western countries – mostly orally but also by injection. Derivatives of retinol (retinoids, e.g. **etretinate** and **acitretin**) are used topically to treat severe skin disorders, such a psoriasis, through their action in preventing dermal differentiation.

Vitamin B complex is the collective term for a number of water-soluble vitamins found particularly in dairy products, cereals and liver. Vitamin B_1 (**thiamine**) is used by mouth for dietary supplement purposes and by injection in emergency treatment of Wernicke-Korsakoff syndrome. Vitamin B_2 (**riboflavin**) is a constituent of the coenzyme FAD (flavine adenine dinucleotide) and FMN (flavine mononucleotide) and is therefore important in cellular respiration. Vitamin B_6 (**pyridoxine**) is a coenzyme for decarboxylases and transamination, and is concerned with many metabolic processes. Overdose causes peripheral neuropathy. It may be used medically for vomiting and radiation sickness and for premenstrual tension. Pyridoxine has a negative interaction with the therapeutic use of **levodopa** in parkinsonism by enhancing levodopa decarboxylation to dopamine in the periphery, which does not then reach the brain. The antitubercular drug **isoniazid** interferes with pyridoxine, and causes a deficiency leading to peripheral neuritis that may need to be corrected with dietary supplements. Vitamin B_7

(**niacin, nicotinic acid**) and its amide, **nicotinamide**, are pyridine derivatives and have nutritional uses (deficiency causes pellagra, though this is rare) and are constituents of multivitamin preparations. However, large doses cause vasodilation, and so **nicotinic acid** (and derivatives, e.g. **inositol nicotinate** and **nicotinyl alcohol**), which are used for VASODILATOR actions, can be used especially to give symptomatic relief in peripheral vascular disease (Raynaud's phenomenon). Also, nicotinic acid can be used as a lipid-lowering drug to reduce blood levels of lipids by inhibiting their synthesis in the liver. **Folic acid** (pteroylglutamic acid) is important in the synthesis of nucleic acids (DNA and RNA) and with a role closely interrelating to that of vitamin B_{12}. Food sources of folic acid include liver and vegetables. Consumption is particularly necessary during pregnancy, and health agencies now agree that folic acid supplements help prevent neural tube defects when taken before, and during, pregnancy. Also, there are certain forms of anaemia (megaloblastic anaemia) that are treated with folic acid (and also supplements of cyanocobalamin). It is also used in the form of folinic acid (usually as calcium folinate) as a supplement to patients who are suffering from toxic effects due to folic acid depletion on treatment with 'antimetabolite' anticancer drugs (e.g. **methotrexate**). Vitamin B_{12} (**cyanocobalamin**) is found in fish, eggs, liver and meat. Deficiency leads to a megaloblastic anaemia – degeneration of nerves in the central and peripheral nervous systems, and abnormalities of epithelia (particularly of the mouth and gut). Apart from a poor diet, deficiency of vitamin B_{12} can be caused by lack of an 'intrinsic factor' necessary for absorption in the stomach (pernicious anaemia), and various malabsorption syndromes in the gut (some due to drugs). Deficiency may be rectified by giving the derivative **hydroxocobalamin**, normally by injection. Pantothenic acid is a constituent of coenzyme A, and is regarded as being one of the B vitamin complex. **Aminobenzoic acid** (*p*-aminobenzoic acid; PABA) is sometimes regarded as being a member of the B vitamin complex, though its role here is not clear. In a quite separate role it is used as a SUNSCREEN AGENT as it helps to protect the skin from ultraviolet radiation and is present in many suntan lotions and some barrier preparations used during repeated radiotherapy.

Vitamin C (**ascorbic acid**) is essential in the development and maintenance of cells and tissues. It cannot be synthesized in the body and so is an essential requirement in the diet. Good food sources are vegetables and citrus fruits. Deficiency eventually leads to scurvy; but before that, there is a decreased resistance to infection, and other disorders are seen particularly with the elderly. Vitamin C supplements are rarely necessary with a normal diet. There have been claims that pharmacological doses help prevent colds, and it is incorporated into a number of cold remedies.

Vitamin D occurs in a number of sterol forms, such as vitamin D_3 – **cholecalciferol** – a natural form in foods and made in the skin by the action of UV, and vitamin D_2 – **ergocalciferol** – which is formed in plants by the action of sunlight. These forms are 25-hydroxylated in the kidney, and then 1α-hydroxylated in the kidney (under the control of **parathormone**), to make the most active form. This is available as **calcitriol** (1α,25-dihydroxycholecalciferol). Vitamin D facilitates the absorption of calcium and, to a lesser extent, phosphorus from the intestine and promotes deposition into the bones. A deficiency of vitamin D, therefore, results in bone deficiency disorders, e.g. rickets in children. Good food sources include eggs, milk and cheese, and fish liver. Vitamin D deficiency is commonly found in communities eating unleavened bread, in the elderly and where disease prevents good absorption of the vitamin from foodstuffs. Therapeutic replacement of vitamin D in cases of severe deficiency requires quantities of the vitamin best provided by one of the synthetic vitamin D analogues, but too large doses can produce a hypervitaminosis syndrome. Synthesized replacement forms include **alfacalcidol** (1α-hydroxycholecalciferol) and dihydrotachysterol.

Vitamin E (**tocopherol**) is found in a variety of foods, including eggs, vegetable oils, wheat germ and green vegetables, and deficiency diseases are rare with a normal diet. The form of tocopherol most used in therapy to make up vitamin deficiency is **α-tocopheryl acetate**, which is used, by oral administration, to treat deficiency due to malabsorption, such as in abetalipoproteinaemia in young children with congenital cholestasis or cystic fibrosis.

Vitamin K is a fat-soluble vitamin that occurs naturally in two forms. Vitamin K_1 is called **phytomenadione** and is found in plant foodstuffs. Vitamin K_2 is, in fact, a series of menaquinones of various chain lengths which are normally synthesized in the intestine by bacteria. Vitamin K is essential to the process of blood clotting. Since it is fat-soluble, there may be a deficiency in fat malabsorption diseases. Normally, deficiency of the vitamin in adults is rare and overdosage in the form of vitamin supplements (hypervitaminosis) can be dangerous. However, it is given routinely to newborn babies. Phytomenadione is normally obtained in the diet from vegetable oils, seeds, milk, yoghurt and green vegetables. In deficiency, it may be administered orally or by intravenous injection. **Menadiol sodium phosphate** (vitamin K_3) is a synthetic form sometimes used in medicine in preference to vitamin K_1 or K_2, because the latter natural forms are only fat-soluble, whereas vitamin K_3 is water-soluble and is therefore effective when taken by mouth to treat vitamin deficiency that is caused by fat malabsorption syndromes (e.g. through obstruction of the bile ducts or in liver disease). In malabsorption syndromes it is important to make up vitamin K deficiency on a regular basis, as this vitamin is an absolute necessity in the body to maintain clotting factors of the blood.

A number of other dietary agents are classified as vitamins.

Council on Scientific Affairs (1987) Vitamin preparations as dietary supplements and as therapeutic agents. *J. Am. Med. Assoc.*, **257**, 1929-1936.

Subar, A.F. *et al.* (1990) Use of vitamin and mineral supplements: demographics and amounts of nutrients consumed. The 1987 Health Interview Survey. *Am. J. Epidemiol.*, **132**, 1091-1101.

Shils, M.E. *et al.* (eds) (1994) *Modern Nutrition in Health and Disease*, 8th edn, Lea & Febiger, Philadelphia.

Vivactil™ ➡ protriptyline.

VLB ➡ vinblastine.

VM 26 ➡ teniposide.

VNP ➡ vasonatrin.

volazocine [INN, USAN] (Win 23200) is a benzazocine derivative, and is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

Volital™ ➡ pemoline.

Voltaren™ ➡ diclofenac.

Voltarol™ ➡ diclofenac.

Voltarol Optha™ ➡ diclofenac.

vorozole [BAN, INN, USAN] (R 76713) is a non-steroid, with aromatase inhibitor (oestrogen synthetase inhibitor) activity. It is under investigation for some ANTICANCER applications.

VP 16 ➡ etoposide.

VP 16213 ➡ etoposide.

VUF 8325 ➡ imetit.

Vumon™ ➡ teniposide.

W, X, Y, Z

W 108 ➡ **clozapine**.
W 554 ➡ **felbamate**.
W 2354 ➡ **seclazone**.
W 2964M ➡ **flupirtine**.
W 3395 ➡ **algestone acetonide**.
W 3566 ➡ **quinestrol**.
W 3699 ➡ **piprozolin**.
W 4540 ➡ **quingestanol**.
W 5219 ➡ **proglumide**.
W 6309 ➡ **difluprednate**.
W 7320 ➡ **alclofenac**.
W 8495 ➡ **isoxicam**.
WI 287 ➡ **euprocin**.
WAC 104 ➡ **binifibrate**.
WAL 2014 ➡ **talsaclidine**.
warfarin [BAN, BSI, INN, ISO] (warfarin sodium [BAN, USAN]; warfarin potassium [USAN]) is one of the coumarin group, which are synthetic derivatives of bishydroxycoumarin found in bruised sweet clover. It is an (oral) ANTICOAGULANT, acting through vitamin K antagonism to depress synthesis of coagulation factors. It can be used therapeutically to prevent the formation of clots in heart disease, in venous thrombosis and pulmonary embolism, and after heart surgery (especially after heart valve surgery). The onset of effect is delayed by several days. It is also used as a rodenticide.
warfarin potassium [USAN] is a coumarin group (oral) ANTICOAGULANT: see **warfarin**.
warfarin sodium [BAN, USAN] (Marevan™) is a coumarin group (oral) ANTICOAGULANT: see **warfarin**.
Warticon™ ➡ **podophyllotoxin**.
Wasp-Eze™ ➡ **benzocaine**; **mepyramine**.
WAY-ANA-756 ➡ **tasosartan**.
WEB 2086 ➡ **apafant**.
WEB 2170 ➡ **bepafant**.
Wellbutrin™ ➡ **bupropion**.
Wellcome U3B ➡ **thioguanine**.
Welldorm™ ➡ **chloral hydrate**.
Wellferon™ ➡ **interferon α**.
Wellvone™ ➡ **atovaquone**.
whey factor ➡ **orotic acid**.
WHR 1142A ➡ **lidamidine**.
Win 771 ➡ **hydroxypethidine**.
Win 1258-2 ➡ **hydroxychloroquine**.
Win 1539 ➡ **ketobemidone**.
Win 1783 ➡ **isomethadone**.
Win 2848 ➡ **thenyldiamine**.
Win 8077 ➡ **ambenonium chloride**.
Win 11318 ➡ **bupivacaine**.
Win 14098 ➡ **piminodine**.
Win 14833 ➡ **stanozolol**.
Win 18501 ➡ **oxypertine**.
Win 20740 ➡ **cyclazocine**.
Win 23200 ➡ **volazocine**.
Win 24540 ➡ **trilostane**.
Win 25978 ➡ **amfonelic acid**.
Win 32729 ➡ **epostane**.
Win 34276 ➡ **ketazocine**.
Win 35833 ➡ **ciprofibrate**.
Win 38020 ➡ **arildone**.
Win 42156-2 ➡ **tonazocine**.
Win 44441 ➡ **quadazocine**.
Win 49596 ➡ **zanoterone**.
WIN 64338 is the first non-peptide (B_2-subtype) BRADYKININ RECEPTOR ANTAGONIST disclosed. It did not advance to clinical development, but has been used as a pharmacological tool.
Winstrol™ ➡ **stanozolol**.
Wintersteiner's compound F ➡ **cortisone**.
WK 142 ➡ **pepstatin**.
WL13 ➡ **PD 123177**.
WM 1127 ➡ **chlorhexadol**.
wofaverdin ➡ **indocyanine green**.
WR 2785 ➡ **mercaptopurine**.
WR 14997 ➡ **cycloleucine**.
WR 95704 ➡ **altretamine**.
WR 220057 ➡ **mitobronitol**.
wuweizi alcohol A ➡ **schizandrin**.
wuweizichun A ➡ **schizandrin**.
Wy 401 ➡ **ethoheptazine**.
Wy 757 ➡ **proheptazine**.
Wy 806 ➡ **oxethazaine**.
Wy 1359 ➡ **propiomazine**.
Wy 2039 ➡ **etoxeridine**.
Wy 2445 ➡ **carphenazine**.
WY 3478 ➡ **4-hydroxybutanoic acid**.
Wy 3707 ➡ **norgestrel**.
Wy 4082 ➡ **lormetazepam**.
Wy 15705 ➡ **ciramadol**.
Wy 16225 ➡ **dezocine**.
Wy 18251 ➡ **tilomisole**.
Wy 21743 ➡ **oxaprozin**.
Wy 21894 ➡ **fentiazac**.
Wy 22811 ➡ **meptazinol**.
WY-40972 ➡ **lutrelin**.
Wy 45030 ➡ **venlafaxine**.
Wy 47846 ➡ **zalospirone**.
WY 48624 ➡ **enciprazine**.
Wyamine™ ➡ **mephentermine**.
Wycillin™ ➡ **procaine penicillin**.
Wydase™ ➡ **hyaluronidase**.
Wytensin™ ➡ **guanabenz**.
Xalatan™ ➡ **latanoprost**.
xamoterol [BAN, INN, USAN] (xamoterol fumarate [USAN]; Corwin™) is a β-ADRENOCEPTOR AGONIST selective for the β_1-subtype. It can be used as a CARDIAC STIMULANT.
xamoterol fumarate ➡ **xamoterol**.
Xanax™ ➡ **alprazolam**.
xanomeline [INN, USAN] is a thiadiazolmethylpyridine derivative, a (M_1) MUSCARINIC CHOLINOCEPTOR AGONIST. It has been investigated for possible use in cholinergic replacement therapy for Alzheimer's disease.
xanthine (2,6-dihydroxypurine) is found naturally in potatoes, coffee beans etc. It is used clinically in the form of compounds, e.g. **enprofylline**.
XANTHINE-OXIDASE INHIBITORS act by inhibiting the enzyme in the body that synthesizes uric acid and so can be used in the treatment of gout, because gout is caused by the deposition of uric acid crystal in the tissues. The result of this action is a decrease in blood and tissues of the relatively

insoluble xanthates and of xanthic acid, so there is less formation of renal stones, and some reversal of existing crystals in tissues. The most widely used xanthine-oxidase inhibitor, acting as a competitive substrate, is **allopurinol**, which is administered for the long-term treatment of gout. Other agents with this activity are ciapilome, oxypurinol and tisopurine. See URICOSURIC AGENTS.

xanthinol niacinate ➡ **xanthinol nicotinate**.

xanthinol nicotinate [BAN] (xanthinol niacinate [USAN]; xantinol nicotinate [INN]) is the nicotinate salt of the theophylline derivative xanthinol, and is a peripheral VASODILATOR. It has been used in the managment of peripheral and cerebral vascular disorders.

Xanthomax™ ➡ **allopurinol**.

xanthone 411F ➡ **vinaxanthone**.

xantifibrate ➡ **clofibrate**.

xantinol nicotinate ➡ **xanthinol nicotinate**.

Xatral™ ➡ **alfuzosin**.

XE 14-543 ➡ **etofibrate**.

xenysalate [BAN, INN] is a topical LOCAL ANAESTHETIC, ANTIBACTERIAL and ANTIFUNGAL, and is widely used in medicated shampoos.

xenytropium bromide [INN] is a quaternary ammonium compound with MUSCARINIC CHOLINOCEPTOR ANTAGONIST activity. It has ANTISPASMODIC activity.

xibenolol [INN] is a β-ADRENOCEPTOR ANTAGONIST. It can be used therapeutically in ANTIHYPERTENSIVE treatment.

xipamide [BAN, INN, USAN] (Diurexan™) is related chemically to **chlorthalidone**, and is a (thiazide-related) DIURETIC which can be used in ANTIHYPERTENSIVE therapy.

xipranolol [INN] is a β-ADRENOCEPTOR ANTAGONIST with ANTIARRHYTHMIC properties.

xorphanol [INN] (xorphanol mesylate [USAN]) is a morphinan derivative, and is an OPIOID RECEPTOR AGONIST with OPIOID ANALGESIC activity.

xorphanol mesylate ➡ **xorphanol**.

'XTC' ➡ MDMA.

XU 62-320 ➡ **fluvastatin**.

Xylocaine™ ➡ **lignocaine**.

Xylocard™ ➡ **lignocaine**.

xylocoumarol [INN] is a synthetic agent chemically of the coumarin group, and is an (oral) ANTICOAGULANT. It can be used therapeutically to prevent the formation of clots in thromboembolytic disease.

xylometazoline [BAN, INN] (xylometazoline hydrochloride [USAN]; Otrivine™; Sudafed™) is an imidazole SYMPATHOMIMETIC, an α-ADRENOCEPTOR AGONIST which can be used as a VASOCONSTRICTOR and nasal DECONGESTANT.

xylometazoline hydrochloride ➡ **xylometazoline**.

Y 3642 ➡ **tinoridine**.

Y 9179 ➡ **nizofenone**.

Y 25130 ➡ **azasetron**.

yageine ➡ **harmine**.

YM 022 is a benzodiazepine, a selective (CCK_B/gastrin subtype) CHOLECYSTOKININ RECEPTOR ANTAGONIST. It is used as a pharmacological tool.

YM 060 ➡ **ramosetron**.

YM 09151-2 ➡ **nemonapride**.

YM 11170 ➡ **famotidine**.

YM 11256 ➡ **lidamidine**.

YM 12617 ➡ **tamsulosin**.

Yodoquinol™ ➡ **diiodohydroxyquinoline**.

yohimbine hydrochloride (Yohimex™) is a complex alkaloid isolated from many plant species. It is a selective (α_2) α-ADRENOCEPTOR ANTAGONIST with ANTISYMPATHETIC activity, and has been used as an ANTIDEPRESSANT. It also shows local anaesthetic activity, and is an alleged aphrodisiac. Yohimbine and its stereoisomers are used as tools for study of different adrenoceptor sites.

Yohimex™ ➡ **yohimbine hydrochloride**.

Yomesan™ ➡ **niclosamide**.

Yutopar™ ➡ **ritodrine**.

Z 905 ➡ **pinazepam**.

zabicipril [INN] is an ethyl ester prodrug that is converted *in vivo* to zabiciprilat [INN], and is an ACE INHIBITOR and antihypertensive and peripheral VASODILATOR.

zabiciprilat ➡ **zabicipril**.

zacopride [INN] (zacopride hydrochloride [USAN]; zacopride fumarate; ARH 11190) is a benzamide, a ($5\text{-}HT_4$) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST and ($5\text{-}HT_3$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It has ANTIEMETIC, ANXIOLYTIC and ANTIPSYCHOTIC (antischizophrenic) properties. The N^4-Me derivative = mezacopride [INN], which has antiemetic properties.

zacopride fumarate ➡ **zacopride**.

zacopride hydrochloride ➡ **zacopride**.

Zaditen™ ➡ **ketotifen**.

Zadstat™ ➡ **metronidazole**.

zafirlukast [BAN, USAN] (Accolate™) is a complex five-ring structure, and is a potent LEUKOTRIENE RECEPTOR ANTAGONIST. It is an orally active ANTIASTHMATIC which can be used for prophylaxis.

Zagreb antivenom is a non-proprietary antivenom preparation that can be used as an injected ANTIDOTE to the poison from an adder's bite. However, the systemic allergic and other effects of the venom are rarely serious enough to warrant the use of the antivenom.

zalcitabine [BAN, INN, USAN] (ddC; DDC; Hivid™) is a synthetic nucleoside analogue, a REVERSE TRANSCRIPTASE INHIBITOR which acts as an ANTIVIRAL AGENT. It is active orally as an ANTI-HIV AGENT.

zalospirone [INN] (zalospirone hydrochloride [USAN]; Wy 47846) is a tetracyclic structure, a ($5HT_{1A}$) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST with ANXIOLYTIC activity.

zalospirone hydrochloride ➡ **zalospirone**.

zankiren [INN] (zankiren hydrochloride [USAN]) is a pseudopeptide, a RENIN INHIBITOR and an (aspartyl) PROTEASE INHIBITOR, which is ANTIHYPERTENSIVE.

Zami 420 ➡ **triletide**.

zanamivir [BAN] (GR 121167X; GG 167) is an *N*-acetylneuraminic acid derivative which acts as a neuraminidase (sialidase) inhibitor. It is an ANTIVIRAL that inhibits influenza virus replication, and has shown promise in phase III trials given by direct inhalation for limitation of the duration and severity of flu symptoms.

zankiren hydrochloride ➡ **zankiren**.

Zanosar™ ➡ **streptozocin**.

zanoterone [INN, USAN] (Win 49596) is a steroid, an ANTIANDROGEN, potentially of use in the treatment of benign prostatic hyperplasia and as an ANTICANCER AGENT for prostate cancer.

Zantac™ ➡ **ranitidine**.

zanthotoxin ➡ **methoxsalen**.

zaprinast [BAN, INN] is a propoxyphenylazahypoxanthine derivative, a (type V) PHOSPHODIESTERASE INHIBITOR. It has ANTIALLERGIC and ANTIASTHMATIC actions.

Zarontin™ ➡ **ethosuximide**.

Zaroxolyn™ ➡ **metolazone**.

zatosetron [BAN, INN] (zatosetron maleate [USAN]; LY 277359) is an azabicyclooctylbenzofuran, a ($5\text{-}HT_3$)

5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST. It has ANTIEMETIC and ANTINAUSEANT activity against chemotherapy-induced emesis. It is a potential ANTIMIGRAINE AGENT.

zatosetron maleate ➡ **zatosetron**.

Zavedos™ ➡ **idarubicin**.

Z-clopenthixol ➡ **zuclopenthixol**.

ZD 1694 ➡ **raltitrexed**.

ZD 8731 ➡ **ICI 8731**.

Zebeta™ ➡ **bisoprolol**.

Zefazone™ ➡ **cefmetazole**.

Zemuron™ ➡ **rocuronium bromide**.

zenarestat [INN] (FR 74366; FK 366) is similar to **tolrestat**, and is an ALDOSE REDUCTASE INHIBITOR (ARI). These agents have potential for the treatment of peripheral diabetic neuropathies.

zeniplatin [INN, USAN] (CL 286558) is a platinum-containing organic complex, similar to **cisplatin**. It is an alkylating ANTICANCER AGENT that has been used against a variety of malignant neoplasms.

zeranol [BAN, INN, USAN] (MK 188; P 1496) is a non-steroidal agent isolated from *Fusarium* spp. and has OESTROGEN activity. It has been used for the management of menstrual disorders as an ANABOLIC AGENT, and also as an oestrogen agent but mainly in veterinary practice.

Zerit™ ➡ **stavudine**.

Zestril™ ➡ **lisinopril**.

zidometacin [INN, USAN] is an analogue of **indomethacin** and a member of the indole acetic acid series. It is a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.

zidovudine [BAN, INN, USAN] (azidothymidine; AZT; Retrovir™ etc.) is a REVERSE TRANSCRIPTASE INHIBITOR of the nucleoside analogue group. It has ANTIVIRAL properties and is widely used as an ANTI-HIV AGENT in AIDS management.

zileuton [BAN, INN, USAN] (ABT 077) is a benzothienylethylhydroxyurea, a (5) LIPOXYGENASE INHIBITOR. It has ANTIALLERGIC and ANTIINFLAMMATORY properties, and is a potential ANTIASTHMATIC. It is also being investigated for treatment of irritable bowel disease.

zilpaterol [INN] is a β-ADRENOCEPTOR AGONIST selective for the β_2-subtype. It can be used as a growth promoter.

zimeldine [BAN, INN] (zimeldine hydrochloride [USAN]; H 102/09; FR 30385; HR 102/09) is a pyridinylpropenamine, a SSRI, a selective serotonin (re-) UPTAKE INHIBITOR. It moderates ethanol consumption in alcohol-dependent patients and was used as an ANTIDEPRESSANT. It is no longer marketed due to adverse effects reported (associated with Guillain-Barré syndrome).

zimeldine hydrochloride ➡ **zimeldine**.

Zimovane™ ➡ **zopiclone**.

Zinacef™ ➡ **cefuroxime**.

Zinamide™ ➡ **pyrazinamide**.

zinc chloride [JAN USAN] is an ASTRINGENT. The ^{65}Zn labelled compound is used as a radioactive agent (zinc chloride Zn 65 [USAN]).

zinc chloride Zn 65 ➡ **zinc chloride**.

zinc insulin ➡ **insulin**.

zinc omadine ➡ **pyrithione zinc**.

zinc oxide [JAN, USAN] (zinc white) is a mild ASTRINGENT, which is used primarily as a topical DERMATOLOGICAL AGENT to treat skin disorders, rashes and eczema. It is available in a range of compound forms: as a cream with arachis oil, oleic acid and wool fat, or with ichthammol and wool fat; as an ointment and as an ointment with castor oil; as a dusting powder with starch and talc; as a paste with starch and white soft paraffin, or with starch and zinc and salicylic acid paste.

zinc polyanemine ➡ **pyrithione zinc**.

zinc pyridinethione ➡ **pyrithione zinc**.

zinc pyrithione ➡ **pyrithione zinc**.

zinc sulfate [JAN, USAN] (zinc sulphate) is used as a biocide, ANTIFUNGAL and ANTIMICROBIAL AGENT in deodorants, toothpastes and as an ophthalmic astringent (used to reduce corneal inflammation in conjunctivitis). Also, it can be used as an anticopper agent for the treatment of Wilson's disease.

zinc sulphate ➡ **zinc sulfate**.

zinc white ➡ **zinc oxide**.

Zinecard™ ➡ **razoxane**.

Zineryt™ ➡ **erythromycin**.

Zinnat™ ➡ **cefuroxime**.

zinostatin [INN, USAN] (neocarzinostatin [JAN]; NSC 69856) is an (enediyne) peptide ANTIBIOTIC, containing 113 amino acid residues and a non-protein chromophore, isolated from *Streptomyces carzinostaticus*. It shows ANTICANCER activity, mainly due to the chromophore (which is stabilized by the polypeptide). It has been used to treat leukaemias and neoplasms of the stomach and pancreas.

Zirtec™ ➡ **cetirizine**.

Zithromax™ ➡ **azithromycin**.

ZK 30595 ➡ **drospirenone**.

ZK 34798 ➡ **nileprost**.

ZK 35973 ➡ **spirorenone**.

ZK 57671 ➡ **sulprostone**.

ZK 62498 ➡ **azelaic acid**.

ZK 62711 ➡ **rolipram**.

ZK 65997 ➡ **lormetazepam**.

ZK 76604 ➡ **pirazolac**.

ZK 93426 is a pyridoindole-carboxylic acid, a BENZODIAZEPINE BINDING-SITE ANTAGONIST which acts at the $GABA_A$ receptor modulatory site (at which benzodiazepine and alcohol act). It is reported to be a NOOTROPIC AGENT.

ZK 94726 ➡ **nocloprost**.

ZK 95639 ➡ **atamestane**.

ZM 241385 has a loose structural similarity to the xanthines, and is a (P1 purinoceptor) ADENOSINE RECEPTOR ANTAGONIST selective for the A_{2A}-subtype. It is used as a tool in adenosine receptor studies.

Zocor™ ➡ **simvastatin**.

zofenoprilat arginine ➡ **zofenopril**.

zofenopril [BAN, INN] (zofenopril calcium [USAN]; zofenoprilat arginine [USAN]) is a mercapto captopril-like ACE INHIBITOR which can be used as an ANTIHYPERTENSIVE. It is a prodrug of zofenoprilat [INN].

zofenopril calcium ➡ **zofenopril**.

Zofran™ ➡ **ondansetron**.

Zoladex™ ➡ **goserelin**.

zolantidine (SKF 96282) is a benzothiazolamine, a HISTAMINE H_2-RECEPTOR ANTAGONIST which penetrates the brain, and so is a valuable pharmacological tool for investigating possible physiological and pathological roles for histamine in the CNS. It is a reported ANTICONVULSANT.

zolasartan [INN] (GR 117289) is an analogue of **saprisartan**, and is an (AT_1) ANGIOTENSIN RECEPTOR ANTAGONIST with ANTIHYPERTENSIVE activity.

zolimidine [INN] (UGD; S40015 and many other names) is an imidazopyridine with ANTIULCEROGENIC activity. It is given with NSAID ANALGESICS to decrease the risk of peptic ulcer.

zolmitriptan [BAN, INN] (Zomig™) is a tetracyclic structure, a ($5HT_{1D}$) 5-HYDROXYTRYPTAMINE RECEPTOR AGONIST with ANXIOLYTIC activity. It is a potential ANTIMIGRAINE AGENT.

Zoloft™ ➡ **sertraline**.
zolpidem [BAN, INN] (zolpidem tartrate [USAN]; Ambien™; Stilnoct™ and many other names) is one of the imidazopyridines, and a non-benzodiazepine BENZODIAZEPINE BINDING-SITE AGONIST. Most of its properties are similar to **diazepam**, but with less ANTICONVULSANT, SEDATIVE and SKELETAL MUSCLE RELAXANT properties. It has HYPNOTIC activity and has been used to treat insomnia.
zolpidem tartrate ➡ **zolpidem**.
Zomacton™ ➡ **human pituitary growth hormone**.
zomepirac [BAN, INN] (zomepirac sodium [USAN]; McN 2783-21-98) is a pyrroleacetic acid derivative, a CYCLOOXYGENASE INHIBITOR with NSAID ANALGESIC, ANTIINFLAMMATORY and ANTIPYRETIC activity.
zomepirac sodium ➡ **zomepirac**.
Zomig™ ➡ **zolmitriptan**.
zonisamide [BAN, INN, USAN] (AD 810; CI 912; PD 110843) is a sulphonamide derivative, with ANTICONVULSANT properties. It has been used as an ANTIEPILEPTIC.
Zonulysin™ ➡ **chymotrypsin**.
zopiclone [BAN, INN, JAN] (RP 27267; Zimovane™ and many other names) is one of the cyclopyrrolones, and is a non-benzodiazepine BENZODIAZEPINE BINDING-SITE AGONIST. Most of its properties are similar to **diazepam**, including SEDATIVE, ANTICONVULSANT and SKELETAL MUSCLE RELAXANT activity. It has HYPNOTIC activity and has been used to treat insomnia.
zopolrestat [BAN, INN, USAN] is similar to **tolrestat**, and is an ALDOSE REDUCTASE INHIBITOR (ARI). These agents have potential for the treatment of peripheral diabetic neuropathies.
zorubicin hydrochloride [USAN] is a derivative of **daunorubicin**, and is an (anthracycline group) ANTIBIOTIC, clinically used as a cytotoxic ANTICANCER AGENT, particularly in the treatment of leukaemia.
zotepine [INN, JAN] (FR 1314) is a dibenzothiepine, a ($5\text{-}HT_2$) 5-HYDROXYTRYPTAMINE RECEPTOR ANTAGONIST, with dopaminergic activity. It has been used as an ANTIPSYCHOTIC in the treatment of schizophrenia.
Zoton™ ➡ **lansoprazole**.
Zovirax™ ➡ **aciclovir**.
zucapsaicin ➡ **capsaicin**.
zuclomifene ➡ **clomiphene**.
zuclomiphene ➡ **clomiphene**.
zuclopenthixol [BAN, INN] (clopenthixol [BAN, INN, USAN]; zuclopenthixol decanoate; zuclopenthixol dihydrochloride; Z-clopenthixol; Clopixol™) is a thioxanthene with a piperizine side-chain, and has general properties similar to the phenothiazines, such as **chlorpromazine**. It is used as an oral ANTIPSYCHOTIC for the short-term management of acute psychotic and mania disorders, or the exacerbation of chronic psychotic disorders. The decanoate and hydrochloride forms can be given by deep intramuscular injection particularly for maintainance of patients with agitated and aggressive behaviour.
zuclopenthixol decanoate ➡ **zuclopenthixol**.
zuclopenthixol dihydrochloride ➡ **zuclopenthixol**.
Zumenon™ ➡ **oestradiol**.
Zydol™ ➡ **tramadol**.
Zyloprim™ ➡ **allopurinol**.
Zyloric™ ➡ **allopurinol**.
Zyprexa™ ➡ **olanzapine**.

Appendix A

Glossary

Å Ångström units (10^{-10}m).
aa amino acid.
Ab antibody.
ABC antigen binding protein.
ABO A system of human blood groups.
ABPI Association of the British Pharmaceutical Industry.
absorption In pharmacology, the uptake of a drug from its site of administration.
abundance The term used to describe the average number of molecules of a particular **mRNA** per cell.
abuse liability of drugs The propensity of a drug to lead to drug-seeking behaviour. Certain drugs, especially OPIOID ANALGESICS, such as heroin, have a strong progression into drug **dependence**.
abuse of drugs The nonmedical use of drugs, i.e. 'recreational use' without the intention to treat a disease. It is usually a pejorative term, reflecting how drugs can seriously interfere with health. See also **misuse of drugs**.
accessory cells Cells that, along with **B-** and/or **T-lymphocytes**, are involved in the expression of the **immune response**.
ACE angiotensin-converting enzyme.
acetylation The addition of an acetyl group to a molecule.
acetylcholinesterase See **cholinesterases**.
ACh ACETYLCHOLINE (unofficial).
AChE acetylcholinesterase.
AChR acetylcholine receptor.
acquired immune deficiency syndrome (AIDS) Caused by the human immunodeficiency virus (HIV). The virus destroys a subgroup of lymphocytes resulting in suppression of the body's immune response.
acridine orange (basic orange) A chemical used in experimental biology as a **fluorochrome** to distinguish between double-stranded DNA (fluoresces green) and single-stranded nucleic acids (fluoresces orange-red).
acromegaly A disease caused by excessive secretion of growth hormone from the anterior pituitary gland as a result of a benign pituitary tumour.
actin A protein found in most cells, which can polymerize to form noncontractile filaments.
action potential The transient localized reversal of the electrical potential across a nerve or muscle cell membrane, and its restoration. In nerves it can be blocked with TETRODOTOXIN.
active immunity **Immunity** that results from stimulation of the host's tissues by **antigen** leading to the formation of specific **antibodies**.
active transport The mechanism by which substances are moved across membranes which involves energy and **carrier proteins**. Often against a concentration gradient.
activity In pharmacology is a general term used to denote the **potency** of a drug.
activity-ratio For series of drugs, is the inverse ratio of the concentrations required to give a quantitatively equivalent biological response. If the EC_{50} values for three agonists A, B and C are 1, 10 and 100 nM, respectively, then the activity ratios for B and C, relative to A = 1.00, are 0.10 and 0.01, respectively. Thus, the higher the index, the higher the potency of that drug; which is the reciprocal of the **equipotent molar ratio**. The term is used largely interchangeably with **relative potency**, but may be preferable where evidence is lacking of similar slopes and maxima (as required for the latter).
acute A pharmacological response that is quick in onset and/or of short duration; or a disease that has a rapid onset, severe symptoms and brief duration. See also **chronic**.
ADCC antibody-dependent cell-mediated cytotoxicity.
addiction See **dependence**.
additive response Where administration of two drugs produces a response that is the simple sum of their individual responses, i.e. there is not **synergism** or **antagonism**.
adenyl cyclase See **adenylyl cyclase**.
adenylate cyclase See **adenylyl cyclase**.
adenylyl cyclase The enzyme that produces the **second messenger cyclic-AMP** from ATP.
ADH ANTIDIURETIC HORMONE (vasopressin).
adhesion The mechanism by which cells form contacts with one another and/or an appropriate substratum, e.g. **integrins**, **selectins**.
adhesion molecules See **cell adhesion molecules**.
ADI acceptable daily intake (environmental chemistry).
adjuvant A chemical agent that augments the activity of another agent, such as an antigen, when used in conjunction.
ADP ADENOSINE DIPHOSPHATE (adenosine 5′-diphosphate).
ADP-ribosylation The addition of a ribosyl group derived from the **ADP** moiety of nicotinamide adenine dinucleotide to a protein. (Certain toxins have their effects through this mechanism, e.g. cholera toxin ADP-ribosylates and inactivates the GTPase activity of G_s.)
adrenal Pertaining to the adrenal gland.
adrenolytic An agent that blocks the effects of ADRENALINE and NORADRENALINE secreted by the adrenal medulla, or released from adrenergic nerve terminals.
ADROIT Adverse Drug Reaction On-line Information Tracking.
adverse drug reaction A seriously unpleasant or harmful effect of a drug administered at a dose normal for therapeutic use. They are divided into groups, such as type A, which are dose-related and expected (often inevitable), and type B, which are rare and often due to **allergic reactions** (sometimes called idiosyncratic reactions).
aequorin A CALCIUM-BINDING PROTEIN, which is used especially in experimental electrophysiology, that emits a flash of light when it binds calcium ions.
aetiology The study of the cause of disease.
AFC antibody forming cell.
affective disorder A mental illness characterized by changes in mood (affects).
afferent Leading to; e.g. nerves that transmit information from the periphery to the CNS.
affinity In pharmacology, is used as a chemical measure of the strength of a ligand's tendency to react with a receptor or other binding site. It may be estimated using either functional or chemical (e.g. radioligand-binding) techniques. A number of forms of equation or treatments have been derived that describe the reversible binding of chemicals to saturable sites. The form of expression for binding of oxygen with haemoglobin was derived by Hill (see **Hill equation**) and is similar to those later derived by Langmuir (see **Langmuir equation**) for gases. Analogous relationship results from application of the **law of mass action**, and are used in enzymology as the **Michaelis–Menton equation**. Special applications to the actions of antagonists are found in the **Clark equations** and **Gaddum–Schild equations** for occupancy of drugs at receptors. See also **association constant**; **dissociation constant**; $\mathbf{pA_2}$.
Ag **antigen**.
agar A galactan (agarose and agaropectin) used in gel form in experimental techniques, such as gel diffusion, gel

electrophoresis and gel filtration.

agenesis The absence of an organ or tissue.

aggregation The clumping together of platelets.

agonist Any agent, whether an endogenous mediator or an exogenous chemical, that on combination with a receptor induces a change in that receptor that leads to a biological response. A **full agonist** produces the maximum biological response that is achievable in a particular system (though probably at less than full receptor occupancy), and is an agent with relatively high **efficacy**. A **partial agonist**, by definition, gives a less than maximum biological response, and has a lower efficacy, such that, even when all receptors are occupied, it gives insufficient stimulus to achieve a maximum response. It is important to appreciate that partial agonists can act as antagonists, since when given together with full agonists they occupy receptors unfruitfully. See also **intrinsic activity**; **intrinsic efficacy**; **stimulus**.

agranular leukocyte See **agranulocyte**.

agranulocyte (agranular leukocyte) A white blood cell, such as a **lymphocyte** and a **monocyte**, that has non-granular cytoplasm.

AIDS Acquired Immune Deficiency Syndrome.

akaryote A cell that lacks a nucleus.

albumin A protein that is water-soluble and coagulated by heat. Serum albumin, found in blood plasma, is important for maintaining plasma volume.

alcian blue (copper phthalocyanine) A basic dye used experimentally to stain polysaccharides and glycoproteins.

aldehyde dehydrogenase An enzyme involved in a stage in the catabolism of alcohols. In humans this enzyme shows **pharmacogenetic polymorphism**, resulting in the rate of alcohol metabolism differing in different genetic groups.

aldosteronism A disease caused by the excessive production of ALDOSTERONE due to a **tumour** of the adrenal gland (Conn's syndrome), liver damage or heart failure.

alkylating agent An agent that reacts with nucleophilic groups, substituting them with alkyl groups, e.g. in proteins and nucleic acids.

allele One of the alternative forms of a **gene** at a given locus on a **chromosome**.

allergen A substance, an **antigen**, to which the body has become hypersensitive and so causes an immune response termed an **allergic reaction**.

allergic reaction An immune response caused by the reaction of **allergens** with **antibodies** as a result of prior exposure to the antigen. These reactions may be local or generalized (e.g. **anaphylactic shock**). Also, there may be reactions (type B **adverse drug reactions**) to some drugs.

allergy A type of **immune response** to otherwise innocuous **antigens** (called **allergens**) exhibited by hypersenitive individuals, e.g. hay fever.

all-or-none responses Are **quantal** responses; those which are present or absent (e.g. death or survival).

allosteric interaction An interaction of two chemical substances, or two molecules of the same chemical substance, which act at different sites on the same macromolecule. In enzymology it is common for an allosteric regulator to alter (positively or negatively) the enzymatic modification of another molecule. In some cases, binding of one molecule enhances affinity for the binding of the other; an instance of such positive cooperativity, with just one type of interactant involved, is the binding of oxygen molecules with the haemoglobin molecule. (The opposite phenomenon is negative cooperativity.) An important instance of two different chemicals showing allosteric interaction is that of the benzodiazepines and GABA interacting at $GABA_A$ receptors. Positive and negative cooperativity in binding are often detected by deviations of the **Hill slope** from unity.

allotopic Interaction of two drugs acting at different sites on a receptor; as opposed to *syntopic* interaction where they act at the same site on the receptor. Allosteric interactions and uncompetitive antagonism are examples of allotopic interactions. See also **allosteric interaction**; **antagonism – pharmacodynamic**.

alternative medicine See **complementary medicine**.

alternative splicing Where different proteins can be produced at translation from a single gene, as a result of different **splicing** of the primary mRNA transcript. This is often tissue-specific.

Alzheimer's disease A progressive disease where nerve cells in the brain degenerate. A common cause of **dementia**.

amenorrhoea Stopping or absence of menstrual periods.

aminopeptidases A group of enzymes that remove the amino-terminal amino acid residues from peptides or proteins, often leading to inactivation.

amino terminus (*N*-terminus) The end of a protein or peptide chain that bears the free α-amino group.

AMP ADENOSINE MONOPHOSPHATE (adenosine 5'-monophosphate).

aminotransferase See **transaminase**.

anabolism See **metabolism**.

anaemia A collection of conditions where there is a reduced capacity of the blood to carry oxygen.

amino acid Any of a class of compounds of general formula $RCH(NH_2)COOH$ where R is a side-chain. They have many functions, as **neurotransmitters**, as building blocks of **peptides** and biosynthetic precursors of many other molecules.

amino acid transmitter A **neurotransmitter** that chemically is an amino acid. Excitatory amino acids, e.g. glutamate and aspartate, are the principal transmitters, mediating fast excitatory synaptic responses in the CNS, others, e.g. GABA, are major inhibitory neurotransmitters in the CNS.

amphipathic Molecules having both **hydrophobic** and **hydrophilic** properties or regions.

anaesthesia A state of insensibility, which may be a general or local loss of sensation.

analogue One of a group of chemicals that are closely related in terms of chemical structure.

analysis of variance (ANOVA) A statistical procedure used in the analysis of groups of data, to partition total variability into components according to the source of the variability. It is a principle used in experimental design to allow sometimes complex analysis of one-way, two-way sets of data.

anaphylatoxins The fragments **C3a** and **C5a** that are formed during **complement fixation**.

anaphylaxis An extreme local reaction to a drug or allergen in hypersensitive persons, causing an immediate-type **immune response**. Anaphylactic shock is an extreme generalized reaction (e.g. to a bee sting), including hypotension and bronchoconstriction, and is a medical emergency.

angina pectoris A pain felt in the centre of the chest and sometimes spreading to the arm, shoulder or jaw. It is due to the demand for oxygen by the heart muscle exceeding supply.

angio-oedema (angioneurotic oedema) A reaction to an **allergy** resulting in the rapid development of swellings of the skin and other sites, including the larynx. Common causes

are food allergy, drug allergy, insect stings and infections.

angiogenesis The development and formation of new blood vessels.

angiotensin-converting enzyme A proteolytic **enzyme** that converts angiotensin I to the vasoconstrictor angiotensin II. See ACE INHIBITORS.

anion A negatively charged ion.

anion channel See **ion channels**.

anorexia A loss of appetite that can be induced by APPETITE SUPPRESSANTS or anorectic agents. The psychological state anorexia nervosa is characterized by an unwillingness to eat, extreme weight loss and fear of becoming fat.

ANOVA **analysis of variance**.

anoxia A state where tissues receive inadequate oxygen.

antagonism - chemical (antagonism by neutralization) When the responses to an agonist are reduced by an antagonist through a mutual chemical reaction, where the product is inactive and diminishes the effective concentration of the agonist. There is no interaction at receptor level, but the kinetics of this interaction may be very similar to those for competitive receptor interaction. This form of antagonism is of particular importance in toxicology, e.g. to reduce the toxic effects of heavy metals (e.g. Cd^{2+}, $^{45}Sr^{2+}$) by binding them to a **chelating agent** such as sodium calcium edetate (in therapeutics, to hasten their excretion as inactive complexes). See also **antagonism - pharmacodynamic**.

antagonism - functional (physiological antagonism) Where antagonism between two drugs is due to their having opposite or opposing actions. In this case either drug can be regarded as the antagonist. See also **antagonism - pharmacodynamic**.

antagonism - pharmacodynamic Where drug antagonism is the result of interaction at receptors or binding sites. There are a number of subcategories. 1. *allotopic*: The antagonist binds at a different site to the agonist, though closely associated with the receptor. Also referred to as non-competitive, allosteric. It may be reversible or irreversible. 2. *syntopic*: The antagonist and agonist bind in a mutually exclusive fashion to a common binding site. This competition for the binding site may be reversible, slowly reversible, or irreversible over a meaningful time-span: (a) where equilibrium antagonism can be achieved, this relationship is universally termed competitive antagonism, and classical treatment can be applied to derive parameters such as the affinity of the antagonist. In operational terms this latter situation can be termed **surmountable antagonism**; (b) non-equilibrium antagonism poses more problems, does not so readily allow derivation of affinity parameters, and is sometimes referred to as (irreversible) competitive binding, or (probably incorrectly) as noncompetitive antagonism. In operational terms this latter situation can be termed **insurmountable antagonism**.

antagonism - pharmacokinetic Where one drug antagonizes the other by decreasing the concentration of the latter at its site of action. See also **antagonism - pharmacodynamic**.

antagonism of responses Where administration of two drugs produces a response that is less than the sum of their individual responses. Normally, one drug has no effect on its own, but attenuates the effects of the other, so is regarded as the antagonist. See also **antagonism - pharmacodynamic**; **insurmountable antagonism**.

anterior Relating to the front of the body.

antibody (immune body) An **immunoglobulin** produced in response to an **antigen**. It binds specifically and reversibly with the antigen as a result of contact between specific antibody combining sites, Fab portions (located at the variable (*N*-terminal) end of the heavy chain and light chain in the molecule) and antigenic determinants (**epitope**). The Fc portion of an antibody is responsible for determining which component of the immune system the antibody will bind to. Antibodies are produced by plasma cells derived from **B-lymphocytes**. The body can make a vast variety of antibodies, each B-lymphocyte being genetically programmed early in development to produce an antibody of single specificity. Involved in immunity and allergy.

anticoding strand See **antisense strand**.

anticodon Three consecutive **nucleotide** sequences in **tRNA** complementary to the **codon** in **mRNA**.

antidote An agent that counteracts a poison.

antigen A protein that is treated by the body as foreign and so triggers an **immune response**, resulting in the production of **antibodies** in the blood

antigenic determinant See **epitope**.

antigenicity The capacity to function as an **antigen**.

antimetabolite An analogue of a normal metabolite that disrupts normal metabolic processes by acting as a counterfeit. See ANTICANCER AGENTS; DHYDROFOLATE REDUCTASE INHIBITORS; SULPHONAMIDES.

antimicrobial An agent that destroys or inhibits the growth of **microbes**.

anti-oncogene A gene that counteracts the effect of an **oncogene**. See **tumour suppressor gene**.

antisense A strand of **DNA** having a sequence identical to **mRNA** which codes for the protein.

antisense strand The strand of a double-stranded DNA, from which RNA is **transcribed**.

antisense technology An experimental technique used to prevent expression of a **gene** through the use of synthetic nucleotide sequences, complementary to specific DNA or RNA sequences.

antiserum A serum containing antibodies for use against antigens of a particular kind. See also **immunity**.

AP-1 A transcriptional regulatory protein. It is the product of C-*Jun*, a **proto-oncogene**.

aplasia The failure of development of an organ or tissue.

apoptosis Programmed cell death. Encompassing the series of events which are in response to specific developmental or physiological signals, which leads to death and removal of the cell.

apparent pK_B The prefix 'apparent' is sometimes introduced when there are assumptions in the methods used to determine pK_B, or where it is recognized that some composite 'macroscopic' affinity is estimated rather than the true of 'microscopic' affinity for the reaction of interest. In functional determinations the use of the term is recommended when the affinity of an antagonist has been estimated from the **dose-ratio** at a single antagonist concentration from the **Gaddum-Schild equation**, or when no **Schild analysis** has been carried out, and consequently the interaction is presumed to be competitive.

APUD amine-precursor-uptake-decarboxylation cells (peptide- and amine-storing cells) are a diverse group, embryologically of neural crest origin that are characterized by these cytochemical characteristics: they secrete amine and/or peptide mediators; at one extreme they may be released into the bloodstream to act at a distance (i.e. **endocrine** action); and at the other to act locally at an adjacent cell (paracrine action). See **local homones**.

A.R. analytical standard of reagent.
arachidonic acid A fatty acid precursor of **prostaglandins**.
Arïens equation See **intrinsic activity**.
β-ARK An enzyme that phosphoylates the occupied form of a **G-protein** coupled receptor, e.g. the ß-adrenoceptor, leading to uncoupling of that receptor and desensitization.
ARMI age-related memory impairment.
arrhythmia (dysrhythmia) An abnormality of heart rhythm or rate of heartbeat, usually caused by disturbance of the electrical impulses and their conduction within the heart. They include ectopic beats (isolated irregular beats), tachycardias (too fast a heartbeat), bradycardias (too slow a heartbeat) and atrial flutter and ventricular fibrillation.
Arthus reaction A severe local **inflammatory response**, a skin reaction characterized by **erythema**, **oedema**, necrosis, local haemorrhage. A **type III hypersensitivity reaction**.
Arunlakshana and Schild plot See **Schild plot**.
ascites fluid The fluid that accumulates in the peritoneal cavity during certain pathological conditions.
aspiration The withdrawal of fluid or tissue from the body by suction.
assay Means to measure. In pharmacology the term embraces biological, chemical and hybrid (e.g. immunoassay) methods. The term **bioassay** is generally used when some functional response is used.
association constant Sometimes known as the affinity constant or affinity (units, molar) for reaction at equilibrium. It is the reciprocal of the **dissociation constant**.
asthma An obstructive airways disease characterized by acute attacks of shortness of breath (caused by difficulty in exhalation), often with increased secretions in the airways.
asymptote/-otic Approaching closer and closer but never meeting.
ataxia Lack of coordination, clumsiness, unsteady gait, impaired eye and limb movements and speech difficulties.
atheroma A degeneration of the walls of blood vessels, causing **atherosclerosis**, characterized by fatty deposits and scar tissue.
atherosclerosis An arterial wall disease where the inner layer is thickened and so results in impaired blood flow. See **atheroma**.
atopy The tendency to develop **hypersensitivity** states due to heredited factors.
ATPase ADENOSINE TRIPHOSPHATASE.
ATP-γ-S - ADENOSINE-5′-(γ-THIO) TRIPHOSPHATE: a nonhydrolysable analogue of ATP.
attention-deficit hyperactivity disorder A condition in children characterized by **hyperkinesia**.
Auerbach's plexus See **myenteric plexus**.
autacoid A mediator that acts close to its site of release. See **local hormone**.
autocrine A cell that release a mediator that acts on the cell type from which it was released. See **local hormones**.
autoimmune disease Any of a number of diseases where there is an **immune response** of a person's **antibodies** with some of their own cells, which act as **antigens**.
autonomic nervous system The system involved in the control of involuntary bodily functions, such as blood pressure, heart rate and the activity of muscles and internal organs. The sympathetic nervous system (utilizing the neurotransmitter NORADRENALINE and the hormone ADRENALINE) is primarily involved in eliciting these functions involved in the 'fight, fright or flight' response. The parasympathetic nervous system (utilizing the neurotransmitter ACETYLCHOLINE) is more involved in functions such as the digestive processes.
autoradiography A technique where a radiolabelled compound is used to locate and label large molecules (e.g. receptor proteins, mRNA), cell components or body organs. Their image is then recorded on photographic film to produce an autoradiograph or autoradiogram.
autoreceptor A receptor that is activated by the mediator secreted by the cell on which it resides.
autosome A non-sex chromosome.
auxotonic Contractions against an increasing resistance, e.g. in muscle.
axon A **nerve fibre**, a single elongated process that extends from the neuronal cell body and which carries nerve impulses away from it.
baccillus A term used to describe both rod-shaped bacterial cell and a large genus of Gram-positive, spore-bearing bacteria with this form (e.g. *B. anthrax*).
background Spontaneous rate or level.
bacteriology The science of the study of bacteria.
bacteriophage A virus whose host is a bacterium.
balanced salt solution (BSS) Any of a number of solutions used to provide correct pH, ionic and osmotic conditions for the maintenance and growth of cells.
BALB/c mice An inbred strain of mice which is predisposed to **myeloma** formation following intraperitoneal injection of, e.g. mineral oil.
BAN British Approved Name (for a drug).
basal Pertaining to the base.
base A proton acceptor. Often used to refer to the nitrogenous bases, the purine and pyrimidine bases of nucleotides.
base analogue An analogue similar enough to a **purine** or **pyrimidine** base to substitute for these bases, resulting in abnormal **base pairing**, e.g. **point mutations**.
base pair A pair of bases, one purine, one pyrimidine, each in a separate **nucleotide** in which each base is hydrogen bonded to the other in opposite strands of double-stranded DNA.
base pairing The weak bonding between **pyrimidine** and **purine** bases within nucleic acids. See **base pair**.
base sequence The specific order of **pyrimidine** and **purine** bases in a polynucleotide.
basic dye A dye having a coloured cation which combines with anionic groups used to stain nucleic acids and so nuclei.
basic orange See **acridine orange**.
basophil A polymorph **neutrophil** classed as a granulocyte involved in immediate-type hypersensitivity reactions, when it releases e.g. histamine, is stained by **basic dyes**.
basophilia The affinity of a specimen to being stained by **basic dyes**.
B-cells See **B-lymphocytes**.
BChE **butyrylcholinesterase**.
becquerel (Bq) The SI unit used to describe activity of a radioactive source. One Bq being the decay of a radionucleide at a rate of 1 spontaneous nuclear transition per second (replaces **curie**).
benign In general, means harmless, not threatening to life. In relation to **tumours** it is used where the growth does not invade and destroy other cells or tissue, i.e. it is not **malignant** (cancerous).
bilateral Of or relating to both sides of the body, a tissue, an organ or both of a pair of organs.
bilharzia See **schistosomiasis**.
bilirubin The main pigment found in bile formed from the break down of the blood pigment **haemoglobin**.
bimodal distribution A frequency distribution with

two peaks instead of the usual one of unimodal distributions (e.g. the Gaussian distribution). In pharmacology, bimodal and trimodal distributions are sometimes seen if large sample characteristics are displayed in a **histogram** when there are two or more populations with distinct (unimodal) characteristics being sampled (e.g. rate of acetylation of drugs is commonly bimodal; dibucaine numbers as an indication of activity of cholinesterase in cleaving suxamethonium is trimodal).

binding isotherm The (normally **hyperbolic**) relationship between the concentration of a ligand, and the proportion bound or adsorbed onto binding sites. The relationship is described by the **Langmuir equation** and allows estimation of the equilibrium **dissociation constant**, the B_{max}, and after suitable analysis the **Hill slope**. Experimentally, the relationship is best estimated by the use of radio-labelled ligands.

binding site That part of a molecule (e.g. of a receptor protein) with which another molecule (e.g. an agonist ligand) can form a complex.

binomial distribution Is a **frequency distribution** shown by many **all-or-none responses** – qualitative responses – for example death or survival (in contrast to quantitative responses which are continuous variables).

bioassay To measure (**assay**), using some functional biological responses. The purpose of a bioassay may commonly be to estimate the potency of a drug or principle, or to measure the amount or concentration of a pharmacologically-active chemical. In a wider sense, any pharmacological measurement from a toxicity test to a clinical trial, is a bioassay. The outcome of a bioassay may be absolute (e.g. EC_{50}), but is more commonly comparative, with some actual or implied standard (e.g. in relative potency determinations).

bioavailability In a pharmaceutical formulation, is the amount that, after administration and subsequent absorption and distribution, is then biologically available to act pharmacologically.

biochemistry The study of chemical changes within and produced by living organisms.

bioequivalence If the bioequivalence between two drug preparations is equal, it means that their **bioavailability** (rate and extent) is the same. It is important to establish that equivalent preparations of a medicine have the same bioavailability, and thus therapeutic effect, particularly in generic forms of 'parent' **proprietary** medicines.

biogenic amine Any of a group of organic compounds which includes the **catecholamines**, which contain one or more amine groups. They have a role in brain functioning.

biological half-life The time taken by the body to eliminate $^1/_2$ of the amount of a substance, e.g. a drug, through the normal routes of elimination.

biological standardization A form of **bioassay** used in standardizing the pharmacological activity of a preparation of a biologically active substance. Standardization normally entails comparison of the activity of a laboratory sample with a national or international standard. Biological or hybrid biological/chemical methods (e.g. **immunoassays**) may be used.

biology The study of living organisms.

bioluminescence The emission by living organisms of visible light.

biolysis Death and tissue disintegration.

biometrics See **biostatistics**.

biometry The application of mathematical techniques to the quantification of the characteristics of living organisms, populations.

biostatistics Statistics as applied to biology.

biophase A (largely hypothetical) area around the receptor that limits drug access.

biosynthesis The production of a chemical compound by a living organism.

biotechnology A term, which is used in a variety of ways, that denotes application of biological techniques to chemical manufacture, e.g. **genetic engineering**.

biotype A group of organisms having the same **genotype**.

biphasic In pharmacology, biphasic responses may indicate contribution of two components to drug responses through a displacement in time of two peaks of activity, or by a dose-response curve that appears to be made up of the superimposition of two separate curves displaced vertically or laterally.

bipolar A **neuron** having two processes extending in different directions from its cell body.

bipolar disorder An illness characterized by swings in mood between opposite extremes. See **manic-depressive illness**.

Black & Leff model An operational model (1983) that provides a mathematical framework for drug-receptor interactions. A key aspect of the model is that it seeks to describe for agonists at receptors, the relationship between **hyperbolic** concentration-occupancy curves, and hyperbolic concentration-effect curves, in terms of a further hyperbolic coupling function. The usual parameters of affinity etc. are used in the descriptive equations, and a key descriptive parameter called the transducer function (τ), the equivalent of efficacy, which can be derived. The models are usually represented by three-dimensional graphs plotting axes for agonist concentration, receptor occupancy and effect.

block/blocker The process where an **antagonist** prevents an **agonist** drug exerting its effect, usually by preventing the action of the latter at a **receptor** (e.g. β-blockers).

blood–brain barrier The means by which the nerves within the brain are normally kept separate from the blood cells and large molecules within the blood.

blood clotting Where liquid blood is converted into a solid clot to plug a wound which is associated with bleeding. It involves activation of coagulation factors, proteins which are responsible for the conversion of soluble **fibrinogen** to insoluble **fibrin** which forms a meshwork with red blood cells, platelets and other plasma proteins to form the clot.

blood dyscrazias See **dyscrazia**.

blotting An experimental technique used to identify and assay target molecules, e.g. RNA (**Northern blot technique**), DNA (**Southern blot technique**), protein (**Western blot technique**).

B-lymphocyte (B-cell; bursa equivalent) A small **lymphocyte** which originates in bone marrow (haemopoietic stem cells), found in lymph nodes, spleen, other secondary lymphoid tissue and blood. Whilst in bone marrow it undergoes rearrangement of its **immunoglobulin** genes to produce genes which encode **antibody** of a single specificity. Following encounter with **antigen**, B-lymphocytes proliferate and differentiate into antibody-producing plasma cells.

BMA British Medical Association.

B_{max} A direct measure of receptor concentration or density determined using radioligand-binding techniques, commonly in units such as pmoles/mg membrane protein. It is the asymptotic maximum of a **binding isotherm**, but is usually determined by calculation from the form of the isotherm (or less satisfactorily from the **Scatchard plot**). It is the measured

equivalent of receptor density (Rt) used in receptor modelling.
BNF *British National Formulary.*
body cavity The internal cavity surrounded by the body wall in which internal organs are suspended.
bolus injection A single dose of a drug administered over a short period.
BP *British Pharmacopoeia.*
BPC *British Pharmaceutical Codex.*
brachial Pertaining to the arm.
brady- A prefix denoting slowness.
bradycardia A decrease in the rate of heartbeat.
bradykinesia Slow and poor movement. As seen in Parkinson's disease and **extrapyramidal disorders** it is caused by several groups of drugs as an **adverse drug reaction**, which is commonly a forseeable side-effect (e.g. ANTIPYSCHOTICS, such as phenothiazines).
bronchitis An obstructive airways disease caused by **inflammation** of the bronchi and characterized by a chronic shortness of breath (due to a difficulty in exhaling) and coughing, with inflammation and increased secretions and blockage of the airways.
bronchoconstriction (bronchospasm) A narrowing of the bronchioles of the lungs, caused by a contraction of the **smooth muscle** that surrounds the airways, often exacerbated by excessive secretions within the airways.
bronchoconstrictor An agent that contracts bronchial **smooth muscle**, resulting in the constriction of the airways.
bronchodilator An agent that relaxes bronchial smooth muscle, resulting in the widening of the airways.
BSA bovine serum albumin.
BSE bovine spongiform encephalopathy.
BSF-1 B-cell stimulating factor.
BSS **balanced salt solution**.
buccal A term for the mouth or hollow part of the cheek, or a form of drug administration where the drug, in solid form, is placed between the cheek and jaw – the buccal cavity.
buffer A solution that compensates for changes in **pH** on addition of acid or alkali by absorbing protons from acids and releasing them on addition of alkali.
butyrylcholinesterase See **cholinesterases**.
C1 A component of the **complement system** which comprises C1q, C1r and C1s. It binds to antibody-antigen complexes to initiate the classical pathway.
C3a (anaphylatoxin) A component of the **complement system** which is cleaved from C3 by enzymatic action and causes vasodilatation and polymorphonuclear leucocyte accumulation.
C3b (opsonin) A component of the **complement system** which can promote **phagocytosis** of the **antigen–antibody** complex to which it has adhered.
C5a (chemotactic factor) A component of the **complement system** which is cleaved from C5 by enzymatic action. It causes vasodilatation and polymorphonuclear leucocyte accumulation.
C6 / C6b / C7 Components of the **complement system** that attract polymorphorphonuclear leucocytes.
C9 A component of the **complement system** which causes lysis by forming pores in cell membranes.
CAAT-box A conserved sequence in the **promoter** region of DNA involved in the initiation of **transcription**. It is located 70–80 base pairs upstream from the start point of transcription.
Ca^{2+}-ATPase (calcium pump) A protein found in the plasma membrane that uses a mechanism of **active transport** to move calcium ions across the membrane.
cachectin See **tumour necrosis factor**.
cadherin Any of a family of cell-surface proteins which are involved in cells adhering to one another. Cadherin molecules on different cells bind to each other in a Ca^{2+}-dependent manner.
calcium-binding protein An **endogenous** protein that, when bound to calcium, results in a conformational change, so activating or inactivating it. **Exogenous** calcium-binding proteins, e.g. **aequorin**, are used in experimental biology.
calcium channel See **ion channel**.
calcium pump See **Ca^{2+}-ATPase**.
caldesmon An endogenous **calcium-binding protein** which is abundant in smooth muscle and may be involved in smooth muscle contraction.
calmodulin An endogenous **calcium-binding protein** that once bound to Ca^{2+} modulates the activity of various proteins and enzymes.
calsequestrin An endogenous **calcium-binding protein** in the sarcoplasmic reticulum of muscle.
CAM **cell-adhesion molecules**.
cAMP **cyclic-AMP** (see **cyclic adenosine 3′,5′-monophosphate**).
cancer The symptoms of the disease due to unrestrained cell growth and **tumours**. They are described as **malignant**, as such cells or growths invade and destroy other calls or tissues. There are various types of cancer, including **carcinoma** (arising in the epithelium, which lines the internal organs and skin), **sarcoma** (arising in connective tissue of bone, cartilage, skin etc.), **lymphoma** (lymph nodes, including Hodgkin's disease) and **leukaemia** (arising in blood-forming organs, including the bone marrow).
cannula A small, usually plastic tube inserted into e.g. a vein or artery to allow administration of drugs or tracers, or allow measurement of e.g. blood pressure.
caudal Positioned towards the lower end of the spine.
caudal block **Nerve block** induced by injecting a local **anaesthetic** into the lower part of the spine.
canonical sequence See **consensus sequence**.
cAPK See **cyclic AMP-dependent protein kinase**.
capsule A gelatine or similar container for liquid or solid forms of drugs that are to be taken orally.
carbohydrate Any of a number of compounds of the general form $C_x(H_2O)_y$, which includes sugars and polysaccharides.
carboxypeptides Proteolytic enzymes which remove the ***C*-terminal** amino acid from a **peptide**. They often function to inactivate peptide mediators, though in some instances they change the peptide's spectrum of activity. See CARBOXYPEPTIDASE INHIBITORS.
***C*-terminus** **carboxy-terminus**.
carboxy-terminus (*C*-terminus) The end of a protein chain that bears the free carboxyl group.
carcinogen Any agent capable of causing **cancer**.
carcinoid tumour A cancerous growth of neuroendocrine glandular tissue, leading to a large and often dramatic release of potent **autacoids**.
carcinoma A **malignant** type of **neoplasm** that arises in the epithelium.
cardiac muscle The type of (involuntary) striated muscle that makes up the contractile muscle of the heart.
cardiogenic Arising in the heart.
carditis **Inflammation** of the heart or its linings.
carrageenan (carrageenin; carragheen) A substance derived from algae and used in experimental biology to cause **inflammation**.

carrier An individual who is heterozygous for a **recessive gene**, which codes for a genetic disease, and one normal **allele**. This usually implies a carrier of a recessive disease, such as cystic fibrosis, who will remain unaffected throughout their life.

carrier-mediated transport The transport of solutes across cell membranes with the aid of a **carrier protein**.

carrier protein A membrane protein which transports molecules across a membrane by **active transport** or **facilitated diffusion**.

catabolism See **metabolism**.

catalase An enzyme that catalyses the decomposition of H_2O_2 to molecular oxygen and water. See **free-radical**.

catecholamine Monoamine derivatives of amino acids that have a catechol ring, e.g. NORADRENALINE, DOPAMINE.

cation A positively charged ion.

CCK See CHOLECYCTOKININ.

CD 1. controlled drug (UK). 2. See **cluster of differentiation**.

CD antigens Cell surface **antigens** present on **leucocytes** that are detected by certain **monoclonal antibodies** (CD1, CD2, CD3 etc.)

cDNA See **complementary DNA**.

α-cell Glucagon-secreting cells in the islets of Langerhans in the pancrease.

β-cell Insulin-secreting cells in the islets of Langerhans in the pancrease.

cell-adhesion molecules (CAM) A large and heterogenous group of cell-surface glycoproteins produced by cells which bind to each other and to other cell types, e.g. **cadherin**, **integrin**, **selectin**.

cell fractionation A method of separating cell components by breaking them up by **centrifugation**.

cell-free system A mixture of cell components reconstituted **in vitro** and used for various processes, such as to study genetic processes, e.g. DNA replication.

cell hybrid A cell produced **in vitro** by the fusion of two **somatic** cells, which may be from different species with different genetic constitutions.

cell line A culture of cells that can be propagated indefinitely.

cell-mediated hypersensitivity See **type IV hypersensitivity**.

cell-mediated immunity See **immune response**.

cellulitis Inflammation of the subcutaneous tissues.

centiMorgan (cM) A measure of distance between two **genes** based on the frequency with which they are inherited together. One cM is equivalent to 1% of recombination and approximately to 1 megabase.

central dogma The dogma that genetic information can only be transferred in the direction DNA → protein.

central nervous system (CNS) In vertebrates this comprises the brain and the spinal cord.

centrifugation See **ultracentrifugation**.

centrifuge See **ultracentrifuge**.

cephalic Pertaining to the head.

cerebrospinal fluid (CSF) The fluid filling the cavity in the brain and spinal cord.

cervical Pertaining to structures connected with the neck.

CF **complement fixation**.

CFT **complement fixation test**.

cGMP **cyclic-GMP; cyclic guanosine 5′-monophosphate**.

chelating agent Any of a number of agents that combine with metal ions and form a stable compound. They can be used to render toxic metals less poisonous.

chemical antagonism See **antagonims - chemical**.

chemical drug name This is not normally used outside technical circles because, though precise and unambiguous, it can be very large and unwieldy. Instead, official 'trivial' or shortened names are used, such as a **generic drug name** (these, however, may vary from country to country). For example, *N*-(4-hydroxyphenyl)acetamide is the chemical name for the analgesic given the general name of paracetamol in the UK and acetaminophen in the USA.

chemoattractant Any chemical that attracts cells or organisms to move towards it.

chemokine A **cytokine** that is **chaemotactic** for **leucocytes**.

chemotaxis The moving away or towards a chemical source by microorganisms or motile cells.

chemotherapy The use of chemicals to treat disorders, e.g. cytotoxic ANTICANCER AGENTS in the treatment of cancer and ANTIBIOTICS for microbial infections.

Cheng-Prusoff equation A relationship originally derived for enzymology but commonly used in radioligand-binding studies, which allows calculation of the displacing affinity of a ligand from its displacement curve. The equation is $K_i = IC_{50} / (1 + [A]/K_L)$, where K_i is the equilibrium dissociation constant of the competing (non-radioactive) ligand, [A] is the conc .ntration of free radioligand used in the assay and K_L is the dissociation constant of the radioligand used. The concentration of free radioligand is varied over a range and so allows estimation of the IC_{50}, the concentration of inhibiting ligand giving 50% displacement of the 'hot' radioligand (affinity K_D). If certain conditions are met, K_i should approximate to the IC_{50}.

chimaeric receptor A receptor synthesized by **genetic engineering** techniques and is composed of protein sequences from two or more types of receptor. It is used to identify the function of different parts of receptor molecules.

chirality See **isomer**.

chi-square test (χ^2 test) A **(nonparametric) statistical test** used to compare two or more groups, for instance frequencies in a 2x2 contingency table where the two columns must represent mutually exclusive categories, as must the two rows. The null hypothesis is that there is no association between the variable defining the row and the variable defining the column. The test reports the value of the chi-square statistic, and the *P* value. The test is of value in evaluating the presence, or absence, of association between qualitative characteristics.

chlamydial infection An infection caused by a group of microorganisms called clamydia (*Chlamydiaceae*), which are larger than viruses but smaller than bacteria.

chole- Relating to the biliary system.

cholestasis The failure of the normal bile flow to the intestine, causing cholestatic jaundice.

cholinergic Nerve fibres that release ACETYLCHOLINE.

cholinesterases Enzymes that hydrolyse choline esters, especially ACETYLCHOLINE; of which there are two main forms: acetylcholinesterase ('true cholinesterase') is specific for acetylcholine, rapid in this action, and has a discrete distribution being especially located near cholinergic nerve terminals (and in erythrocytes); butyrylcholinesterase ('pseudo' cholinesterase) is less selective and is able to hydrolyse some drugs (e.g. SUCCINYLCHOLINE CHLORIDE). Many drugs are known that inhibit the action of these enzymes. See ANTICHOLINESTERASES.

chromatin A protein found in the nucleus which stains with basic dyes. It is used in the study of the behaviour of

chromosomes.

chromatography A technique used to separate compounds from a mixture on the basis of their affinity for and migration with a nonpolar solvent (e.g. water), on a polar support (e.g. paper). In gel filtration chromatography, molecules are separated on the basis of size through a column of beads, in affinity chromatography, separation and purification of a sample is achieved by the differing affinities of molecules for particular chemical groups through a column onto which the molecules bind.

chromosome A structure in the nucleus containing **DNA** which carries the genetic information essential to that cell. See **gene**.

chromosome abberation An abnormality in the number or structure of **chromosomes** in a cell.

chromosome mapping The assigning of a **gene** or other **DNA** sequence to a particular position on a specific **chromosome**. See also **linkage map**; **physical mapping**.

chronic A term used to describe a disease of long duration, which is usually of slow onset and slowly reversing (if at all). It does not mean severe. See **acute**.

chronotropic Affecting rate of action.

CIE counter-current immunoelectrophoresis: see **electrophoresis**.

(C_{inf})max The peak plasma concentration reached during a constant **infusion** of a drug.

circadian rhythm (diurnal rhythm) The intrinsic rhythmic changes with a periodicity of approximately 24 hours in an organism.

cirrhosis A progressive disease of the liver caused by damage to the cells.

cistron (structural gene) The **DNA** sequence coding for a single **polypeptide**.

CL clearance rate: the rate at which a substance is removed from the blood as it passes through an organ.

Clark plot A graphical method of estimation of the affinity of a competitive antagonist from a linear plot of the **Gaddum–Schild equation**. In practice, any advantages of this plot have been overlooked, and the logarithmic form of this equation is almost universally used in the **Schild plot**.

class The taxonomic group immediately ranking above the **order** and below the **phylum**.

clearing The use of a clearing agent, a solvent, to increase the transparency of a specimen for microscopy.

clinical pharmacology The scientific study of drugs in humans.

clinical trials These are systematic studies of medically active agents in humans. Such trials advance through early phases in normal volunteers (to determine duration of action and metabolism), to eventual studies in patients with disease. Commonly new active agents are compared to existing standard treatments, and to dummy treatments (placebos). To avoid bias, assessment of the efficacy of treatment may be single-blind (where either the patient or the doctor does not know the identity of treatments) or double-blind (where neither knows until the trial is finished).

clone A collective term for all individual organisms or cells produced asexually or by parthenogenesis from a single individual; or a copy of genetically engineered DNA sequences.

cloned line A term used in tissue culture to describe a population of cells descended directly from a single **clone**.

cloning The isolation of a particular **gene** or **DNA** sequence, e.g. from a DNA library. In **recombinant technology** genes or DNA sequences are cloned by inserting them into a bacterium or other microorganism, which is then selected and propagated.

cloning vector See **vector**.

clotting factor See **coagulation factor**.

cluster of differentiation A set of **monoclonal antibodies** that distinguish between cell surface antigens (CD antigen) on leucocytes, e.g. CD25 is the receptor for interleukin-2.

CMV cytomegalovirus.

cNOS constitutive **nitric oxide synthase**.

CNS See **central nervous system**.

coagulation factor Any of a group of blood proteins which are involved in **blood clotting**, e.g. Factor XII, fibrinogen, kallikrein.

coaxial bioassay A **bioassay** in which one type of tissue is set up within the lumen of another type, and is used to detect the release of mediators from one tissue to another tissue.

coccus (pl. cocci) Any spherical bacterium, e.g. *Staphylococcus, Streptococcus.*

coding sequence The **nucleotide sequence** in DNA or RNA that specifies a **polypeptide**.

coding strand The strand of the **DNA** molecule that acts as the template for **mRNA** synthesis.

codominant gene One or more **genes** that, when present together, specify a **phenotype** unlike that specified by any of the individual genes.

codon A sequence of three consecutive **nucleotide** bases that specifies for a particular amino acid.

coefficient of linear correlation See **correlation coefficient**.

coefficient of linear regression See **regression analysis**.

coefficient of variation (variation coefficient) A device to allow ready comparisons of variability between populations of very different means. It is the (standard deviation/mean), often expressed as a percentage.

coenzyme See **cofactor**.

cofactor Any non-peptide organic molecule necessary for the activity of a given **enzyme**.

cohort A group of individuals of the same age in a population.

colitis Inflammation of the colon or gut, possibly due to infection or **Crohn's disease**.

collagen A major structural fibrous protein of connective tissue.

colony-stimulating factor Any of a group of factors involved in the maturation of **leucocytes**. It includes **GM-C SF**, which is involved with the maturation of macrophages and neutrophils.

combination drug A formulation that contains more than one active agent.

commensal A microbe that colonizes its host without causing it harm.

Committee on Safety of Medicines (CSM) An independent body set up to give advice via the Medicines Control Agency (MCA), which administers the Medicines Act, to the licensing authorities under the Ministry of Health.

competitive anatgonism See **antagonism – pharmacodynamic**.

complement The group of globulin blood proteins involved in inflammatory and **immune responses**. They are involved in the lysis of foreign cells following **antibody** coating and promote foreign cell removal by phagocytic cells. Activation of complement results from a cascade reaction

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triggered by antigen-antibody complexes ('classical pathway') or by certain initiating surfaces ('alternative pathway'), e.g. microorganism-derived substances.

complementary DNA (cDNA; copy DNA) Single-stranded DNA synthesized by **reverse transcriptase** from an **RNA** template.

complementary medicine A general term that is sometimes applied to alternative, non-orthodox systems of medicine and healing, including herbal remedies, homoeopathy, faith healing, hypnosis, acupuncture and aromatherapy.

complement cascade See **complement**.

complement fixation The activation of the **complement system**, and binding of complement to an **antibody–antigen** complex.

complement fixation test A diagnostic test (e.g. for syphilis) where **complement** is added to a test system in order to determine the presence of **antibody** or **antigen** in the blood.

complement-fixing antibody **Antibodies** that fix or activate **complement** when they combine with their homologous **antigens**.

compliance The extent to which patient behaviour accords with medical advice, and in relation to drugs relates to the accuracy and frequency of taking prescribed medicines.

COMT catechol-*O*-methyl transferase.

ConA concanavalin A.

c-onc (proto-onc) A general term for the viral counterpart of a viral **oncogene** (e.g. c-myc for v-myc).

concentration ratio See **dose-ratio**.

concentration–response curve The relationship between concentration (or dose) and biological response. It is normally plotted with the y-axis scaled in terms of the maximum response seen with higher concentrations. With a linear concentration scale, it commonly takes a hyperbolic curve. With a logarithmic concentration scale the curve commonly takes the form of a symmetric sigmoid curve. The lateral position of the curve (location parameter) is an indication of absolute potency of the drug, usually quoted as the EC_{50}. The significance of the form of the curve in terms of receptor theory is noted elsewhere: see **Black & Leff model**; **Langmuir equation**; **logistic equation**; **semilog plot**.

conditioning Associative learning.

$(C_t)max$ The peak plasma concentration reached after a single dose of a drug.

confidence interval A statistic of precision, also useful for denoting on graphs the likely errors in estimates of sample means; see **standard error of the mean**. The 95% confidence interval is the most used, and indicates a probability of $P = 0.05$ that the true mean lies within that interval.

confluence The point at which cells in **culture** have formed a continuous sheet over the dish and have usually stopped dividing.

confocal scanning light microscope A special type of light microscope in which the linear resolution is superior to that obtained in conventional light microscopes.

conformational isomers See **isomer**.

confounding In statistics, the relationship between two or more variables may be obscured by a relationship with further unrecognized or uncontrolled variables. Such difficulties may often be avoided by careful experimental design and attention to sampling, sometimes at the price of loss of higher order information. Recognition of confounding is important in the interpretation of possible causal relationships in surveys and trials.

congenital Present at birth.

conserved sequence A **nucleotide** sequence in genetic material or of amino acids in a **polypeptide** chain that has remained virtually unchanged throughout evolution; usually taken to imply that the sequence has an important function, e.g. **promotor regions**.

constitutive Of an enzyme or receptor synthesized by the cell in the absence of any stimulus. See **inducible**.

constriction A narrowing or obstruction of a hollow organ, commonly applied to blood vessels (vasoconstriction). See VASOCONSTRICTORS.

contact sensitivity (contact dermititis) A type of **delayed hypersensitivity** in the skin.

contact dermitits See **contact sensitivity**.

continuous response (variable response) A variable that changes smoothly.

contralateral Pertaining to the opposite side.

controlled drugs Drugs that are designated as controlled drugs (under the UK Misuse of Drugs Regulations, 1985) because they are subject to social misuse, e.g. cocaine, barbituates.

cooperativity See **allosteric interaction**; **Hill equation**.

correlation coefficient A (**nonparametric**) statistical method to quantify the degree of linear association between two variables (also referred to as Spearman correlation or coefficient of linear correlation). If two variables x and y (normally plotted in the form of a **scatter diagram**), are perfectly related in such a way that y always increases when x increases, then the correlation coefficient (r) equals 1.0. If y perfectly decreases as x increases, then $r = -1.0$. The correlation coefficient has no units, and always is between -1 and +1. If there is a weak or no relationship between x and y, then r tends to zero, and a P value may be calculated in testing the null hypothesis that the population correlation coefficient equals zero (along with the confidence interval for the correlation coefficient). A high correlation coefficient does not necessarily imply a causal relationship between x and y, or y and x.

cosmid A type of **cloning vector**.

co-transmitter A **neurotransmitter** that is stored in, and released from, the same neuron as another neurotransmitter, e.g. NORADRENALINE and NEUROPEPTIDE Y in sympathetic neurons.

counter stain A second contrasting stain used to stain features that have not taken up the first stain.

covariance A parameter used to measure the extent to which two variables are related. When the variables are not at all correlated, then the covariance is zero. See **correlation coefficient**.

COX cyclooxygenase (enzyme).

COX-1 **Constitutive** form of cyclooxygenase enzyme.

COX-2 **Inducible** form of cyclooxygenase enzyme.

cranial nerve Any of 12 pairs of nerves that arise directly from the brain: I (olfactory); II (optic); III (oculomotor); IV (trochlear); V (trigeminal); VI (abducens); VII (facial); VIII (vestibulocochlear); IX (glossopharyngeal); X (vagus); XI (accessory); XII (hypoglossal). They comprise part of the **peripheral nervous system**.

CRF / CRH CORTICOTROPIN-RELEASING FACTOR.

Crohn's disease A chronic inflammatory disease of the gastrointestinal tract, which leads to **colitis**.

cryostat An instrument used to cut very thin slices of specimens, e.g. tissues.

CSF See **cerebrospinal fuid**.

CSF **colony-stimulating factor**.

CSF-1 MACROPHAGE-COLONY-STIMULATING FACTOR.
CSM Committee of Safety of Medicines.
C-terminus See **carboxyterminus**.
culture A nutrient-rich medium on which has grown a population of a particular type of cell or microorganism.
curie (Ci) A unit of radiation corresponding to an amount of radioactive material producing 3.7×10^{10} disintegrations per second (the activity of radium). Replaced by the SI unit the **becquerel** (1Bq = one disintegration per second).
Cushing's syndrome A disorder caused by raised levels of CORTICOSTEROID hormones in the bloodstream.
cutaneous Pertaining to the skin.
CVS cardiovascular system.
cyclic 3',5'-adenosine monophosphate (cAMP A **second messenger** molecule, a nucleotide produced from **ATP** by the action of the enzyme **adenylyl cyclase**, and inactivated by **phosphodiesterase** enzymes to 5'-AMP. Many mediators and drugs cause their effects by increasing or decreasing the activity of adenylyl cyclase, and thus concentration of cAMP in the cell. cAMP has its effects by activating **protein kinase** enzymes.
cyclic AMP (cAMP) See **cyclic 3',5'-adenosine monophosphate**.
cyclic AMP-dependent kinase See **cAMP kinase**.
cyclic guanosine monophosphate A **second messenger** molecule formed from guanosine monophosphate by the enzyme guanylyl cyclase on **G-protein** receptor activation.
cyclic nucleotide See **cAMP**; **cGMP**.
cycloplegia Paralysis of the ciliary muscles of the eye.
cystitis Inflammation of the inner lining of the bladder.
cytochrome Any of the group of respiratory protein pigments that function as electron carriers in biological oxidation. Usually found in the mitochondria.
cytokine Any of a group of peptides that are soluble mediators involved in regulatory **inflammatory** and **immune responses**. Includes interleukins 1–10, interferons, colony-stimulating factors and various growth factors.
cytotoxic T-cell (cytolytic T-cell; Tcyt) A **T-lymphocyte** that lyse cells that bear **antigens** for which the T-cell is specific for.
Da **dalton**.
DAF See **delay-accelerating factor**.
Dale–Schultz reaction See **Schultz–Dale reaction**.
dalton (dal; Da atomic mass unit) The unit of atomic mass used as a unit to express molecular mass. Equal to 1 on the atomic mass scale.
dansyl chloride A reagent that reacts with amino acids and proteins to form derivatives that show intense yellow fluorescence under UV irradiation.
dark field microscopy A type of microscopy used for studying living cells which produces an illuminated object on a dark background.
deamidase An enzyme that catalyses the removal of an amido group from a compound.
deaminase An enzyme that catalyses the hydrolysis of amino compounds.
deamination Removal of an amino group ($-NH_2$).
decarboxylase An enzyme that hydrolyzes the carboxyl radical, -COOH.
deficiency (deletion) The absence, or inactivation of a **gene** or segment of **chromosome**.
degenerative disease Where a disease is caused by tissue deterioration.
degranulation The release of granules and mediators from mast cells and certain basophil **leucocytes** during **inflammation**.
degrees of freedom The number of independent comparisons that can be made from samples (often n-1, where n is the number of observations).
delay-accelerating factor (DAF) A membrane-bound glycoprotein that binds activated complement components C3b and C4b and thereby inhibits further action of **complement**.
delayed hypersensitivity See **type IV hypersensitivity**.
deletion mutation A type of mutation in which one or more **nucleotides** are lost from the **genome**.
dementia A progressive decline in all areas of mental processes which is usually the result of organic brain disorder, the most common being Alzheimer's disease.
demyelination The breakdown of **myelin**, the fatty sheath that surrounds and electrically insulates nerve fibres. A characteristic of multiple sclerosis.
denaturation The structural and functional changes to globular protein or nucleic acid in solution, brought about by extremes of heat, pH, some chemicals or X-rays.
dendrite A short branching process of the neuronal cell body which synapses with other neurons.
dendrite cells Mobile, non-phagocytic cells derived from bone marrow and which come specialized for particular functions.
denervation Where a nerve supply to a particular structure or structures has been interrupted.
density gradient centrifugation See **ultracentrifugation**.
deoxyribonuclease (Dnase; DNAse) An enzyme that depolymerizes **DNA**.
deoxyribonucleic acid (DNA) A **nucleic acid**, a large linear molecule, made of two complementary chains of deoxyribonucleotides. Each **nucleotide** consists of one of the bases adenine, guanine, cytosine and thymine. It is the physical carrier of genetic information.
deoxyribophage A bacteriophage with a **DNA genome**.
deoxyribovirus A virus with a **DNA genome**.
dependence A state (addiction) where regular, repeated and probably excessive taking of a drug causes the individual to become accustomed to it, resulting in detrimental effects. Stopping dosing precipitates a **withdrawal syndrome**, which may have marked psychological and/or physical symptoms. See also **habituation**.
dephosphorylation The removal of a phosphate group, e.g. of a protein by a **phosphatase** enzyme.
depolarization The reduction in electrical potential difference across a membrane.
depot formulation Usually intramuscular injection of a specially formulated drug which is released slowly and steadily into the blood. See **routes of administration of drugs**.
depression A mental state characterized by extreme sadness, hopelessness and pessimism. See ANTIDEPRESSANTS.
depressor To lower blood pressure. See also ANTIHYPERTENSIVES; HYPOTENSIVES.
dermal Relating to the skin.
dermatitis **Inflammation** of the skin.
descending Extending or directed downward or caudally.
desensitization In pharmacology, is a decreased responsiveness to a drug on repeated administration. The term is used for short time-scale changes (seconds to minutes), and the term **tolerance** is reserved for longer time-scales (hours to days). Homologous desensitization refers to

desensitization confined to one receptor or effector system, whereas heterologous desensitization is a more generalized phenomenon.

designer drugs Drugs of abuse made specifically for the illegal drug market.

determinant (antigenic determinant; determinant group) See **epitope**.

dextral On or pertaining to the right.

dextro- A prefix denoting the right side.

dextro-isomer See **isomer**.

diabetes insipidus A rare metabolic disorder characterized by excessive production of dilute uric acid caused by a deficiency of the hormone VASOPRESSIN.

diabetes mellitus A metabolic disorder of carbohydrate metabolism in which sugars are not oxidized to produce energy due to a lack of the hormone INSULIN, leading to hyperglycaemia. See ANTIGLYCAEMIC AGENTS.

diacylglycerol (DAG) A **second messenger** cleavage product of phospholipase C activity following receptor activation on phosphatidyl inositol bisphosphate (PIP_2). It activates protein kinase C when bound to Ca^{2+} and phosphatidyl serine, and is readily converted to arachidonic acid.

dialysis Separation of substances in liquid by virtue of differences in their capacities to pass through membranes. Haemodialysis is used in medicine to separate low molecular weight compounds (e.g. toxins, or drugs and their metabolites in overdose) from blood. Peritoneal dialysis is a procedure used in drug overdose, in which saline solution is perfused continuously through the peritoneal cavity.

diapedesis Migration of cells, e.g. leucocytes, through the walls of blood vessels into the surrounding tissue during inflammation.

diastole (ventricular diastole) The period between two contractions of the heart when both atria and ventricles are relaxed and the heart refills with blood from the veins; see also **systole**.

diesterase An enzyme that splits esters, including the linkages between the **nucleotides** of a nucleic acid e.g. a nuclease.

differential centrifugation See **ultracentrifugation**.

differential leucocyte count (differential blood count) The determination of the proportions of the different types of **leucocytes** in a sample of blood used in the diagnosis of disease.

differentiation A term used in embryology to describe the process in cell development where cells become specialized for particular functions. In **oncology**, the term describes the degree of similarity of **tumour** cells to the structure of the organ from which the tumour arose.

diffusion The movement of molecules of a substance from an area of high to low concentration.

dilatation (dilation) A widening of a hollow organ, commonly applied to blood vessels (**vasodilation**). See VASODILATORS.

dilator A drug or mediator that causes dilatation of a hollow organ.

dimorphism Where two clearly separable forms exist.

dinoflagellates A group of mainly single-celled algae or protozoa that are equipped with flagella. A number that are found in seawater produce powerful **toxins** (e.g. SAXITOXIN).

dioestrus (diestrus) The quiescent period following ovulation in the mammalian oestrous cycle.

dipeptide The compound formed when two amino acids are joined together by a peptide bond.

diphasic See **biphasic**.

diphtheria A bacterial infection caused by *Corynebacterium diphtheriae* which typically affects the throat and can cause fever and fatal complications. Mass **immunization** has made this serious disease rare.

diploid Where each **chromosome** except the Y sex chromosome is represented twice, i.e. organisms whose cells have two copies of the genetic complement of that species. See also **haploid**.

displacement analysis A form of **radioligand-receptor binding** where the characteristics of an unlabelled drug can be determined by analysis of its ability to compete with the binding of a drug of known properties which is radiolabelled. See **Cheng–Prusoff analysis**.

dissociation constant The equilibrium dissociation constant for a reversible reaction can be used as a measure of **affinity** of a ligand for a receptor. The term affinity is usually quoted with the dissociation constant arranged so $K_d = k_{off}/k_{on}$ (units, M^{-1}). By convention, K_A often denotes the constant for an agonist, whereas K_B is that for an antagonist. However, sometimes in pharmacology, particularly in older papers, affinity denoted K_A is taken to mean the equilibrium association constant ($1/K_d$; units M).

distribution (of a drug) How a drug is distributed in the body following absorption.

distribution-free tests See **nonparametric tests**.

diuresis The increased secretion of urine by the kidneys. See DIURETICS.

diurnal Occuring every day.

diurnal rhythm See **circadian rhythm**.

diverticular disease A disorder characterized by the presence of small pouches or sacs protruding into the intestine, commonly the colon. Diverticulosis is when inflammation is present, and when severe can then perforate the wall of the bowel. Treatment is surgical, and with drugs.

division The taxonomic group immediately above that of **class** (and more inclusive) and below **kingdom** in botany. It corresponds to the category **phylum** in zoology.

dl racemic mixture (**isomers**).

DMSO dimethylsulphoxide; a non-ionized polar solvent used as a cryoprotectant in freezing and as a solvent for both **hydrophilic** and **lipophilic** substances.

DNA **deoxyribonucleic acid**.

DNA cloning The isolation and multiplication of a particular **gene**. See **PCR**.

DNA fingerprinting (genetic fingerprinting) The use of a pattern of DNA fragments obtained on restriction analysis of certain highly variable repeated DNA sequences, e.g. **tandem repeat sequences** which are virtually unique to an individual. This DNA 'profile', which can be detected in minute amounts of cells (e.g. in blood or semen), can be used in criminal cases and paternity suits.

DNA homology The degree of 'relatedness' between base sequences in different DNA molecules or different parts of the same molecule.

DNA hybridization A technique involving reassociation of complementary DNA or RNA in order to identify and isolate chosen DNA or RNA molecules from a mixture. See **in situ hybridization**.

DNA library See **library**.

DNA ligase An enzyme that acts on double-stranded DNA to join DNAs end to end and to repair 'nicks' in the DNA backbone. Used experimentally in **genetic engineering**.

DNA polymerase Any of several enzymes which polymerize deoxyribo nucleotides, i.e. catalyses DNA synthesis.

DNA probe A known, short, labelled DNA sequence

introduced to DNA in order to detect **complementary DNA** sequences through DNA hybridization techniques.

DNA profiling See **DNA fingerprinting**.

DNA replication The mechanism by which a new copy of DNA is made.

DNAse deoxyribonuclease.

DNA sequencing The determination of the sequence of **nucleotides** in a length of DNA.

DNA splicing The rearrangement of DNA sequences into different combinations which can occur naturally, or experimentally in **genetic engineering** procedures.

DNA synthesis See **DNA replication**.

dolar Pain; one of the classic signs of **inflammation**.

dolorimetry The measurement of pain.

domain A structurally defined compact globular section of a protein molecule.

dominant allele The member of a pair of **alleles** which is phenotypically indistinguishable in both homozygous and heterozygous condition.

dorsal Relating to the back of the body.

dorsilateral Pertaining to back and sides.

dorsispinal Pertaining to back and spine.

dorsoventral Extending from the back (dorsal) surface

dose The amount of a drug administered which is a critical amount in order to achieve the desired therapeutic effect without unnecessary adverse effects or side-effects. An initial (loading) dose may be administered, followed by a smaller maintenance dose given at regular intervals appropriate to the particular drug and for the individual and metabolism and excretion (**pharmacokinetics**) in a particular patient.

dose-ratio (concentration-ratio) Is defined as the factor (x) by which the dose of an agonist must be increased in the presence of an antagonist, so as to obtain the same magnitude of response as in the absence of the antagonist. With a competitive antagonist at equilibrium, the **null method** supposes that receptor occupancy by the agonist is equal in the two states. See **Gaddum–Schild equation**; **pAx**; **Schild-plot**.

dose-response curve See **concentration-response curve**.

dosimetry Calculation of appropriate **doses** for given conditions.

dot-blot A variation on Southern hybridization used to quantify a given nucleic acid sequence. See **Southern blot technique**.

double-blind See **clinical trials**.

double-reciprocal plot See **reciprocal plot**.

down-regulation A decrease in rate of production, or of number, e.g. following receptor desensitization.

drachm A unit of weight used in pharmacy, 1 drachm = 3.883g (60 grains) or volume, 1 fluid drachm = 3.696ml ($^1/_8$ fl oz).

dragee A pill that has been coated with sugar.

Draize test A test for topical mucosal toxicity.

DRG **dorsal root ganglion**.

drip See **routes of administration of drugs**.

drug Any substance that affects the structure or functioning of a living organism.

drug dependence See **dependence**.

drug interactions Said to occur when one drug changes the magnitude of effect or duration of action of another.

drug resistance Decreased reactivity to a certain drug type.

drug screening Assessing chemical agents for a given type of pharmacological activity in a suitable test system.

ds double stranded.

ductless gland See **endocrine gland**.

Dunn's post test A statistical multiple comparison test used *post hoc* after certain other multiple group tests (e.g. **Kruskal-Wallis**) to narrow down which groups are significantly different from which other groups.

duodenal ulcer See **peptic ulcer**.

duplicate genes Two identical **genes** that display the same **phenotypic** action, but occur on different chromosomes.

dura The thickest and outermost of the three meninges surrounding the brain and spinal cord.

-dynia A suffix denoting pain.

dys- A prefix meaning abnormal, disturbed or impaired.

dyscrazia A term that formerly referred to any disease state, but now is used only in relation to blood diseases for adnormalities of blood cells or their numbers (e.g. agranulucytosis, thrombocytopenia). A number of drugs cause blood dyscrazias as **adverse drug effects**.

dyskinesia Abnormal muscle movements, such as jerking and twitching; e.g. **tardive dyskinesia**.

dysmenorrhoea The term used for pain or discomfort just before or during menstrual periods. See also **amenorrhoea**.

dysphoria A feeling of discomfort or lack of well-being. See **euphoria**.

dysrhythmia See **arrhythmia**.

dystonia A disorder of skeletal muscle tone (either increased or decreased) causing abnormal positions and movements. It is sometimes caused by disorders of the basal ganglia of the brain due to adverse drug reaction (e.g. ANTIPSYCHOTICS). See also **extrapyramidal disorders**; **tardive dyskinesia**.

Eagle's medium Any of a number of media used in **tissue culture**.

Earle's BSS Earle's **balanced salt solution**.

early gene A **gene** that is expressed early in development.

EBV Epstein–Barr virus.

EC_{50} The concentration of a drug causing 50% of the maximum biological effect. It is commonly used interchangeably with ED_{50}; but where the concentration is known, it is best to use EC_{50}, (preferably as molar concentration) and reserve ED_{50}, for where a dose has been given (as *in vivo* systems). Also, for EC_{50} the response will generally be graded, whereas for the ED_{50}; the response may well be quantal.

EC_{50} effective concentration/dose in 50% of subjects

ECE endothelin-converting enzyme.

eclampsia A condition of late pregnancy, or during or directly after delivery, characterized by convulsions (and preceded in pre-eclampsia by **hypertension**, **oedema** and **proteinurea**.

ectopic Not in its correct or normal position.

eczema An **inflammatory** condition of the skin, usually due to an **allergic reaction**.

ED effective dose.

ED_{50} effective dose in 50% of subjects.

edema See **oedema**.

EDRF endothelium-derived relaxing factor.

EDTA ethylenediaminetetraacetic acid; used as a **chelating agent**. See also ANTICOAGULANTS.

effective concentration See **EC_{50}**.

effector A cell or organ by which an animal responds to internal or external stimuli.

efferent Leading away from; e.g. nerves that take

information from the CNS to the periphery.

efferent function of primary afferents A term used to describe a newly identified function of primary afferent **sensory nerves**, where release of transmitters from the peripheral ('wrong') end of the nerve has a function, e.g. **neurogenic inflammation**.

efficacy In relation to drug effects, is a term used to describe the strength of a drug's action. In therapeutics it is taken to be the capacity of a drug to produce the desired effect or result (e.g. the extent to which pain is relieved). In receptor pharmacology, it is the mathematical term that Stephenson (1956) introduced for a parameter, efficacy (e), which is proportionality constant relating the **stimulus**, produced by an **agonist** on occupying the receptor, to the subsequent biological responses. In the equations: $R = f(S)$ and $S = e.p$, R is the biological response, S is stimulus, e is efficacy, p is the proportion of receptors occupied, and f denotes some simple function. According to this formulation, the ability of an agonist to produce a response at a given level of receptor occupancy depends both on e and on the receptor density. The concept is an advance on that of **intrinsic activity**, and it may take values varying between zero for an antagonist, through small positive values for partial agonist, to larger positive values for a full agonist. Its use in modelling has been extended in intrinsic efficacy.

efflux The movement of an entity across a defined barrier or out of a specialised compartment.

EGF epidermal growth factor.

EIA enzyme **immunoassay**. See **ELISA**.

eicosanoids A family of fatty acid mediators derived from arachidonic acid, and which includes prostaglandins, thromboxanes and leukotrienes.

ejp excitatory junction potential.

elastin A major connective tissues protein in blood vessels.

electroblotting A form of **blotting** where transfer of the nucleic acid or protein of interest from the gel is effected by **electrophoresis**.

electrochemical gradient The gradient across a cell membrane with respect to an ion or other solute. It comprises both the electrical and concentration gradients.

electrogenic Generating an electrical potential across a membrane.

electrogenic transport The transport of molecules across an energy-transducing membrane leading to a change in the potential difference across the membrane.

electroinjection The introduction of substances, including DNA into intact cells by means of electric field impulses.

electrolyte A solution that produces ions.

electron microscopy A form of microscopy where an electron beam interacts with a specimen and thereby contributes to the formation of an image.

electrophoresis Methods of separating molecules, on the basis of their electrical charge and size, and hence different migration characteristics in an electric field. There are several types, e.g. free electrophoresis where the molecules are present in a liquid medium, surface electrophoresis when the molecules move through a thin film of buffer on a strip of e.g. cellulose acetate or paper, and gel electrophoresis where the molecules in the sample move through a gel, often composed of agarose or polyacryemide.

electrophysiology The study of physiological processes in relation to electrical phenomena.

elimination The removal of the active form of a drug from the body. See **excretion**.

ELISA enzyme-linked immunosorbent assay; an assay where **antibodies** are used to measure a particular substance following its labelling by an **enzyme**. See **immunoassay**.

elixir A medicated liquid preparation for taking by mouth, which is intended to disguise a potentially unpleasant taste by including a sweetening substance like glycerol or alcohol, and often with aromatic agents.

elongation factor Proteins required for polypeptide chain elongation during protein synthesis.

elution The washing out of a substance by a solvent, e.g. in **chromatography**.

E_m molar extinction coefficient (concentration in g-moles/e).

EM electron microscope.

EMBA European Medicines Evaluation Agency.

embedding A process by which permanent microscope slides or specimens for **electron microscopy** are prepared.

embolism A condition where a blood clot (thrombus) or other tissue lodges in an artery to obstruct blood flow. There are various types according to the area obstructed (e.g. pulmonary embolism in the case of the lung). Treatment is by surgery, or with drugs that can dissolve blood clots (FIBRINOLYTICS or thrombolytics), or prevent formation of further clots (ANTICOAGULANTS).

embolus A blood clot, particle of tissue or pus which when carried in the bloodstream can effect a distant site. See **embolism**.

embryotoxicology The property of causing damage to the embryo in the period of development of the foetus (organogenesis) up to about 12 weeks of gestation.

emesis Vomiting; see ANTIEMETICS.

emphysema A lung disease where there is damage to the alveoli of the lungs (which are tiny air sacs in which oxygen exchange with the blood takes place), resulting in shortness of breath. It is often accompanied by chronic **bronchitis**, and can in turn lead to heart failure and respiratory failure. It is generally due to smoking, but exacerbated by air pollution (and a genetic predisposition in some individuals). The damage to the alveoli cannot be repaired, but symptomatic relief maybe given by BRONCHODILATORS, CORTICOSTEROIDS and DIURETICS.

empirical Based on or acting on observation or experiment and not on theory. In chemistry, it means the formula showing the constituents of the compound in proportions but not configuration.

enantomers See **isomers**.

encephalopathy Any of a group of disorders that affect the functioning of the brain.

encode The assigning of **DNA bases** such that they represent the sequence of a given protein.

endemic Disease present in a population at low levels all the time.

endo- A prefix meaning within.

endocarditis Inflammation of the endocardium (the lining of the heart). It occurs usually where there has been damage due to congenital heart disease or rheumatic fever, and where the immune system is damaged (as in AIDS). Endocarditis may be caused by a number of microorganisms, including bacteria and fungi, particularly after dental extractions and heart surgery. Antibiotics may be used both prophylactically and in treatment.

endocrine gland A ductless gland secreting **hormones** directly into the blood.

endocrine system Endocrine glands and the blood-borne **hormones** they secrete.

endoenzyme An **enzyme** that cleaves bonds *within* a

polymer chain.

endogenous Produced within the body; in contrast to **exogenous** agents which are administered to the body. Some agents (e.g. hormones, local hormones, neurotransmitters), though formed endogenously, may be administered exogenously as drugs.

endometriosis The abnormal presence of tissue similar to the endometrial lining of the uterus in various sites within the pelvis. The abnormal tissue may undergo similar responses to hormones as the endometrium, causing pain and **dysmenorrhoea**. Treatment is with hormone antagonists and/or surgery.

endometritis Inflammation of the endometrium of the uterus.

endometrium The mucous membrane layer lining the uterus within the muscle layer (myometrium).

endoneurium Connective tissue surrounding bundles of **nerve fibres** together in a nerve.

endonuclease See **restriction endonuclease**.

endopeptidase An enzyme that hydrolyses **peptide bonds** and thereby splits a peptide into smaller fragments. See ENDOPEPTIDASE INHIBITORS.

endothelium The tissue that lines the blood vessels, heart and lymphatic ducts. See **epithelium**.

endotoxic shock A serious life-threatening fall in blood pressure with cardiovascular collapse due to the release of **endotoxin** from the cell wall of dead microbes.

endotoxin A toxic component of a living microbe's structure that is generally released on the death or disruption of the microbe. Although generally less toxic than **exotoxins**, they account for a number of adverse effects of bacteria, including **pyrogenesis** and increased capillary permeability (e.g. in **endotoxic shock**).

end-plate Where a nerve fibre terminates with a muscle fibre.

enema An infusion of liquid into the rectum, via the anus, as a method of administering laxatives, diagnostic agents (e.g. radio-opaque agents) or therapeutic drugs to act locally (e.g. steroids in **colitis**), or sometimes agents for absorption for systemic effects (paraldehyde as an antiepileptic).

enhancer gene A modifier **gene** that enhances the action of a non-allelic gene.

enteral Pertaining to the intestinal tract.

enteral drug administration Administration of a drug by the alimentary tract, mouth or rectum.

enteric-coated tablets These are tablets covered with a layer (originally shellac varnish) that dissolves slowly. They are intended to prevent release until the tablet has left the stomach, where the active drug is gastro-irritant (e.g. aspirin) or is broken down by gastric juices.

enteric nervous system The intrinsic nervous system in the hollow organs (see **intrinsic nerves**), especially the gut, which includes all neurons with cell bodies within the various neuronal plexi. It forms a division within the **autonomic nervous system**. In the gut there are neurons with motor, sensory and associative function, so it has simple attributes of the CNS, and can be used as an experimental paradigm of it.

enterotoxins These cause gastroenteritis and related toxic effects in the alimentary tract. They are usually **exotoxins** elaborated by microbes contaminating ingested food or living within the gut.

enucleate Lacking a nucleus.

enzyme A biologically active protein catalyst, many of which are important drug targets e.g. ACE INHIBITORS.

eosin A red/brown acid dye used experimentally to stain **eosinophils**.

eosinophil A **PMN** that contains basic polypeptides in the cytoplasm and so stains red with the acidic dye eosin. Eosinophils are involved in the **immune response**, e.g. to parasitic infection.

eosinophil chemotactic factor A peptide released from mast cell granules that stimulates **chemotaxis** of **eosinophils**.

eosinophilia An increase in the number of eosinophils in the blood.

epi- A prefix meaning above or upon.

epidemic disease Those diseases occuring or tending to occur in extensive outbreaks, or in unusually high incidence in certain times or places.

epidemiology A term originally used to denote the study and control of epidemic disease, but is now often broadened to mean the study of the occurrence and distribution of all diseases in a population.

epidural The space between the dura mater and wall of the vertebral canal around the spinal cord.

epilepsy A group of CNS diseases characterized by a tendency to recurrent seizures ('fits'), usually of sudden onset. There are various schemes of classification: grand mal – a generalized seizure in which the patient falls down unconscious; petit mal (absence seizures) – generalized seizure characterized by momentary loss of consciousness without abnormal movements; simple partial seizures – where consciousness is maintained during a partial physical seizure, including Jacksonian epilepsy, where twitching occurs and spreads across the body in a pattern; complex partial seizures (temporal lobe epilepsy) – where conscious contact with surroundings is lost and there may be stereotyped abnormal behaviour. Status epilepticus is an extension of one of these conditions to prolonged or repeated epileptic seizures without periods for recovery, and is a medical emergency. Treatment of some of these is with appropriate ANTIEPILEPTICS; see also ANTICONVULSANTS.

epineurium The fibrous connective tissue sheath around a nerve.

epithelium (pl. epithelia) The tissue that covers the entire external surface of the body and lines the hollow organs of the body (except blood vessels). See **endothelium**.

epitope Any region on an antigenic macromolecule with the ability to elicit and combine with specific **antibody**.

epp end-plate potential

equilibrium dissociation constant See **dissociation constant**.

equilibrium potential The potential at which a particular ion type passes equally in both directions across a cell membrane.

equipotent molar ratio (EPMR) For series of drugs, is the ratio of the molar concentrations required to give the same effect. If the EC_{50} values for three agonists A, B and C are 1, 10 and 100 nM, respectively, then the EPMRs for B and C, relative to A=1.00, are 10.0 and 100, respectively. Thus, the higher the index, the lower the potency of that drug. It is the reciprocal of the relative activity or relative potency. The measure is useful in denoting the concentration required to achieve a given response, occupancy etc. See **activity ratio**.

ER endoplasmic reticulum.

error In statistics there are different types of error and consequences. Type I error is a false positive result, where a difference is treated as significant when in fact there is no real difference. Type II error is a false negative result, where a

difference is treated as insignificant when in fact there is a real difference.

erythema Redness of the skin.

erythr- A prefix meaning redness.

erythroblast Nucleated cell of bone marrow which gives rise to **erythrocytes**.

erythrocyte A red blood cell.

erythrogenic Producing reddening.

erythropoiesis The production of **erythrocytes**.

erythropoietin A **hormone** that stimulates the final differentiation of **erythrocytes** from precursor cells.

esoteric Arising with the organism.

essential Substances that cannot be synthesized by the body (e.g. certain amino acids, fatty acids).

essential drugs Medicines 'listed' by the WHO as a common core of basic drugs (currently about 300).

established cell line (continuous cell line) A population of cells capable of unlimited *in vitro* propagation.

estrogen See **oestrogen**.

ethics committees Independent bodies concerned with advising over ethical considerations arising in medicine, and which also play an essential part at the planning stage of clinical trials.

ethnopharmacology (or pharmacoanthropology) The identification and investigation of traditional medicines.

eukaryte An organism whose cells possess a membrane-bound nuclei in which the DNA is organized into chromosomes. See **prokaryote**.

euphoria A feeling of confident well-being, the opposite of **dysphoria**. It can be induced by some opioids, such as morphine, and prolonged use of glucorticosteroids.

European Pharmacopoeia (Eur. P.) This lists official preparation of drugs, like the British Pharmacopoeia (BP). The BP and EP are likely to converge in their coverage.

exipient A normally inert substance added to a medicine to make it of a more suitable form for administration (e.g. Soya flour in tablets, wax in pills).

excitory amino acids See **amino acids**.

excretion (of a drug) The way in which a drug is removed from the body; usually by the kidneys, hepato-biliary system or the lungs.

exo- A prefix meaning from.

exocrine gland A gland that secretes substances through a duct (e.g. the salivary glands), usually under the control of hormones or neurotransmitters. See also **endocrine gland**.

exocytosis The process by which secretory granules or vesicles fuse with the cell membrane and release their contents from the cell.

exogenous Originating outside an organism. See also **endogenous**.

exon The **codon**, the sequence of **bases** in **DNA**, that encodes for a particular amino acid. See also **intron**.

exoreceptor The postulated binding site adjacent to a **receptor** to which a drug molecule can bind and influence the interaction between the drug molecule and the receptor (e.g. binding of the long-acting β-adrenoceptor agonist SALMETEROL to the β-adrenoceptor).

exorphin An opioid formed outside the body, e.g. the opiate MORPHINE.

exotoxin A poison actively elaborated by a living microbe and secreted into its environment, and therefore is the counterpart of **endotoxin**. They are generally very potent heat-sensitive proteins comprised of an active toxic A moiety and a B inactive binding moiety. Some that are active on neural processes are termed **neurotoxins**, whereas those causing gastroenteritis are termed **enterotoxins**. Examples of exotoxins include: clostridium toxin (*Clostridium tetani*) in bolulism food poisoning; pertussis toxin (*Bordetella pertussis*) causing some side-effects in whooping cough; cholera toxin (*Vibrio cholerae*) in cholera; and diphtheria toxin (*Corynebacterium diphtheriae*) in diphtheria.

exponential curve/relationship Curves of this form are of a class where a variable approaches an **asymptote** at a continuously declining rate. The rate of exponential decline is proportional to the size of the variable at any time. From this it follows that there is a fractional decrease per unit time, and this can be expressed in terms of a time-constant (k), commonly quoted as a **half-life** ($t_{1/2}$) (where $t_{1/2} = 0.6993/k$). An example of exponential decline is the decay of radioactive species, and of exponential growth, that of microorganisms at low concentrations in culture.

expression In molecular biology, is the production of a protein from a particular **gene**.

expression vector A cloning **vector** in which **DNA** is cloned and expressed.

extra- A prefix meaning located outside.

extraction ratio The rate, between 0 and 1, of extraction of a drug by an organ relative to its rate of entry.

extrapyramidal disorders (of movement) These are caused by several pharmacological groups as an **adverse drug reaction**; commonly a foreseeable side-effect, which may be difficult to avoid with higher dose-schedules. The syndrome is due to effects of drugs on the basal ganglia and associated structures within the brain (*corpus striatum* and *substantia nigra*), and is most commonly incurred with ANTIPSYCHOTIC drugs, such as phenothiazines working as dopamine-receptor antagonists. See also **tardive dyskinesia**.

extravasate The forcing of fluid, e.g. blood **plasma**, from its proper channels, e.g. venules, into the surrounding tissue.

extravasation See **plasma extravasation**.

extrinsic Lying outside, for example, an organ. See **extrinsic nerves**.

extrinsic Of an organ, those nerves with their cell bodies outside an organ, i.e. nerves that completely degenerate after denervation of the organ.

exudation The slow escape of liquid exudate containing proteins and **PMN**s through intact blood vessels.

Fab portion (Fab fragment) That part of the **antibody** molecule containing the antigen binding site.

facilitated diffusion **Carrier-mediated transport** of molecules along a concentration gradient across the cell membrane with no expenditure of energy.

facilitation Increase in responsiveness of a post-synaptic membrane to successive stimuli.

FACS fluorescence-activated cell sorter.

factorial design A method for studying effects and interactions between treatments and subjects. Having its origins in agricultural field trial, all combinations of treatment, subjects etc. under investigation are allocated into blocks. Factorial analysis shows whether factors are independent or not, and yields unbiased estimates of effects of treatments.

false transmitter A chemical that replaces a normal substrate or metabolite in the synthesis of a **neurotransmitter**, e.g. METHYLDOPA which produces methylnoradrenaline.

familial diseases Any of many diseases found in some families, but not others, which are largely genetically caused.

family The taxonomic group immediately above that of **genus** and below **order**.

favism An inherited defect in the enzyme glucose-6-phosphate dehydrogenase.

Fc receptor Present on some cells including macrophages and is the receptor to which the constant region of **antibody** heavy chains (the Fc region) attaches.
FDA Food and Drug Administration.
fever See **pyrexia**.
FGF fibroblast growth factor.
fibrin Insoluble protein which forms the clot produced by the action of **thrombin** on fibrinogen during **blood clotting**.
fibrinogen The soluble blood plasma protein of **fibrin**.
fibrinolysis Dissolving of blood clots. See **blood clotting**.
fibroblast Connective tissue cell involved in the synthesis and secretion of components of the extracellular matrix, e.g. of **collagen**.
fibronectin A **cell-adhesion molecule**, a glycoprotein located on the external surface of the plasma membrane of most animal cells. Involved in cell-substratum interactions.
Fisher's exact test A method of analysing frequency data, for instance in a 2x2 contingency table where the two columns must represent mutually exclusive categories, as must the two rows. The null hypothesis is that there is no association between the variable defining the row and the variable defining the column. The test is of value in evaluating the presence, or absence, of association between qualitative characteristics.
FITC fluorescein isothiocyanate; a **fluorochrome** that fluoresces greenish yellow.
FITC-dextran **FITC** complexed to dextran used for observation and quantification, e.g. plasma extravasation.
fixation A method using a **fixative** to kill cells but to preserve their structure and organization. A stage in microscope slide preparation.
fixative A chemical used to preserve cells and cellular structures, e.g. formaldehyde.
FLAP 5-lipoxygenase activating protein.
flora The entire plant or bacterial life particular to a given part of the body or geological region.
fluorescein A **fluorochrome**.
fluorescent dye A dye that can fluoresce. See **fluorochrome**.
fluorimetry (fluorescence spectrophotometry) The measurement of the intensity of emitted light of a light-activated **fluorophore** to determine concentration of a fluorescent-labelled compound.
fluorochrome A fluorescent dye, e.g. **acridine orange**, **FITC**, used in experimental biology to label biologically active molecules, e.g. as a **probe** or **tracer**.
Food and Drug Administration (FDA) The USA authority concerned in evaluating evidence of drugs safety and efficacy, clinical trials and the general process of drug registration. Its regulations have an international impact.
formulary A book (or increasingly a computer database) that details formulations or doses of drugs, e.g. the *British Pharmacopoeia*.
formulation The pharmaceutical term for the mode of presentation of a medicine, e.g. capsule, tablet, pill, cream, lotion, emulsion, solution, pessary, suppository, form for injection and so on. Modern medicines are often quite complex and sophisticated products that are stable, have reliable **bioavailability** and acceptability (taste etc.).
FPLC fast protein liquid chromatography.
FRAME Fund for the Replacement of Animals in Medical Experiments.
free-radical An atom or molecule that has an independent existence with an unpaired electron. They are highly reactive and usually have a brief lifetime (microseconds), examples include reactive oxygen and nitrogen species, **superoxide radicals** (O_2^-). Reactive oxygen radicals can attack key molecules, e.g. enzymes, DNA and membrane lipids, and contribute to some diseases.
free-radical scavenger A chemical that reacts with **free-radicals**. Examples include vitamins E and C, **superoxide dismutase** and catalase.
freeze drying (lypholization) Removal of volatile substances, e.g. water from deep frozen material by sublimation under high vacuum to preserve that material, e.g. peptides.
freeze-fracture A specimen-preparation method used to enable the interior of a cell to be visualized in electron microscopy.
frequency distribution A graph or table showing the frequency with which a characteristic occurs in a sample or population. The shape of the resultant curve is bell-shaped in Normal (Gaussian) distributions, and peaks in a less symmetrical way (skewed-to-the-right) with binomial and Poisson distributions. The peak represents some central tendency and can be represented in the form of some average (mean, median). See also **probability distribution**.
Freund's complete adjuvant A complete water-oil emulsion containing a killed microorganism which enhances **antigenicity**. It is used experimentally to induce an **immune response**. Freund's *incomplete* adjuvant does not contain the microorganism.
Friedman test A (**nonparametric**) **significance test** that compares the medians of three or more paired samples. The null hypothesis is that all column medians are equal. It yields a *P* value in testing this null hypothesis, which if low, leads to the conclusion that the samples are unlikely to come from populations with equal medians. The test assumes that the data are sampled from populations with similar distribution characteristics (which may not be Gaussian).
FSH FOLLICLE-STIMULATING HORMONE.
full agonist See **agonist**.
functional antagonism See **antagonism – functional**.
Freund's incomplete adjuvant See **Freund's complete adjuvant**.
GABA γ-AMINOBUTYRIC ACID.
Gaddum–Schild equation Gaddum (1937) solved the equations quantifying the actions of competitive antagonists acting at receptors using the **null method**, where the **dose-ratio**, *x*, can be defined as the ratio of concentrations of agonist giving equal occupancy of receptors – and hence equal responses – in the absence and presence of competitive antagonist. It could then be shown that $(x\text{-}1) = [A]/K_d$ where K_d is the equilibrium dissociation constant and [A] the concentration of the antagonist.
Galenical medicines These are medicines that contain natural, normally herbal, constituents following the methods of Galen, the 2nd-century AD Greek physician.
gamete See **germ cell**.
gamma globulin Any of a group of blood serum. proteins, including **immunoglobulins**, defined as being within a particular range of electrophoretic mobility.
gamma spectrometry A technique that uses gamma electromagnetic radiation in experimental biology.
ganglion A group of nerve cell bodies.
GAP-protein See **GTPase-activating proteins**.
gastric ulcer See **peptic ulcer**.
gastro-oesophageal reflux (acid reflux) Regurgitation of acid and enzymes into the oesophagus from the stomach due to, for example, hiatus hernia or weakness

of the oesphageal sphincter; common in pregnancy.

Gaussian distribution See **Normal distribution**; **probability distribution**.

GDP guanosine diphosphate.

gel A colloidal formulation, e.g. of a medicine as a jelly-like mass, which is convenient for topical application.

gel electrophoresis See **electrophoresis**.

gene The genetic makeup of living organisms is determined by genes (contained in 23 pairs of chromosomes in humans). The gene is the basic unit of inheritance and is the sequence of **DNA bases** that codes for a complete functional polypeptide chain or **RNA** molecule.

gene action The functioning of a gene in determining the **phenotype** of an individual.

gene amplification An increase in the number of copies of a particular DNA sequence in a sample when the rest of the genome remains unchanged. Experimentally or diagnostically used to increase the amount of a DNA sample to facilitate its analysis. See also **polymerase chain reaction**.

gene assignment Localization of **genes** to individual **chromosomes**.

gene bank See **gene library**.

gene cluster A group of two or more closely linked genes that encode for the same or similar products. See **linkage**.

gene disruption See **gene knock-out**.

gene duplication The generation of additional copies of a gene during normal cellular processes. Thought to be the origin of families of related genes.

gene expression The process by which the information encoded by a **gene** is converted into a protein. In clinical genetics it refers to the way in which a gene is expressed in a given individual.

gene fusion The process of altering the **coding sequence** of a **gene** to produce a novel hybrid gene by joining it to the coding sequence of a different gene.

gene library All the genetic information of the species. See **library**.

gene locus The site on a **chromosome** occupied by a **gene**.

gene overlap Where one sequence of DNA codes for more than one protein. This is achieved because of the use of different **reading frames**.

gene pool The total number of **genes** in a given population at a given time.

gene product The protein, **rRNA**, **tRNA** or other structural RNA encoded by a **gene**.

gene regulatory proteins This includes proteins that regulate gene expression by interfering with a control site in DNA. See **transcriptional regulators**; **transcription factors**.

gene rendundancy Where there are several copies of the same **gene** in a given cell.

generations of drugs A 'new' generation occurs when there is a significant advance in the development of a class of drugs, whether in potency, duration of action, absorption, spectrum of action and so on. For example, in a number of ANTIBIOTIC families there are first, second, third generations, e.g. cephalosporins.

generic drug name The official or standard name for the active chemical(s) in a medicine, in contrast to a medicine's **proprietary drug name** (trade or brand name). In the UK, doctors in general and hospital practice are encouraged to refer to, and prescribe, drugs by the generic name (written correctly they have no initial capital letters). Under NHS recommendations for generic substitution, a prescription written for a proprietary drug (with initial capital letters), can be supplied in the form of a (cheaper) equivalent generic drug. However, during the period of the patent that is granted to the inventor (commonly 16–20 years for a new chemical entity or formulation, but depending on the country concerned), only a proprietary form of the drug may be available: in this case a generic prescription will be filled with a proprietary drug (complete with packaging etc., in the latter name). Although the generic form has the same molecular structure as the proprietary form of the drug, concern has been expressed about the **bioequivalence** of preparations, and regulatory authorities normally require proof that, at a given dose, the generic drugs substituted for their parent proprietary drug have a **bioavailability** that ensures equivalent pharmacological effect. See also **chemical drug name**; **names of drugs**.

gene targeting Any of several techniques enabling **mutation** or replacement of a given gene using **recombinant DNA technology**.**gene knock-out** A technique by which specific genes can be disrupted and rendered non-functional (usually through the use of **antisense technology**). When applied to embryonic stem cells, it can be used to generate animals (mice) mutant for a specific gene. See **transgenic technology**.

gene therapy The use of genetic intervention to treat disease caused by genetic defects. Techniques (still mostly experimental) include treatment of a genetic defect by insertion of a normal gene (e.g. cystic fibrosis), blockade of expression of an abnormal gene (e.g. the BCL2 leukaemia gene) with **antisense technology** and the introduction of a gene for an enzyme that converts a prodrug into a cytotoxic metabolite (e.g. thymidine kinase to convert 5-fluorocytosine to 5-fluorouracil).

genetic code The sequence of DNA **nucleotides** that determines the amino acid sequence of the translated protein 'read' in triplets of bases called **codons**.

genetic engineering A **gene therapy** term meaning the use of techniques (mainly **recombinant DNA technology**) to modify the structure of genes, or to create or delete genes. Potentially, these techniques may be used to correct diseases in humans due to genetic defects (e.g. cystic fibrosis). Used in animal husbandry (e.g. to introduce human genes manufacturing human peptide pharmaceuticals, such as insulin, growth hormone) is now quite advanced and used in **transgenic technology**.

genetic induction Gene activation as a result of inactivation of a **repressor protein** by an agent, which consequently activates **transcription** of a structural protein, or activation by a chemical inducer.

genetic map (chromosome map) A map of the positions of **gene** loci on a **chromosome**.

genetic polymorphism The existence of multiple **alleles** at a gene locus.

genetics The science of the study of genes and biological inheritance.

gene transfer The transfer of **genes** from one species into another, used in **gene therapy**.

genitourinary tract (urogenital tract) The sexual organs and bladder, and related structures.

genome The total genetic material of an organism, the genes and the intervening DNA sequences. See **Genome Project**.

Genome Project An international research programme aimed at mapping all the genes in a genome, e.g. of yeast or of man (**Human Genome Project**).

genotype The total genetic complement of a set of genes that the individual possesses, containing contributions from

both parents. Not all this information is expressed. See **phenotype**.

genus The taxonomic group immediately above (more inclusive) that of **species** and constituting the principal subdivision of a **family**.

geometric mean See **mean**.

germ cell (gamete; sex cell) A cell that participates in fertilization and development.

GI gastrointestinal.

G_i G-protein that couples receptors to the cAMP **second messenger** pathway, inhibiting adenylyl cyclase.

glaucoma An eye condition characterized by a raised intraocular pressure in the eye, which if left untreated can damage the optic nerve. There are various forms, including simple (open-angle) glaucoma, which is chronic and seen more commonly in middle-age and is often **familial**, and acute (closed-angle) glaucoma. The former is either treated with beta-blockers and some other drugs, or surgery. See ANTIGLAUCOMA TREATMENTS.

glycoprotein A protein covalently attached to one or more sugar molecules.

GM-CSF granulocyte-macrophage-colony-stimulating factor.

GMP 1. guanosine monophosphate (GUANOSINE 5′-MONOPHOSPHATE). 2. Good Manufacturing Practice; a code of practice covering the manufacture of pharmaceuticals.

GNR Gram-negative, rod-shaped bacteria.

GnRF gonadotropin-releasing factor.

G_o G-protein involved in coupling receptors to the cAMP **second messenger** pathway, inhibiting adenylyl cyclase. Overlaps with **G_i** class.

goitre A collection of disease states characterized by an enlarged thyroid gland. Goitre has a number of causes: (a) a shortage of iodine in the diet (endemic goitre); (b) a hyperplasia (**tumour**) of the gland (sporadic goitre); (c) swelling due to overactivity in Grave's disease (exothalmic goitre); or (d) **autoimmune** thyroiditis (Hashimoto's disease). Additionally, some chemicals and drugs may cause goitre as an **adverse drug reaction**.

G-protein See **guanine nucleotide binding protein**.

G_q G-protein involved in coupling receptors to phosphatidyinositol **second messenger** pathway.

graded response A response that is a continuous variable (e.g. contraction of smooth muscle; change in blood pressure; change in cAMP level), in contrast to a discontinuous variable (e.g. numbers of patients in a group responding).

Gram-negative Decolourizing and staining of bacteria to counterstain when treated to Gram's stain.

Gram-positive Bacteria that hold the colour of the primary stain when treated to Gram's stain.

Gram's stain A differential bacterial stain used as a primary means of identification.

grandfather drug The original or archetype in a series, from which generations of successor drugs have been developed. See **generations of drugs**.

grand mal See **epilepsy**.

granulocyte See **leucocyte**.

granulocytopenia See **neutropenia.**

growth factor A general term to describe cell-specific proteins or peptides responsible for cell division or differentiation, e.g. epidermal growth factor, nerve growth factor.

growth hormone A polypeptide **hormone** secreted by the anterior pituitary gland that promotes an increase in body size. See HUMAN PITUITARY GROWTH HORMONE.

G_s G-protein that couples receptors to the cAMP **second messenger** pathway by stimulating adenylyl cyclase.

G6PD deficiency (glucose 6-phosphate dehydrogenase enzyme deficiency) A genetically inherited condition, relatively common in Indian, African and some Meditteranean races. In affected people serious adverse reactions occur when they take certain drugs, e.g. the antimalarial drug primaquine, which causes red blood cell haemolysis leading to severe anaemia.

G_T See **transducin**.

GTPase-activating proteins Proteins that interact with the GTP-bound forms of guanine-nucleotide binding proteins to stimulate intrinsic GTPase activity, e.g. RAS protein related GTPases.

GTP-binding protein See **guanine-nucleotide binding protein**.

GTP-guanosine 5′-triphosphate An important molecule in signal **transduction** as it forms cGMP, an important **second messenger**.

guanine-nucleotide binding protein Any one of a family of diverse proteins which includes G-proteins, transducin and the RAS proteins. They are involved in transducing signals from cell-surface receptors to effector mechanisms, e.g. enzymes.

Gy gray; SI unit for the amount of ionizing radiation absorbed by tissue.

gynaecomastia Enlargement of breasts in the male. It can be caused by elevated levels of female sex hormones (**oestrogen**) in the blood. Some drugs may cause it as a side-effect (e.g. CIMETIDINE, DIGOXIN, SPIRONOLACTONE).

habituation A state where regular (possibly excessive) taking of a drug causes an individual to become accustomed to it, but not to the extreme psychological or physical stage of **dependence**.

haematinic A general term for any substance that is required for production of **haemoglobin** and related blood elements, or agents used to improve the condition of the blood, particularly to treat deficiencies in anaemia. Agents include iron salts, cobalt salts, vitamin B_{12} and the erythropoietins.

haematology The study of blood.

haemodialysis See **dialysis**.

haemoglobin The oxygen-carrying pigment of the red blood cells (erythrocytes) of the blood. Some **familial** abnormal forms cause **anaemia** (e.g. sickle-cell disease). Other abnormal forms that carry oxygen poorly and cause **anoxia**, are caused by acute reaction with chemicals, for instance, methaemoglobin by nitrates, and a number of other drugs and chemicals, carboxyhaemoglobin by carbon monoxide.

haemolysis (hemolysis, USA) The destruction of red blood cells (**erythrocytes**). It may occur within the body through infection, poisoning, or as an **adverse drug reaction**.

haemorrhoids (piles) An enlargement of the wall of the anus, sometimes caused as a consequence of prolonged constipation and often following childbirth. There may be pain and bleeding. Treatment of first-degree haemorrhoids is normally through adjustment of diet, but second- and third-degree severity may require surgical intervention.

half-life ($t^1/_2$) The time taken for a measured variable to fall to half. When the rate of decline is in the form of a single **exponential curve** (with a time-constant, k), this value is a constant and independent of the starting value; i.e. a constant fraction is lost per unit time; also $t^1/_2 = 0.6993/k$. Commonly used to describe the rate of decline of blood concentrations of drugs, and of decay of radioactive species.

half-time See **half-life**.
hallucinogen An agent that induces hallucinations or illusions.
haploid Where each **chromosome** is represented once, i.e. cells have one set of chromosomes which represent the genetic complement of that species. See **diploid**.
hapten A small non-antigenic molecule which when combined with a larger carrier molecule becomes an **antigen**.
hard drugs Drugs used for nonmedical or social purposes which seriously affect the individual from functioning in society and which induce dependence, e.g. heroin. See also **soft drugs**.
harmonic mean See **mean**.
HCG human chorionic gonadotropic hormone: see GONADOTROPHIN.
HD_{50} haemolytic dose 50; the quantity of complement needed to lyse 50% of a standardized suspension of sensitized **erythrocytes**.
HDL high density lipoprotein.
hDNA **hybrid** DNA.
heat shock proteins A group of proteins whose synthesis is transiently increased in response to a sudden rise in temperature or other stress in order for the organism to survive, e.g. by protecting chromosomes.
heat shock response A cellular response to stress, e.g. increased temperature, resulting in slowing down of synthesis of normal proteins and activation of previously inactive genes resulting in the synthesis of **heat shock proteins**.
heavy chain (A chain; H chain) The heavier of the two types of polypeptide chain in **immunoglobulin**.
HeLa cells A tissue culture of an aneuploid line of human epithelial cells propagated since 1952, derived from cervical carcinoma.
helminth Originally denoted any parasitic worm, but now usually includes free-living or parasitic worms, including the flatworms (Platyhelminthes), roundworms (Nematoda) and Annelida. Infection may be treated with ANTHELMINTIC drugs.
hemo- US spelling of the prefix haemo-.
helper T-cell (T_H, T_h, T helper cell) A **T-lymphocyte** that helps B-lymphocytes during **antibody** formation. They are involved in **delayed hypersensitivity**.
hemolysis The term for **haemolysis** in the USA.
Henderson–Hasslebach equation At equilibrium, relates to the proportions of dissociated and undissociated weak acids/bases to the pH of the solution.
heparin A sulphonated proteoglycan present in **mast cells** and also used as an ANTICOAGULANT.
hepatic Pertaining to the liver.
hepatitis Inflammation of the liver, with accompanying damage or death of liver cells. It may be due to infection (e.g. viral hepatitis), toxic substances or immunological abnormalities. There are several types of infectious hepatitis: hepatitis A (infectious hepatitis) is mainly transmitted by faecal-contaminated food; hepatitis B (serum hepatitis) is transmitted by infected blood, needles and sexually; further forms are hepatitis C (non-A, non-B hepatitis), hepatitis D and hepatitis E. Prevention by **immunization** is recommended for those at risk, and treatments include avoidance of alcohol and occasionally the use of INTERFERONS.
HEPES A zwitterionic pH **buffer** used especially for tissue culture.
herpes An **inflammation** with blistering of the skin or mucous membranes, caused by the herpes virus. Herpes simplex virus (HSV) is of two sorts: type I causes the common cold sore around the lips (which is contagious by contact); type II is associated with genital herpes (which is sexually transmitted). Herpes zoster (shingles), caused by the varicella-zoster virus, remains in a dormant form in sensory nerves following chickenpox, and can later be activated to affect the eye (ophthalmic zoster) or skin (dermosomes). The pain of shingles can be severe, especially in the elderly. Treatment of all forms of herpes is mainly with ACICLOVIR.
hetero- A prefix denoting different.
heterodimer A protein composed of two different subunits.
heterolateral Pertaining to the opposite side.
heteromeric receptor A **receptor** composed of two or more different subunits.
heteroscedastic See **homoscedastic**.
heterozygote An individual who has two different **alleles** at the same chromosonal locus. A heterozygote who has one dominant disease gene and one normal gene will be affected by the disease (as in Huntington's disease); one who has a **recessive** disease gene and a normal gene will be a **carrier** (as in cystic fibrosis).
HGG human gamma globulin.
high performance liquid chromatography See **chromatography**.
Hill equation/slope/plot An equation (A.V. Hill, 1909) relating the proportion of total receptor sites binding a ligand according to affinity and concentration. The Hill equation can be written in a form such that occupancy (or response) can be plotted against concentration of ligand, and when the Hill plot is in its double logarithmic form, it will show a straight line with a slope (nH) referred to as the Hill slope. If there is positive cooperativity in binding, the Hill slope will be greater than unity, whereas if there is negative cooperativity or heterologous binding then the Hill slope will be less than unity. Unity slope indicates a simple 1:1 relationship of ligand and binding at the receptor, and in this case the Hill equation is equivalent of the **Langmuir equation**.
histochemistry The study of the distribution of chemical components in cells.
histogram In statistics, is a graphical method used to display and analyse an observed sample of data, commonly as an aid in judging the population **frequency distribution** underlying that of the sample. The frequency of the number of observations (y) is plotted against intervals in the sample or population variable (x), such that the area of the rectangles is proportional to the number of observations that it contains, and the total area is 100%. The term sometimes (incorrectly) applied to graphs that are (discontinuous) bar diagrams or columns of data not related to dimensions.
histology The study of the chemical composition and structure of tissues in relation to their function.
histones One of a group of major basic proteins which are components of **chromatin**.
HIV human immunodeficiency virus.
HLA human leucocyte antigens.
hnRNA heterogenous nuclear RNA.
Hodgkin's disease A **lymphoma**, a cancer arising in lymphoid tissue including lymph nodes and the spleen.
Hofstee plot A plot formerly used in analysis of the activity of an enzyme in catalysing a reaction. It plots the rate of reaction (v) on the y-axis against the relative rate of reaction (v/s, where s is substrate concentration) on the x-axis. The intercept on the x-axis is an estimate of the maximum reaction rate (V).
homeostasis The physiological mechanisms that maintain the internal state of the body.

homo- A prefix denoting same.
homogenate A finely divided and mixed tissue preparation.
homologous A fundamental similarity.
homologous desensitization See **desensitization**.
homologous series In chemical terms, a series of **analogues** that are closely related in chemical structure, and are often explored in discovering optimal properties for development into drugs.
homology Resemblance by virtue of common descent.
homomeric receptor Receptors composed of two or more identical subunits.
homoscedastic In statistics, where the variance of one variable is constant. Conversely, heteroscedastic is where the variance changes with the magnitude of the other variable. The former situation allows for easier analysis.
homozygote An individual who has two identical **alleles** at a locus. A person who is homozygous for a **recessive** disease gene (e.g. cystic fibrosis) will be affected by that disease.
hormone A **mediator** released into the blood from a ductless gland of the **endocrine system** to mediate its effect at highly specific **receptors** distant from its site of release. Also, mediators released by **exocrine** glands from ducts and canals are termed exocrine hormones. See also **local hormones**.
host In parasitology, the larger partner in a host-parasite relationship: in medical usage normally humans.
HPLC high pressure/performance liquid chromatography.
HRT hormone replacement therapy.
Human Genome Project An international project concerned with mapping and sequencing the complete human genome. See **Genome Project**.
humoral mediated immunity See **immune response**.
hybrid Offspring of genetically dissimilar parents. In **recombinant technology**, the method used to produce DNA molecules composed of segments of different origin.
hybridization The joining of two **complementary** sequences of DNA (or DNA and RNA) by base pairing single-stranded nucleic acids, e.g. from different sources. See **in situ hybridization**.
hydrophilic Having affinity for water.
hydrophobic Having repulsion for water.
hyper- A prefix in medical terms denoting above normal.
hyperalgesia Increased sensitivity to pain.
hyperbolic curve / relationship An important curve in pharmacology because it commonly describes the relationship between the concentration of a drug and the biological response. In receptor pharmacology, this relationship is predicted for the simple binding of agonists at receptors. The **logistic equation** can be used to fit hyperbolic curves to concentration-occupancy and concentration-response data, allowing estimation of parameters equivalent to the location, slope and maximum response of the logistic relationship. See also **Black & Leff model**; **Langmuir equation**; **logistic equation**; **semilog plot**.
hyperkinesis A state of overactive restlessness in children.
hyperplasia An increase in the production and growth of normal cells in a tissue, where the organ becomes bigger but retains its form. See also **hypertrophy**; **neoplasm**.
hyperpolarization Where the cell **membrane potential** is increased, i.e. made more negative.
hyperreactivity See **hypersensitivity**.
hypersensitivity In pharmacology, when a response occurs at lower than normal dose. In immunology, the term often is used to denote a state of being abnormally sensitive to allergens, e.g. where a primed individual on exposure to the **antigen** gives an exaggerated immune response. See **Type I–IV hypersensitivity**.
hypersensitivity reactions Inappropriate immune reactions. Inappropriately deployed T-cell activity underlies hypersensitivity reactions. See **type I**; **type II**; **type III**; **type IV hypersensitivity**.
hypertension Higher than normal blood pressure for a person of that age. WHO defines hypertension as a blood pressure consistently exceeding 160/95 mm Hg (systolic/diastolic). However, since there is a considerable range of blood pressures for a population group, high blood pressure in itself may not denote hypertension, but a rising pressure with secondary pathology usually is an indication for treatment. Clinically, hypertension is divided into a number of disease states each with different **aetiology**. Essential hypertension is the most common, and here the determinants of the disease are not well understood. Renal hypertension has its origins in kidney disease (e.g. narrowing of the renal arteries). **Phaeochromocytoma** is characterized by episodes of extreme hypertension due to release of adrenaline and noradrenaline from a tumour of adrenal gland tissue. Other specific causes of hypertension include Cushing's disease and pre-eclampsia. Treatment depends on cause. See ANTIHYPERTENSIVES.
hyperthermia Elevated body temperature.
hyperthyroidism Overactivity of the thyroid gland, with elevated levels of thyroid hormones (THYROXINE) in the bloodstream. See **goitre**.
hypertrophy An increase in the size of an organ or tissue brought about by an increase in the size of its cells, as with muscles after exercise (rather than of number, as in tumours or **hyperplasia**). See also **neoplasm**.
hypo- A prefix in medical terms denoting below normal.
hypoglycaemia Abnormally low levels of blood glucose.
hyposensitization See **desensitization**.
hypotension A lower than normal blood pressure. However, since there is a considerable range of blood pressures for a population group, low blood pressure in itself may not denote any pathology. It is more normally seen as an acute medical condition due to excess loss of body fluids (e.g. in burns, vomiting and diarrhoea) or blood (e.g. haemorrhage). There are a number of other causes, including **myocardial infarction**, Addison's disease, pulmonary embolism. Postural hypotension (othostatic hypotension) is a temporary fall in blow pressure when the subject rises from a supine position, and is due to impaired physiological compensatory reflexes. Many drugs can cause hypotension as part of a serious **adverse drug reaction**, or as a minor side-effect. Many antihypertensives cause postural hypotension or periods of hypotension.
hypothermia Reduced body temperature.
hypotonic 1. Abnormally low muscle tension or strength. 2. Lower osmotic strength than **physiological salt solution**.
i.a. intraarterial drug administration.
IAP islet-activating protein (Pertussis toxin).
iatrogenic disease is produced as a result of medical or drug treatment (e.g. as a result of an **adverse drug reaction**).
IBD inflammatory bowel disease.
IBS irritable bowel syndrome.
ICE 1. interleukin-1β converting-enzyme. 2. 'street' name for methamphetamine.
ICH International Conference on Harmonization (drug regulatory requirement).
IC_{50} A potency measure of the inhibitory action of drug or

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ligand, in terms of the concentration of ligand to produce inhibition of control response to 50%. Inhibition may be of a functional response, or of radioligand-binding. Under most conditions it is an essentially empirical measure since the control level is arbitrary; also an IC_{50} estimate is a function of the slope of the inhibition curve. However, in radioligand-binding, the displacement IC_{50} may, via the **Cheng-Prusoff equation**, be used to calculate the K_i which under defined conditions is equal to the K_d of the ligand.

IC_{50} inhibitory concentration 50%.

ICV intracerebroventricular drug administration.

IDDM insulin-dependent diabetes mellitus.

idiosyncratic response See **adverse drug reaction**.

idiotype The segment of an **antibody** molecule that is responsible for its antigenic specificity.

IED individual effective dose.

IEP isoelectric point.

Ig immunoglobulin.

IgA – immunoglobulin A A type of **immunoglobulin** that is produced by certain lymphoid tissues secreted in saliva, tears, milk. There are two subclasses: IgA_1 and IgA_2.

IgD – immunoglubulin D An **immunoglobulin** that appears as a surface-bound immunoglobulin on B cells before and in conjunction with IgM.

IgE – immunoglobulin E An **antibody** involved in local **inflammatory** reactions. Binding of antigen to IgE bound to receptors on mast cells and basophil leucocytes leads to release of all contents, including heparin, histamine and leukotrienes.

IGF insulin-like growth factor.

IgG – immunoglobulin G The main **immunoglobulin** type to be produced at the end of a primary **immune response** and in a secondary response.

IgM – immunoglobulin M (macroglobulin) The first class of **immunoglobulin** produced in a primary **immune response**. IgM is a complement-fixing antibody.

immediate early genes A group of genes including c-myc, c-fos and c-jun that are rapidly and transiently induced in a response to agents that induce cell division. They all code for proteins that are involved in regulation of **transcription**.

immediate hypersensitivity See **type I hypersensitivity**.

immortalized cell line Cells *in vitro* that continue cell division indefinitely.

immune complex A complex of **antigen–antibody** and **complement**. If the complex is deposited in blood vessels, activation of the complement pathway results in **hypersensitivity** reactions.

immune response The selective response of an organism which is a consequence of activation of the **immune system** by **antigens**. Specific **antibodies** (humoral mediated) or cytotoxic cells (cell mediated) are produced in response to foreign substances, e.g. parasites, or transplanted organs perceived by the body as foreign.

immune response genes (Ir genes) A group of **genes** of the **major histocompatibility complex** that are involved in determining the degree of **immune response**.

immune system The cells, tissues and mediators that enable an organism to initiate and maintain an **immune response**, to protect the body from infection.

immunity A state of protection against infection and disease through the activity of the immune system, composed of circulating **antibodies** and white blood cells. Therapeutically, immunization can be used to boost the immunity; **active immunity** can be stimulated by vaccination, and **passive immunity** by injection of antibodies in antiserum or transfer of maternal antibodies across the placenta.

immunization The means by which an organism is rendered immune to a specific communicable disease, either by **active immunity** or **passive immunity**.

immunoassay A method of quantifying amounts of a substance, e.g. protein or other **antigen**.

immunocompetent Where the **immune system** of an individual is fully operative.

immunocompromised A term that refers to a person whose immune defences are much lower than normal due to either a congenital (present at birth) or acquired condition. The commonest deficiencies are: of certain of the white cells (neutrophils) which are the first line of defence in acute infections; of the white cells, macrophages and T-lymphocytes, which are involved in cell-mediated killing of foreign, or 'parasitized' host cells; and of the **antibodies**.

immunodeficient (immunodepression) The state where the **immune system** of the individual is to some extent depressed or deficient.

immunodepression See **immunodeficient**.

immunoelectrophoresis See **electrophoresis**.

immunofluorescence A technique where fluorescent dyes, used as markers, are attached to **antibodies** in order to detect **antigens**.

immunogen A substance that can stimulate an **immune response**.

immunoglobulins (Igs) A class of proteins synthesized by **B-lymphocytes** of the **immune system** which includes all the **antibodies**. They exist both membrane-bound on the surface of the B cells, where they act as receptors for **antigens**, and as antibodies secreted during an immune response. They consist of two identical **light chains** and two identical **heavy chains**. The class includes IgA, IgD, IgE, IgC, and IgM.

immunology The study of the **immune system**.

immunostimulant An agent that enhances immunological processes.

immunosuppression The production of immunodeficiency by artificial means (e.g. radiation or drugs).

immunosuppressive An influence (e.g. an IMMUNOSUPRESSANT) that depresses the function of the immune system. Some such drugs may be used in therapeutics to maintain survival of transplanted organs (e.g. methotrexate; cyclophosphamide; cyclosporin; mycophenolate mofetil) or to treat some autoimmune diseases such as rheumatoid arthritis (e.g. corticosteroids, such as prednisolone; azathioprine).

implant A form of drug **depot administration** where a solid formulation of the drug is given at intramuscular or subcutaneous sites. The commonest example is **contraceptive** hormone drugs.

inactivated vaccine A suspension of killed microorganisms used as **antigens** to produce **immunity**.

incapacitating concentration 50 (IC_{50}) The concentration of smoke or gas that incapacitates 50% of test animals in a set time.

inducer T-cell A **T-lymphocyte** that is involved in the activation of regulatory cells, such as initial stage suppressor T-cells. The term is sometimes applied to those T-cells which activate other effector cells and B-cells.

inducible A protein or gene whose synthesis is stimulated by a specific inducing agent.

infarction Death of part or all of an organ.

infection The outcome of the interaction of host and microbe that results in some observable, normally detrimental, change.
inferior Lower in the body in relation to another structure.
inflammation An acute or chronic bodily reaction to chemical, physical injury or infection. It is characterized by the 'cardinal signs': *calor* (heat); *rubor* (redness); *dolor* (pain); and *tumor* (swelling). Inflammation is initially protective, but chronic inflammatory diseases can be incapacitating. See ANTIINFLAMMATORY AGENTS; CORTICOSTEROIDS.
infusion The continuous administration (by injection) of a drug or fluid, over a period of minutes, hours or days.
inhibitor An agent that prevents or reduces a given process or reaction.
inhibitory amino acids See **amino acid transmitter**.
iniation codon (start codon) A **codon** (usually AUG, or GUG) that signals the first amino acid in a protein sequence.
initiation factors Proteins that initiate **transcription** or **translation** of RNA during protein synthesis.
INN International Nonproprietary Name.
innate Pertaining to an inborn character, i.e. that determined by genetic makeup.
innate immunity Protection against infection because of a pre-existing mechanism. See **acquired immunity**.
innervation The nerve supply to an organ or tissue.
inoculation A method used to confer **active immunity** by injecting a living or mildly infective pathogen.
inos inducible **nitric oxide synthase**.
inositol 1,4,5 triphosphate (IP_3; $insP_3$) A **second messenger** produced by the action of **phospholipase C** on the membrane phospholipid phosphatidylinositol which acts to liberate calcium ions from intracellular stores, following activation by a **G-protein**-activatated receptor.
insertion mutagenesis Where a **gene** is altered by insertion of an unusual nucleotide sequence.
insertion vector A cloning **vector** having a single site at which a sequence of exogenous DNA can be inserted.
insomnia Inability to fall asleep or remain asleep for an adequate length of time.
in situ In its original place.
***in situ* hybridization** A technique where a labelled **probe** is used to detect and locate any specific **complementary DNA** or RNA sequence in a tissue section, cultured cell or cloned bacterial cell using radioactive nucleic acid. Its position can be determined by **autoradiography**.
insufflation The administration of a drug by blowing into a cavity.
insurmountable antagonism A term applied by Gaddum to the behaviour of agonist concentration-response curves in the presence of an antagonist; where sufficient increase in an agonist concentration can not fully surmount the effect of the antagonist, and the maximum response is depressed: the opposite of surmountable antagonism. Such an operational description of behaviour is preferable in pharmacology to the use of terms such as non-competitive in instances when, in reality, nothing is known of the mechanism of action of the antagonist. See also **antagonism – pharmacodynamic**.
integrins A family of cell-surface transmembrane receptor proteins which have functions in regulation of cell **adhesion** and migration.
interferons A group of inducible **cytokines** synthesized in response to viral and other stimuli.
interleukins A group of mediators within the **cytokine** group.
International Pharmacopoeia (Int. P) The **pharmacopoeia** of the World Health Organization, a **formulary** intended to meet international needs.
interneuron A neuron in the CNS synapsing between **sensory neurons** and **motor neurons** in a typical spinal reflex arc.
intima The inner layer of an artery or vein or organ.
intolerance When there is a greater than expected reaction to a drug. The term **hypersensitivity** is preferred.
intradermal Injections made into the skin. See **routes of administration of drugs**.
intracellular Within a cell.
intradermal Within the dermis of the skin.
intraluminal Within the lumen of a structure.
intramolecular Occuring within a molecule.
intramural Within the substance of the walls of an organ.
intramuscular Lying within or going into muscle.
intraocular Within the eyeball.
intraocular pressure The hydrostatic pressure within the eyeball.
intraparietal Within the wall of an organ, the parietal region of the cerebellum or the body wall.
intraperitoneal (i.p.) Within the peritoneal cavity or peritoneum.
intrathecal Injections made into the subarachnoid space of the spinal cord. This route is used to localize the actions of LOCAL ANAESTHETICS and ANALGESICS to certain segments of the body supplied by sensory nerves originating from the area of injection. See also **routes of administration of drugs**.
intravenous Going into or located in veins. See also **routes of administration of drugs**.
intravesical Within the urinary bladder.
intravital Occuring while the organism or cell is alive.
intravital stain A non-toxic dye that can be injected to selectively mark cells or tissue.
intrinsic activity A treatment by Ariens (1954) that attempts to relate receptor occupancy and biological response in a way that allows for the behaviour of partial agonists, using the proportionality parameter intrinsic activity (α), such that $R = \alpha.p$; where R is the biological response, and p is proportion of receptors occupied. Full agonists are assumed all to produce a maximum with full receptor occupancy, so they have $\alpha = 1.0$. Antagonists have no intrinsic activity, so $\alpha = 0$. Partial agonist have α values between 0 and 1.0: for instance a partial agonist producing 50% of maximum response has $\alpha = 0.5$. This concept has been refined in the definitions of **efficacy** and **intrinsic** efficacy; however, it remains a useful shorthand for denoting the maximum response to a partial agonist. See also **agonists**.
intrinsic efficacy An extension of the concept of **efficacy** (e) by Furchgott (1965 onward) to separate drug-dependent parameters and tissue-dependent parameters inherent in the previous formulation of efficacy. Intrinsic efficacy (ε) is defined in the equation $e = \varepsilon.(R_t)$ where R_t is receptor density. See also **agonist**; $\mathbf{B_{max}}$; **efficacy**; **intrinsic activity**.
intrinsic nerves Of an organ, those nerves with their cell bodies within the organ, i.e. nerves that do not completely degenerate after denervation of the organ.
intron Noncoding segment of a DNA which separates two of the **coding sequences**. See **exon**.
inverse agonist A term used particularly to describe the effects of certain benzodiazepines, to indicate the behaviour of analogues that though activating receptors, have the opposite action to normal benzodiazepine agonists (e.g. are anxiogenic rather than anxiolytic).

in vitro A term used to describe biological actions observed under artificial conditions of tissues or cells in laboratory glassware (e.g. organ-bath or culture-medium).
involuntary muscle A muscle not under voluntary control. See **cardiac muscle**; **smooth muscle**.
ion channels Highly organized protein structures that span the cell membrane, providing a pore through which certain ions may pass. Voltage-gated ion channels may pass sodium, potassium, calcium or chloride ions depending on transmembrane potential. **Ligand-gated ion channels** form part of a neurotransmitter receptor and open or close on receptor occupancy, and pass certain ions depending on the type of receptor. The effect of channels opening depends on the cell type and the intracellular and extracellular concentrations of ions, but allowing sodium or calcium to enter the cell normally causes depolarization and activation, but the opposite may hold for potassium and chloride.
ion exchange Adsorption of ions onto a resin in exchange for others.
ion exchange chromatography A method used to separate molecules using their different net charges to differentially bind them to a column of, e.g. carboxylated polymer anions binding to the column. See **chromatography**.
ionic bond Electrostatic bond.
ionophore A compound that can carry ions across a lipid barrier, e.g. plasma membrane.
ionotropic receptor A cell-surface receptor which has an associated **ion channel**.
ion pump A protein that transports an ion across a biological membrane against a concentration gradient by **active transport**.
iontophoresis A method of delivering drugs across the skin using an electric current to drive electrically charged drug molecules.
IP_3 inositol 1,4,5 trisphosphate.
IPSP inhibitory postsynaphic potential; post-synaptic membrane hyperpolarization.
Ir genes immune response genes.
iridal Pertaining to the iris.
ISA intrinsic sympathomimetic activity.
ischaemia Reduced blood supply.
isoelectric point (IEP) The pH at which an amphoteric molecule, e.g. a protein, carries no net charge.
isomers These forms of a chemical can be *cis/trans*-isomers or optical isomers. *Cis/trans*-isomers differ in their arrangement about rigid bonds (*trans*- is where identical groups are on opposite sides of the bond, and *cis*- when on the same side). They have different chemical properties as well as different biological properties. Optical isomers (enantiomers) are stereoisomers that are mirror images of one another, and rotate polarized light in opposite directions (*laevo* and *dextro*-isomers; *l*- and *d*- or (+)- and (-)-isomers). In general, isomers are possible when molecules show chirality, that is, 'handedness' such that the molecule cannot be superimposed on its mirror image, e.g. due to four different groups being attached to one carbon atom. Two such isomers can be described by an unambiguous notation system as either '*R*' or '*S*' (for *rectus* or *sinister*). They have identical chemical properties except when they interact with other molecules that are themselves chiral, e.g. in biological systems. Not all molecules show chirality, e.g. glucose is chiral but ethanol is not. Only one chiral form of glucose occurs naturally. Racemic mixtures are a mix of equal amounts of optical isomers (denoted ± or *d*/*l*) and being more easily prepared are often used in medicine even when the main pharmacological activity resides only in one isomer (though sometimes toxicity may reside in the other).
isometric contraction Where muscle tension is increased, but the muscle is not shortened.
isotonic contraction Where the muscle shortens without generating any extra force.
isotonic solutions Having equal solute concentrations, thus osmotic pressure. Often implicitly isotonic with human plasma extracellular fluid. See **physiological salt solution**.
isotopes Atoms of the same element differing in the number of neutrons in the nucleus. They differ very little in chemical properties, but some unstable isotopes, radioisotopes, emit radiation, and can be used in medicine for a variety of purposes.
-itis A suffix meaning inflammation, e.g. tonsilitis.
IUPHAR International Union of Pharmacology.
i.v. intravenous.
JAN Japanese Accepted Name (for a drug).
joule The SI unit of energy.
K^+- channel See **ion channel**.
kary- A prefix denoting a cell nucleus.
Kb See **kilobase**.
Kbp See **kilobase**.
K_D See **dissociation constant**.
Kelvin The SI unit of temperature.
K_i The measure of displacing potency of a ligand in radioligand-binding assay: under appropriate conditions, equals K_D. It is commonly estimated from the IC_{50}, using the **Cheng-Prusoff equation**.
killer cell (k cell) A non-**phagocytic** cell related to macrophages and leucocytes that can lyse foreign cells in the presence of antibody.
kilobase (Kb; Kbp) A unit of length of DNA equivalent to 1000 base pairs in DNA or 1000 nitrogenous bases in RNA.
kilodalton (K; kD; kdal) Unit of mass equal to 1000 daltons, or 1000 units of molecular mass. Abbreviated to K.
kinase An enzyme that catalyses the transfer of a phosphate group.
kinesis Movement.
kingdom A taxonomic group corresponding to **division** in botany.
Km **Michaelis constant**.
knock-out See **gene knock-out**.
Kruskal-Wallis test A **(nonparametric) significance** test to compare the medians of three or more unpaired sample groups. The null hypothesis is that all group medians are equal.
Kupffer cell A phagocytic cell lining the hepatic sinusoids.
kymograph An instrument that records physical variables, e.g. blood pressure, muscle tension.
labelled A molecule that can be detected and traced by virtue of it having a radioactive element or other detectable chemical attached to it.
labelling Techniques for detecting the presence and movement of molecules, e.g. by using radioactive isotopes for **autoradiography** or **in situ hybridization**.
laevo- (levo-, USA) A prefix denoting left.
***laevo*-isomer** See **isomers**.
Langendorff preparation An isolated heart preparation used to test drug effects on heart rate and contractile force.
Langmuir equation (Langmuir adsorption isotherm) An equation (Langmuir, 1918), originally formulated for

adsorption of gases, describing the **hyperbolic relationship** between the proportion (p) of binding sites (receptors) that are occupied at equilibrium by a ligand (drug) according to the affinity (K_d; the equilibrium dissociation constant) and concentration (x) of that ligand: *viz.* $p = x/(x+K)$. For a simple 1:1 relationship of ligand and binding at the receptor, the Langmuir equation is the same as the **Hill equation**.

late gene A gene expressed late in the life-cycle.

Latin square design A systematic method of allocating treatments in a block design, with the object of minimizing **confounding**. For instance, in a 4x4 Latin square to study the effects of low and high doses of two drugs, all four combinations are given in each row of a block design, but each row contains a different order.

law of mass action States that a chemical reaction proceeds at a rate that is proportional to the active mass (molar concentration) of the reactant substance (or the product of the active masses of reactants when there is more than one). The law applies to the reaction of drugs with proteins, including receptors or enzymes.

LD **lethal dose**.

LD_{50} Denotes the lethal dose that kills 50% of a sample of experimental animals, and as such is a statistically acceptable measure of acute toxicity, though not necessarily a very meaningful pharmacological or clinical measure.

LDL low-density lipoprotein.

least-squares methods Techniques for minimizing errors in obtaining best estimates of parameters. These methods minimize the sums of the squares of the deviations of the imperfect data points from the fitted line or model relationship.

leishmaniasis A protozoan disease (genus *Leishmania*) common in the tropics and transmitted by sandflies.

lethal dose (LD) A dose of a chemical that kills all test samples/animals in a given time. See also **LD_{50}**.

lethal gene A **gene** that, under certain conditions, causes death of the individual carrying it.

leucopenia A condition when there is a low level of leucocytes (white blood cells) in the bloodstream. It may be caused by an **adverse drug reaction**.

leucocyte (leukocyte; white blood cell) A nucleated blood corpuscle that lacks haemoglobin; includes monocytes, granulocytes (neutrophils, eosinophils, basophils) and lymphocytes (T- and B-cells).

leukaemia A malignant growth, a cancer where abnormal white blood cells proliferate in the bone marrow.

leukocyte See **leucocyte**.

leukotriene Mediators formed from **arachidonic acid** as a result of the action of 5-**lipoxygenase** on arachidonate, and released during **inflammation**.

levo- A prefix denoting left.

LH LUTEINIZING HORMONE.

library A collection of cloned DNA fragments representing either all expressed genes, a **cDNA** library, or a whole **genome**, a genomic library.

ligand This term has various uses, particularly for molecules that bind to receptors, and radioactive atoms or molecules that bind to sites (radioligand binding).

ligand binding assay A technique used to assess the characteristics of receptors using radioactively **labelled** drug molecules. See **displacement (competition) analysis**; **saturation analysis**.

ligand-gated ion channel Receptor – ion channel complex that opens or closes in response to binding of specific ligand molecules, thereby causing excitation or inhibition of the cell. See **ion channels**.

ligases (synthetases) Enzymes that catalyse covalent bond formation using energy obtained from cleavage of a pyrophosphate bond, such as in ATP.

light chain The smaller of the two polypeptide chain types that are present in an **immunoglobulin** monomer.

linctus A medicated syrup that is thick and soothing enough to relieve sore throats or loosen a cough.

linear regression See **regression analysis**.

Lineweaver–Burk plot A form of double-reciprocal plot used in analysis of the activity of an enzyme in catalysing a reaction. The reciprocal of the reaction velocity is plotted against the reciprocal of the substrate concentration. The intercept of the fitted line gives the reciprocal of the Michaelis–Menten constant. A similar treatment can be applied to drug dose-response relationships, but is less satisfactory than some other methods because of statistical uncertainties in the weighting of experimental points.

liniment A medicated lotion for rubbing into the skin. Many of them contain ethyl alcohol and/or camphor, and are intended to relieve minor muscle aches and pains.

linkage The tendency or degree to which alleles of two or more given **genes** are inherited together. Linked genes occur on the same **chromosome** and are said to constitute a **linkage group**.

linkage group See **linkage**.

linkage map A map of the relative positions of the **gene** loci on a **chromosome** which is deduced from the frequency with which they are inherited together: distances of which are measured in **centiMorgans**.

linkage mapping Chromosome mapping determining the relative positions of known genes in a **linkage group**.

lipophilic Having affinity for lipids.

lipopolysaccharide (LPS) A molecule that consists of a lipid linked to a polysaccharide.

lipoprotein A micellar complex of protein and lipid, e.g. cholesterol.

liposomes A drug-delivery system comprised of small vesicles of phopholipid-protein membrane with an aqueous drug-containing interior. They may allow absorption from the intestine, and thus administration of substances such as the peptide insulin, that would otherwise be digested. Also liposomes may reduce the toxicity of substances administered intravenously.

lipoxygenase Soluble enzymes located in the cytosol that catalyse addition of an oxygen molecule to the double bonds of some unsaturated fatty acids, or their derivatives; e.g. 5′-lipoxygenase which is the first enzyme in the synthesis of **leukotrienes**.

live vaccine A **vaccine** made from active but non-pathogenic viruses.

ln natural logarithm.

local (action of drugs) Where application or injection is such that drug action is limited to a certain area of the body, in contrast to **systemic** action, where the drug passes into the blood circulation and thus has a general action. See also **routes of administration of drugs**.

local hormones Mediators released and acting locally, rather than blood-borne as with endocrine hormones. Most are paracrine agents (released from one cell to act at a second cell), rather than **autocrine** agents (released by a cell to act on the same cell). The term is used largely synonymously with **autacoid**. Examples include HISTAMINE, NITRIC OXIDE and the **prostaglandins**.

location parameter A term referring to left-right position of curve on the x-axis. For functional responses, it will be the position on concentration-response curve estimated in terms of EC_{50} or log EC_{50}. For receptor-occupancy relationships, it can be the K_D or log K_D.
log See **logarithm**.
logarithm A power to which a fixed number (base) must be raised to produce a given number.
logarithmic transformation A **transformation** can be used for a number of purposes, including to linearize or simplify a relationship, or to normalize variances. For dose-response lines, if the logarithm of the dose is used, then a **hyperbolic curve** is transformed to a symmetrical **sigmoid curve** which is easier for display and analysis. The **Hill plot** is a double-logarithmic form to linearize the curve and allow parameter estimation. Where a **frequency distribution** is skewed-to-the-right (as when the true distribution is log-normal, which is common in pharmacology), then working with the logarithms of the data values will tend to normalize variances.
logistic equation An equation that can be used to fit **hyperbolic curves**; in pharmacology, particularly to concentration-response and concentration-occupancy curves. Parameters equivalent to the location, slope and maximum response of the logistic relationship can be estimated. The ability of microcomputer programs to iteratively fit these three parameters simultaneously, has resulted in a reduced use of graphical devices such as **transformations**.
logistic regression analysis Using the logistic equation to fit binding data or dose-response curves directly without using a **transformation** to a linear form.
logit See **regression analysis**.
log-normal distribution See **normal distribution**; **transformations**.
lotion A medicated liquid used to bathe or wash skin, the hair or eyes.
lozenge A hard, often sweet and flavoured, base containing a medicament. They are intended to be slowly dissolved in the mouth to treat local irritation or infection.
LPS lipopolysaccharide.
LTP long-term potentiation.
lupus erythematosus An **autoimmune disease**; a chronic inflammatory condition of the connective tissue. Treatment is with NSAID ANALGESICS or IMMUNOSUPRESSANTS.
Lyme disease A disease caused by a bacterium (spirochaeta, *Borrelia burgdorferi*) transmitted by the bite of tick that lives on deer and can also infest dogs. It causes acute inflammation at the site of the bite, followed by headache, lethargy, fever and muscle pain. There can be serious chronic symptoms. Treatment is with ANTIBIOTICS.
lymphocyte A type of agranulocyte **leucocyte**. An immunologically competent cell which recognizes **antigens**, comprises **B-lymphocytes** and **T-lymphocytes** and occurs in the spleen, blood and lymphatic tissue.
lymphokine A non-immunoglobulin oligopeptide, a **cytokine** synthesized by **T-lymphocytes**. It acts to modulate an immune response.
lymphoma A **malignant** disease, a **cancer** arising in lymphoid tissue (mainly of the nodes and spleen), including Hodgkin's disease.
lysis Dissolution or break down of a cell through damage to its cell membrane allowing escape of the cell contents.
lysosome A cytoplasmic particle that contains **enzymes**. It has a role in intracellular digestive processes.
MAC minimum alveolar concentration (for drug vapour).
macerate To wear down or soften, e.g. by digestion.
macro- A prefix meaning large.
macroglobulin See **IgM**.
macromolecule A molecule of very high molecular weight, e.g. protein.
macrophage A large **phagocytic** mononuclear **leucocyte** scavenger cell present in connective tissue and many organs.
major gene A gene that is individually associated with pronounced **phenotypic** effects.
major histocompatibility complex A multigene cluster that encodes for cell surface glycoproteins. the glycoproteins are involved in the cellular **immune response** to distinguish self from non-self.
malaria An infectious parasitic disease caused by *Plasmodium* spp. prevalent in tropical and subtropical regions, spread by mosquitos.
malignant In general, a term that describes any condition in the body which if untreated may be a threat to health (e.g. malignant hypertension). Specifically, it is used to describe any condition that tends to become progressively worse and results in death, and is mainly used for cancerous **tumours**.
manic-depressive illness A disorder characterized by disturbance of mood, most commonly bipolar (depression alternating with mania).
Mann–Whitney test This is a (**nonparametric**) **significance test** to compare the median of two unpaired sample groups. The null hypothesis is that the two population medians are equal. A *P* value for this hypothesis is calculated from the sample size and the sum of ranks in each group. This test assumes that the data are representative or randomly sampled from two populations having identically shaped distributions (which do not need to be Gaussian).
MAO monoamine oxidase (enzyme).
MAOI MONOAMINE-OXIDASE INHIBITORS.
MAP microtubule-associated protein, or mitogen-associated protein.
map distance The relative distance apart of two **gene** loci on the same **chromosome**.
MAP kinase serine-threonine protein kinase: an enzyme whose activity is stimulated by the action of **mitogens** and **growth factors**. Involved in phosphorylation of transcription factors and consequent stimulation of gene expression.
mast cell A granular **leucocyte** derived from myeloid tissue, having granules containing mediators including HISTAMINE, 5-HYDROXYTRYPTAMINE, HEPARIN and **TNFα**. Degranulation occurs when an **allergen** cross-links **IgE**.
matched-pairs t-test In comparing two treatments, the **confounding** effects of between-subject variability can be minimized by matching subjects as closely as possible, or ideally by using subjects as their own controls. In a matched-pairs t-test, matched data are arranged in rows, and treatments in two columns. In analysing the two related samples, the null hypothesis is that the two population means are equal. The paired t-test first computes the difference between columns for each subject (row), and for this single sample the null hypothesis is that the mean of these differences equals zero. A *P* value for this is calculated, together with the 95% confidence interval for the mean difference. With this treatment, the analysis is exactly equivalent to the **one-sample *t*-test**. The paired t-test assumes that the data on each row are repeated measurements on the same subject or measurements on matched subjects (e.g. matched for age and gender). The test

also assumes that the differences in the overall population follow a Normal distribution.

matched-pair study See **case-control study**.

maximum response The maximum responses to **agonists** at a given receptor to give a graded response, depends on efficacy: full agonists give the same maximum and **partial agonists**, by definition, give a smaller maximum. The maxima of concentration-response curves is thus a variable that must be estimated experimentally to allow calibration of the y-axis in terms of per cent of maximum, or before some linearizing transforms (e.g. the **Hill plot**) can be used. The maximum can best be mathematically estimated, along with the location parameter and slope, using the logistic equation.

MCA Medicines Control Agency (UK).

M-CSF macrophage-colony-stimulating factor: a protein **growth factor** that stimulates the growth of **monocytes** and **macrophages**.

MCV hepatitis C virus.

MDP (muramyl dipeptide) A component of a modified form of **Freund's complete adjuvant**.

mean (arithmetic, geometric, harmonic) The term is used loosely to imply arithmetic mean (the sum of all the observations divided by the number of observations), i.e. the average. In statistics, if the values are sampled randomly from a Normal population, then the sample mean gives an unbiased estimate of the population mean. However, if the underlying population is not Normally distributed, then the arithmetic mean gives a biased estimate, and it is best instead to estimate the **median** or the **mode**. If the underlying frequency distribution is known to be log-normal (e.g. EC_{50} and K_d values), then the geometric mean will give a better estimate. The geometric mean is obtained by averaging the logarithms of the values, then taking the antilogarithm of the result. Similarly, the harmonic mean is used in averaging reciprocals of values.

mechanoreceptor (mechanoceptor) A specialized sensory structure that responds to mechanical changes in the environment, e.g. tension, movement, pressure.

MED minimum effective dose (of a drug).

medial Situated towards the midline of the body.

median The median of a sample is the middle or central value when all values in a sample are arranged in order of magnitude. It provides a less biased estimate of the population mean than the **arithmetic mean** when the underlying distribution is not known, or is known *not* to be Normal. Medians (sample and population) are used in the calculations of many **nonparametric** variants of significance tests.

mediator A chemical released or formed by cells in response to a stimulus that exerts an effect on another, or the same cell type, e.g. **autacoid**, **hormone**, **neurotransmitter**.

Medicines Control Agency (MCA) Part of the UK drugs regulatory system that administers the Medicines Act, acting on evidence received advice from the **Committee on Safety of Medicines** (CSM).

mediodorsal In the dorsal midline.

megabase (Mb) A unit of length of DNA equivalent to 1 million **nucleotides**. The shortest human chromosome (number 21) is about 50Mb long, the longest (number 1) about 250Mb.

megakaryocyte A cell in the bone marrow that produces **platelets**.

-megaly A suffix denoting enlargement.

membrane potential The electrical potential difference that exists across an excitable membrane because of the membrane's selective permeability to ions, and the different concentrations of ions determined by the activity of **ion pumps**.

memory cells **Lymphocytes** that respond quickly to antigen because of being primed through a previous contact.

meninges The membranes that cover the brain and spinal cord.

meningitis **Inflammation** of the membranes covering the brain and spinal cord (meninges), commonly through infection by bacteria or viruses.

mepp miniature end-plate potential.

messenger ribonucleic acid (mRNA) The linear sequence of **nucleotides** that is transcribed from a single strand of DNA, to which it is complementary. It carries the information for protein synthesis to the ribosomes.

messenger RNA (mRNA) See **messenger ribonucleic acid**.

meta-analysis An analytical technique for collecting and grouping results and conclusions from a number of clinical trials.

metabolism The sum of the chemical activities in a cell that are involved in function, construction (anabolism), repair, breakdown (catabolism) and energy supply.

metabolism of drugs The process whereby the body detoxifies chemicals and excretes them as metabolites.

metabotropic receptor A receptor that is G-protein linked, often exclusively used to describe the non-ion channel receptor for glutamate.

methaemoglobin (metHG; methemoglobin, USA) An oxidized form of **haemoglobin** that is not able to carry oxygen, so production of it can lead to toxic anoxia. Blood can be converted (normally reversible) into this form by drugs and chemicals (e.g. nitrates, nitrofurantoin).

methylene blue A **dye** used in experimental biology as a **vital stain**.

methyl green A **basic dye** used to differentially stain RNA (red) and DNA (green).

me-too drug A slang term for a medicine developed by a manufacturer to obtain a share of a (lucrative) market, but which does not represent any advance in its actions over earlier drugs.

MHC **major histocompatibility complex**.

MIC minimum inhibitory concentration.

micelle A structered aggregation of molecules that occurs at high concentrations of certain surface-active agents (e.g. bile salts).

Michaelis-Menton equation/kinetics This equation, which is central to enzymology, describes the relationship between the initial rate of reaction (v) and the substrate concentration (C). It gives the initial rate of reaction as $v = V_{max}\,C/(K_m+C)$; where V_{max} is the maximum velocity of reaction, C is the concentration of substrate and K_m is the Michaelis–Menton constant. C is equal to the Michaelis–Menton constant when v is 50% of V_{max}.

micro- A prefix meaning small.

microbe A microorganism that is too small to see with the naked eye (e.g. bacterium, virus, protozoan, some fungi).

microbiology The study of microorganisms.

microcirculatory system The vessels of the blood and lymphatic system which are visible only with a microscope.

micrograph (photomicrograph) A photograph of an image viewed through a microscope.

microinjection Injection of cells using a micropipette.

micrometer In light microscopy, a device to measure a specimen, e.g. ocular micrometer, slide micrometer.

micrometre (micron) μm 10^{-6}m
microtome An instrument used to cut extremely thin slices of a material (e.g. tissue) which is usually embedded in a medium such as wax.
MID minimum infectious dose.
MIF macrophage migration inhibition factor: a protein produced by activated **T-lymphocytes** which prevents the movement of **macrophages**.
migratory cells These are cells, such as **leucocytes** and **macrophages**, that enter tissues from the bloodstream.
-mimetic A suffix meaning to imitate or mimic, e.g. SYMPATHOMIMETICS are agents that mimic the actions of the sympathetic nervous system.
MIMS See **Monthly Index of Medical Specialities**.
minim A unit of volume used in pharmacy equivalent to $^1/_{16}$ part of a fluid **drachm**.
miosis Constriction of the pupil of the eye.
misuse of drugs A term referring to inappropriate use of drugs, e.g. unethical uses. See **abuse of drugs**.
mitogen A compound that stimulates cells to undergo mitosis non-specifically.
mixed nerve A nerve containing both **sensory** (afferent) and **motor** (efferent) components.
mixed spinal nerves Spinal nerves after union of the ventral (**efferent**) and dorsal (**afferent**) roots.
MLD (minimal lethal dose) The smallest quantity of a toxic compound that has been recorded to cause death.
modality Relating to statistical **mode**.
mode Most commonly the occurring value in a sample.
modified-release preparation (sustained-release preparation) Usually a tablet or capsule designed to release its active constituents over a period of time. See also **routes of administration of drugs**.
modifier gene A gene that alters the phenotypic expression of a non-allelic **gene**.
mol **mole**.
mole (mol) The SI unit of the amount of a substance which contains as many elementary units as there are atoms in 0.012 kg of ^{12}C. One mole of a substance has a mass equal to its **molecular weight** in grams.
molarity (M) The concentration (strength) of a solution. It is expressed as the weight of dissolved substance in grams per litre divided by its molecular weight to give moles per litre.
molar solution A solution where the number of grams of dissolved substance per litre equals its molecular weight, so the concentration is 1M (one molar), i.e. 1 mole of solute per litre of solution.
molecular biology The study of biological phenomena at the molecular level. Recently, it has taken on special meanings and is used particularly to denote the study of genes, gene products and sometimes pharmaceuticals manufactured by processes using genetic materials.
molecular mass The sum of the atomic masses of all the atoms in a molecule. See **relative molecular mass**.
molecular weight See **relative molecular mass.**
molecule The smallest unit of a substance that can exist independently and still have the properties characterisitic of that substance.
monoamine oxidase An enzyme that oxidatively deaminates intraneuronal **biogenic amines**, including the **neurotransmitter catecholamines**.
monoclonal antibody **Antibody** that has been produced by a single clone of B cells and which therefore consists of antibody molecules that are identical and specific for a single **antigenic determinant**.
monocyte A type of phagocytic **agranulocyte** leucocyte. Its function is the ingestion of foreign particles.
monomer A molecule composed of a single unit, such as a protein composed of a single polypeptide chain. See **oligomer**.
Monthly Index of Medical Specialities (MIMS) A comprehensive compendium of drugs that is available to GPs, pharmacists and other health professionals.
morbidity Diseased state, normally expressed as a morbidity rate. See **mortality**.
morphology The structure and form of an organism or structure.
mortality The incidence of death in a population per year, usually expressed as mortality rate (per 10,000).
motoneuron See **motor neuron**.
motor When applied to nerves, refers to those that carry impulses from the **CNS** (efferent) to bring about an effect, e.g. in a gland or muscle.
motor end-plate (neuromuscular junction) Where the motor neuron terminates in close contact with a skeletal muscle fibre.
motor neuron A **neuron** carrying impulses away from the **CNS** to an **effector**.
motor unit A motor neuron and associated muscle fibres.
MR modified-release (formulation of drug).
Mr relative molecular mass.
MRC Medical Research Council.
MRI magnetic resonance imaging (or scanning).
MRL maximum residue limit.
mRNA **messenger RNA**.
MRT mean residence time (drug turnover time).
mucosa The lining of the gut, consisting of three layers: the inner epithelium; lamina propria; muscularis mucosae.
mucous membrane (mucosa) The moist membrane lining internal structures, e.g. respiratory tract.
mucus The fluid secreted by mucous membranes.
multideterminant Antigen carrying more than one **antigenic determinant**.
multidrug resistance Where a number of organisms have acquired resistance to antibiotic or other antibacterial agents, each with a different mechanism of action, and thus are multidrug resistant.
multigene family Similar but not identical **genes**, i.e. having a higher level of base sequences in common that encode for different but related proteins; thought to have arisen from duplication and divergence of an ancestral gene.
multipolar A nerve cell having more than two main cellular processes.
multispecificity Refers to the ability of a single type of **antibody** molecule to combine with different **antigens**.
multivalent An **antibody** with more than one **antigen**-binding site.
murine Pertaining to or derived from any member of the family *Muridae*, which includes mice and rats. Often applied to mice exclusively.
muscle spindle A stretch receptor (proprioceptor) of muscle.
muscularis mucosa The outer, smooth muscle layer of the gut mucosa.
mutagen Anything (e.g. chemical) that increases the rate of **mutation** in living cells.
mutagenesis The production of **mutations**, e.g. by X-rays or chemicals.
mutant A cell or organism with altered genetic material such that it differs from its precursor cell or parent. See

mutation.

mutation A change in DNA sequence, ranging from an alteration in a single base (e.g. sickle-cell haemoglobin) to loss or gain of chromosomal material (e.g. the Philadelphia chromosome in chronic myeloid leukaemia). The change in the chemical structure or amount of DNA results in a change in the characteristics of an individual cell or organism. The mutation results from alteration in the protein (or RNAs) specified bt the DNA that has mutated.

mutualism An intimate but not necessarily obligatory association between two different species in which there is mutual aid and benefit (c.f. **commensual**, **parasite**, **symbiosis**).

myalgia Muscle pain.

myasthenia gravis An **autoimmune disease** where **antibodies** against skeletal muscle nicotinic receptors are produced.

mycology The study of fungi.

mycotoxins **Toxins** derived from fungi.

mydriasis Dilation of the pupil of the eye.

myel- A prefix denoting the spinal cord, bone or myelin.

myelin The material consisting of lipid and protein that forms the protective sheath around some nerve endings.

myelin sheath An insulating sheath wrapped in a tight spiral around a nerve axon formed of the membrane of Schwann cell in peripheral nerves, or of oligodendrocyte in the CNS.

myelitis **Inflammation** of the spinal cord.

myelocyte A bone marrow cell.

myeloma A **malignant cancer** of myeloid tissue.

myenteric plexus (Auerbach's plexus) The nerve plexus that lies between the circular and longitudinal smooth muscle layers of the small instestine.

myo- Pertaining to muscle.

myoblast A precursor cell of skeletal muscle fibres.

myocardial infarction (heart attack) The sudden death of part of the heart muscle, characterized by severe unremitting pain. It is usually caused by coronary thrombosis, obstruction of the coronary arteries.

myocarditis An acute or chronic **inflammation** of the muscle of the heart (cardiac muscle).

myocardium The muscular wall of the heart.

myocyte A muscle cell.

myogenic Originating within muscle cells.

myometrium The muscular uterine wall.

myosin An ubiquitous protein, especially in muscle fibrils, having **ATPase** activity and which interacts with actin in, for example, muscle to form a contractile complex.

NAD^+ (NADH) nicotinamide adenine dinucleotide (reduced form).

$NADP^+$ (NADPH) nicotinamide adenine dinucleotide phosphate (reduced form).

Na^+,K^+-ATPase (Na^+-K^+pump) A plasma membrane protein with **ATPase** activity which by **active transport** moves Na^+ ions out of the cell, and K^+ ions into the cell using energy derived from ATP hydrolysis. It sets up the ionic gradients across the membrane and maintains **membrane potential**.

names of drugs There are three main types. The **chemical drug name** is the full name of the chemical that is the active component, but has the disadvantage in medical use that it is often very long and complex. The **generic drug name** is the official 'trivial' official name (e.g. paracetamol), and is used in normal medical prescribing and administration. The **proprietary drug name**, the trade name, is normally capitalized (e.g. Panadol), and is used for marketing purposes and commonly in packaging.

NANC non-adrenergic non-cholinergic (neurotransmission): that component of response not mediated by noradrenaline or acetylcholine. Possible mediators include purines, e.g. ATP, and peptides, e.g. substance P.

nano 10^{-9}

narcolepsy An extreme tendency to fall asleep in a quiet environment, although such individuals can be easily roused. Treatment may be with CENTRAL STIMULANTS, e.g. dexamphetamine.

nascent Newly formed, e.g. of DNA or RNA material, or that part of a neurotransmitter pool.

natriuresis Excretion of sodium in the urine.

natriuretic Causing a sodium loss into the urine (a property of DIURETICS).

natural killer cell (NK cell) A large granular **lymphocyte** which, when activated by INTERFERON, binds to and kills certain virally-infected cancerous cells.

nebulizer See **aerosols**.

NC cells Natural cytotoxic lymphocytes.

NCE New chemical entity.

necrosis The relatively uncontrolled process of cell death. Contrast with **apoptosis**.

NED **normal equivalent deviate**.

negative staining A technique used in electron microscopy in which a specimen is surrounded by a heavy metal stain. The result is to outline the shape of the specimen and penetrate its surface clefts to produce a 'negative impression'.

NEL no-adverse-effect level (chemical hazard).

neoplasm Any abnormal or new growth. Correctly, the term can be applied to relatively harmless swellings (**benign**) or cancerous (**malignant**) growths. Nevertheless, the term neoplastic disease is often loosely taken as synonymous with cancerous growth. See **hyperplasia**; **hypertrophy**.

nerve block The interruption of the transmission of an impulse through a nerve, e.g. with a **local anaesthetic** injection.

nerve ending The structure on the distal end of a peripheral nerve. It may comprise a free nerve ending or a receptor organ.

nerve fibre The axon of a neuron and its myelin sheath if present.

nerve impulse The all-or-none response, comprising an **action potential** which is propagated along the length of an excitable cell, such as a nerve axon.

nerve plexus A diffuse network of neurons and ganglia.

nervous system The network of cells specialized to carry information in the form of nerve impulses to and from all parts of the body. It comprises the **CNS** and **peripheral nervous system**.

neural tube The embryonic tube that differentiates into the brain and spinal cord.

neurobiology The study of the physiology, biochemistry, morphology and development of the brain and nervous system – the cellular and biochemical basis of brain function.

neuroblastoma A tumour of the adrenal glands or the sympathetic nervous system. Cultured cells derived from neuroblastoma are used extensively in experimental biology, e.g. electrophysiology.

neuroendocrine Pertaining to both the **nervous** (neuro) and **endocrine** systems.

neuroendocrine cells See **neurosecretory cells**.

neurogenic Innervated by nerves or originating in nervous tissue.

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neurogenic inflammation **Inflammation** that is a consequence of released mediators from nerves. The term is often used to refer to the **efferent function of primary afferent** nerves.

neuromodulator An endogenously released mediator that modifies the effect of a **neurotransmitter**.

neuromuscular junction The site at which a nerve axon terminal contacts a muscle cell.

neuron (neurone; nerve cell) The major cell type that makes up nervous tissue. It is specialized for transmission of information in the form of **nerve impluses**.

neuropeptide Any of many small peptides that function as **neurotransmitters**, e.g. SUBSTANCE P.

neurophysins Proteins that function to transport hormones from nerve axons to the blood of neuroendocrine (**neurosecretory**) cells.

neuroplasm The protoplasm of nerve cells.

neurosecretion Release of mediators from neurons. See **neurosecretory cells**.

neurosecretory cells (neuroendocrine cells) Nerve cells that release mediators that travel in the blood to their target cells, e.g. cells in the hypothalamus that act on the pituitary gland.

neurotoxin(s) A loose group of toxins that act predominantly to disrupt neurotransmission and other neural processes. Some original examples were exotoxins produced by microbes (e.g. tetanus toxin), but the term is often extended to include natural toxins or venoms of diverse structure from many animal and plant phyla (e.g. tetrodotoxin, conotoxins, bungarotoxins).

neurotransmitter A **mediator** released from the terminal of a **neuron** which transmits the neuronal signal across a synapse to act locally at another neuron or other cell type, e.g. muscle. Selectivity of signalling is achieved by the relatively close apposition of release site and effector cell.

neurotrophic Influences that nourish nervous tissue.

neurotrophic factors Peptides that support survival and growth of **neurons**.

neurotropic Having an affinity for nervous tissue, including viruses or bacteria that infect nervous tissue or **toxins** that act on nerve cells.

neurovascular Pertaining to both nervous and vascular tissue.

neutropenia (granulocytopenia) A decrease in the number of **neutrophils** in the blood. It may be caused by a number of diseases and as an **adverse drug reaction**, and increases susceptibility to infection.

neutrophil A large granular leucocyte, a phagocytic **PMN**. It responds to chemotactic stimuli and is important in the early stages of acute **inflammation**, containing a wide range of enzymes.

neutrophilia Having affinity for neutral dyes.

NGF nerve growth factor.

NHS National Health Service (UK).

NIDDM non-insulin dependent diabetes mellitus.

NIH National Institutes of Health (USA)

nitrergic nerve A nerve that uses NITRIC OXIDE as the **neurotransmitter**.

nitric oxide synthase The enzyme that produces the neurotransmitter and smooth muscle relaxant nitric oxide (NO) following deamination of arginine. It exists in **constitutive** and **inducible** forms.

NK **natural killer cell**.

NMDA *N*-methyl-D-aspartate.

NMR nuclear magnetic resonance.

NO NITRIC OXIDE (nitrogen monoxide) (mediator).

nociception The reception, conduction and processing of noxious stimuli. Usually results in the sensation of pain.

nociceptive reflex A reflex that protects tissue from injury.

nociceptive system See **nocifensive system**.

nociceptors **Sensory receptors** located on afferent neurons that detect noxious stimuli resulting from, for example, chemical or physical tissue damage.

nocifensive system (nociceptive system) The neurons that are involved in nociception.

non-equilibrium antagonist A term that has been applied to antagonism where the antagonist binds essentially irreversibly to the receptor, e.g. phenoxybenzamine with α-adrenoceptors. The affinity of such antagonists for the receptor cannot be estimated, but they can be used in **receptor occlusion** studies to estimate affinities of agonists.

non-granular leucocyte A **leucocyte** with a clear homogenous cytoplasm.

nonparametric A type of statistical test (a distribution-free test) that does not assume that the sampled data has a particular **probability distribution** (many assume, for instance, approximation to a Normal distribution). However, there will still generally be assumptions about random and independent sampling, with the data being reasonably representative and with samples drawn from populations with the same distribution (unknown). It may be noted that with sampling distributions that are noticeably skewed-to-the-right (as is often the case in pharmacology where the log-normal distribution is common), then application of the **logarithmic** transformation may be used to normalize variances and allow parametric tests.

nonsense codon See **termination codon**.

Normal distribution (Gaussian distribution) A particular probability distribution believed to underlie much quantitative physical data, and so is the basis of many standard **parametric** significance tests and other analyses. However, in pharmacology, and much of biology in general, it is the logarithm of the variable, not the variable itself, that is Normally distributed; in other words, there is a log-normal distribution. This is especially true of the distribution of sensitivities of individuals in a population to chemical substances (e.g. EC_{50} and LD_{50} values). See also **frequency distribution**; **probability distribution**.

normal equivalent deviate (NED) In statistics, NED is used to obtain a generalized form of the relationship between population **standard deviation** for a Normal distribution and the resultant cumulative frequency. In graphical form, the *x*-axis is a standardized Gaussian curve with mean zero and a standard deviation of unity, and the *y*-axis is the cumulative frequency from 0 to 100%. This curve takes a symmetrical sigmoid form (whereas the non-cumulative version is a bell-shaped curve). Points on this curve are given in standard NED statistical tables. Thus 0 SD corresponds to 50%; -1 and +1 SD corresponds to 15.97 and 84.13 %, respectively; -2 and +2 SD correspond to 2.27% and 97.73%, respectively; etc. This information can be used in a number of ways. In pharmacology, is has been used as the basis of a theoretically justified **linearizing transformation**. The **probit** is defined as NED + 5 (so as to eliminate most negative NED values). For quantal dose-response lines (e.g. mortality data), if the data are plotted with probits on the *y*-axis versus the logarithm of dose on the *x*-axis, then in a generalized case, the data will fit a straight line. This linearizing transformation allows weighting of experimental

points in fitting the best linear relationship by least-squares methods: but values much smaller than ca. 5% and much greater that ca. 95%, have near negligible weight. Estimates of interest include ED_{50} or LD_{50} (the *x*-intercept corresponding to the line intercept at the level of probit 5.0) and the slope (which is inversely related to the variance of sensitivities to the drugs within the samples). See also **quantal responses**.

normal flora The collection of (non-pathological) microbes usually present as colonists in an environment such as the gut.

normal saline solution See **physiological salt solution**.

normal salt solution See **physiological salt solution**.

Northern blot technique A technique that is used to identify **RNA**. RNA is separated according to size by use of a denaturing gel and **electrophoresis** prior to being blotted onto a solid support. The mRNA transcripts are then detected by hybridization with a radioactive labelled **probe**. The abundance of the mRNA is indicated by the intensity of the radioactive signal. See also **Southern blot technique**.

NOS **nitric oxide synthase**.

nosocomial synonomous with **HAI**.

NO synthase See **nitric oxide synthase**.

NSAID NON-STEROIDAL ANTIINFLAMMATORY DRUGS.

nucleic acid hybridization See **DNA hybridization**.

nucleic acids Chains of **RNA** or **DNA**, two organic acids present in the nucleus (and sometimes the cytoplasm) of all living cells. They are the basic units of protein synthesis and of heredity. Nucleic acids are long chains of linked **nucleotides** which in DNA contain the purine bases adenine and guanine, plus the pyrimidine bases thymine and cytosine; whereas in RNA the place of thymine is taken by uracil.

nucleoside The glycoside resulting from removal of the phosphate group from a **nucleotide**, i.e. the base-ribose moiety of a nucleotide

nucleotide The structural unit of a **nucleic acid**, consisting of a nitrogen-containing base (a **purine** or a **pyrimidine**), linked to a sugar molecule, i.e. a **nucleoside**, and a phosphate group. Nucleic acids are long chains of linked nucleotides. See also **gene**.

nucleotide sequence The order of **nucleotide** residues in a nucleic acid.

null allele A **mutant allele** that results in an absence of a functional gene product.

null hypothesis In statistical **significance tests** this is a statement of the model tested. Generally, null hypotheses are for there being no real difference between two or more samples, or difference of the samples from some theoretical value (e.g. one or zero), or from a known population value. A difference is said to be significant when the observed difference, as compared to that stated in the null hypothesis, is so great at a given **probability value** ($P<0.05$ etc.) that the null hypothesis is unlikely to be true.

null method A method useful in pharmacology to bypass the unknown relationship between receptor occupancy by an agonist and the resultant response. It was used by Gaddum (1937) in order to solve the occupancy equations for competition of an agonist and competitive antagonist at a receptor, by assuming that at a given level of response, there is equal occupancy by a given agonist species. Thus, both in the absence of antagonist, and in the presence of a competitive antagonist when the concentration of the agonist must be increased *x*-fold to achieve exactly the same response, there is assumed to be equal occupancy of receptor by the agonist species. The variable, *x*, was termed the dose-ratio or concentration ratio (see **Gaddum–Schild equation**). Its use in receptor studies was extended by Stephenson (1956), who assumed that equal responses to two agonists results from equal stimulus, which then allows meaningful comparisons of the agonists' **efficacy** and **relative potency**.

occupancy Receptor occupancy is normally quoted as a proportion of the total receptor population occupied by the ligand, so takes values between zero and unity.

OD optical density.

oedema An abnormal accumulation of fluid in the body tissues, which may be localized (e.g. is a swelling) or generalized (e.g. after heart failure). It can be caused by injury as a component of **inflammation**, or as a symptom of various diseases (heart failure, cirrhosis of the liver). It may also be caused by a number of drugs (e.g. CONTRACEPTIVES, CORTICOSTEROIDS). Treatment of oedema depends on the cause, but DIURETICS are commonly used.

oesophageal ulcer See **peptic ulcer**.

ointment A general term that is used to describe a group of essentially greasy preparations which are insoluble in water and so do not wash off. They are used as bases for many therapeutic preparations for **topical** application (particularly in the treatment of dry lesions or ophthalmic complaints). Most ointments have a form of PARAFFIN as their base, but a few contain LANOLIN.

oligomer A molecule composed of only a few **monomer** units.

oligonucleotide A laboratory prepared short chain of **nucleotides**.

oligopeptide A short **polypeptide** (comprising less than 10 amino acids.

oncogene A gene that under certain conditions can cause **cancer** by stimulating abnormal uncontrolled cell growth and excessive proliferation in the cell in which it occurs, or is introduced to. A mutant form of **proto-oncogene**.

oncology The study and practice of treating **tumours**.

one-sample t-test (Student's one-sample t-test) A (**parametric**) **significance test** that compares the mean of one sample group with a theoretical value. The null hypothesis is that the population mean equals the theoretical value (e.g. zero, unity, or some determined population value). Both a *P* value and the 95% confidence interval for the difference between the population mean and the hypothetical value in testing this null hypothesis can be calculated. The test assumes that the data are representative and randomly sampled from a larger population, each observation is independent and the population has a **Normal distribution**.

open reading frame A sequence of **DNA** that contains a signal for the start of **translation**, a length of amino acid encoding triplets to form a protein and then a signal for termination of translation. It may therefore indicate the presence of a protein-coding **gene**.

opsonin Any **antibody** that increases the susceptibility of a particular **antigen** (e.g. microorganism) to which it binds to **phagocytosis**. Also, C3b of complement.

opsonization The process by which foreign particles (**antigens**, e.g. microorganism) become coated with specific **antibody** (opsonin), which makes them more readily ingested by phagocytic cells (**phagocytosis**).

optical isomers See **isomers**.

order The taxonomic group of related organisms ranking between **family** and **class**.

orphan receptor A receptor protein whose structure is predicted from a cloned **gene**, but whose function is

unknown.

osteoarthritis A type of arthritis (joint **inflammation**) in which there is degeneration of the cartilage that lines the joints. It is exacerbated by stress, and characterized by creaking joints. Treatment of symptoms is by NSAIDS, CORTICOSTEROIDS or surgery.

osteoporosis A loss of the bone tissue, leading to a tendency to become brittle and fracture. The cause can be infection, injury, as part of Cushing's syndrome, especially in long-term CORTICOSTEROID therapy, or in the elderly and in women following the menopause.

OTC over-the-counter, i.e. non-prescriptionmedicine.

ototoxicity Toxic damage to the inner ear, including drug-induced damage to the nerve serving the inner ear (eighth cranial nerve) the cochlea and semicircular canals, so causing deafness or loss of the sense of balance. This is a common adverse effect seen with the use of the antibiotic NEOMYCIN and related aminoglycosides.

oxytocic An agent that stimulates the rate of childbirth, especially through stimulation of uterine smooth muscle.

P450 cytochrome P450 mixed-function drug metaboling enzyme.

pA_2 Index of potency of antagonists devised by Schild (see **pA_x**). It is the negative $\log_{10}$ of antagonist concentration that gives an agonist **concentration-ratio** (dose-ratio) $x = 2$. The index may have different uses. (i) Where there is simple equilibrium competition between agonist and antagonist for a single site, $pA_2 \equiv pK_B$ ($-\log_{10} K_B$ of the antagonist), and the affinity constant can be calculated from the **Gaddum–Schild equation** or from a **Schild plot**. (ii) Where the antagonism is not competitive, or there is not equilibrium (or it is not known), the index can be used as a simple empirical measure of antagonist potency (with no inference of affinity).

pA_x Logarithmic index of potency of antagonists devised by Schild (1947, 1949). Defined as the negative logarithm of the molar concentration of an antagonist such that the dose of an agonist needs to be increased by a factor of x so as to obtain the same size of response as in the absence of antagonist. In general terms, x is referred to as the **dose-ratio** or concentration-ratio. The indexes pA_2 and pA_{10} are where the ratio, x, is 2 and 10, respectively; and theoretically (pA_2-pA_{10}) = 0.95 for competitive antagonism. The index may be interpreted in two main ways; see **pA_2**.

pacemaker A cell or region of an organ that determines the rate of activity in other cells or organs.

Pacinian body A **sensory receptor** sensitive to pressure.

packed cell volume (haematocrit) The volume of **erythrocytes** in blood expressed as a fraction of the total blood volume.

PAF platelet-activating factor.

PAGB Proprietary Association of Great Britain.

PAGE polyacrylamide gel **electrophoresis**; an experimental technique used to separate large molecules such as proteins or nucleic acid.

paracrine See **local homones**.

paraesthesia (pins and needles) Spontaneously occuring tingling sensations, especially in the extremities. Can be caused by damage to peripheral nerves.

paralytic ileus A condition of the gastrointestinal tract, characterized by a failure of the normal peristaltic contractions and resultant obstruction of the intestine, e.g. following abdominal surgery.

parallel imports Refers to the system whereby drugs are reimported for sale from a country where the drugs are sold at a cheaper price.

parameter A term sometimes used to denote a variable, such as heights or weights of individuals, and sometimes a statistical measurement, such as an average, standard deviation or regression coefficient.

parametric A type of statistical test that assumes an underlying probability distribution, in contrast to distribution-free or **non-parametric tests**. Student's t-test in its various forms is a commonly used parametric test.

parasite A **microbe** or other small creature that lives on (ectoparasite) or in (endoparasite) a host, and which normally derives benefit from the association but contributes nothing to its host's welfare (c.f. **commensual**, **mutualism**, **symbiosis**). Examples in medicine include many viruses, bacteria, fungi, protozoa and worms.

parasiticide An agent that detroys parasites (excluding fungi and bacteria). See also ACARICIDE; ANTHELMINTIC; TRYPANOCIDE.

parasympathetic nervous system See **autonomic nervous system**.

parental Administration by any route other than by mouth. See also **routes of administration of drugs**.

parietal Of or situated on the wall of an organ or other body structure.

pars A part of an organ.

partial agonist See **agonist**; **efficacy**; **intrinsic activity**; **stimulus**.

pascal (Pa) The SI unit of pressure, equal to one newton per square metre.

passive immunity **Immunity** acquired by injection of **antibodies**, or in the foetus by transfer of maternal antibodies through the placenta.

pastille A soft lozenge.

patch clamp A technique used in experimental electrophysiology where a hollow glass patch pipette forms a tight seal with a cell membrane following suction being applied. It can be used to record activity of single ion channels.

patch test A type of skin test where the **antigen** is applied to the surface of the skin. Used, for example, to detect allergy and assist in medical diagnosis.

patents for drugs See **generic drug name**.

pathogen A disease-causing microorganism.

pathogenesis The mechanism or process of development of a disease.

pathogenic Capable of causing a disease.

pathology The science of disease or dysfunction, or the characteristic symptoms and signs of a disease.

-pathy A suffix denoting disease (e.g. neuropathy).

patient information leaflet (PIL or Product Information Leaflet) The technical literature placed by the drug manufacturer in the packaging of medicines, which is intended to be read by the patient or carer. In the case of OTC drugs these safety warnings are particularly important.

PC *Pharmaceutical Codex.*

PCD programmed cell death; see **apoptosis**.

PCR **polymerase chain reaction**.

PDE **phosphodiesterase** (enzyme).

PDEI PHOSPHODIESTERASE INHIBITOR.

PDGF platelet-derived growth factor.

PEM prescription event monitoring; see **epidemiology**.

peptic ulcer A disease state characterized by ulceration, initially of the mucosa of the alimentary tract, caused by the action of pepsin and hydrochloric acid. It may be in the body of the stomach (gastric ulcer), the duodenum (duodenal ulcer), jejunum (jejunal ulcer; especially in Zollinger-Ellison syndrome) or of the oesophagus (oesophageal ulcer;

associated with **reflux oesophagitis).**

peptidase An enzyme that catalyses the hydrolysis of a **peptide** to smaller fragments, often resulting in inactivation of biological activity.

peptide A chain of a small number of **amino acids** linked by **peptide bonds**. Many act as biologically active **mediators**, e.g. **neurotransmitters** or **hormones**.

peptide bond The covalent bond that joins the alpha-amino group of one **amino acid** to the carboxyl group of another.

peptidyl transferase The enzyme that catalyses the formation of **peptide bonds** during ribosomal protein synthesis.

peptone A soluble product of protein hydrolysis.

percutaneous Through the skin, such as the route of administration of ointments which are absorbed through the skin. See also **routes of administration**.

perfusion The passing of fluid through channels such as blood vessels.

peri- A prefix denoting situated around, near or enclosing.

pericyte A type of cell that surrounds very small blood vessels, such as capillaries arterioles and venules.

peripheral nervous system The **autonomic nervous system**, the **cranial nerves** and the **spinal nerves**.

peripheral neuropathy Numbness, tingling, pain and muscle weakness, particularly of the extremities, resulting from disease or peripheral nerve damage.

peripheral vascular disease Pain and coldness of the extremities, resulting from narrowing of the blood vessels, e.g. in Raynaud's disease, diabetes or varicose veins.

peritoneum The membrane lining the abdominal cavity.

permissive cell A cell that supports virus replication.

pessaries Formulations of drugs inserted in the vagina.

pH acid-base scale; the log of reciprocal of hydrogen ion concentration, a measure of the acidity of a solution.

phaeochromocytoma A type of **tumour** of neuroendocrine glandular tissue of the type normally found in the adrenal medulla, leading to large and often dramatic release of adrenaline and noradrenaline.

phage Bacteriophage.

phagocytic The ability of a cell to carry out **phagocytosis**.

phagocytosis Uptake by **endocytosis** of large solid particles, or other cells into the cell often following **opsonization**.

Pharmaceutical Price Regulation Scheme (PPRS) A voluntarily adhered to scheme in the UK by manufacturers as a means of limiting profit margins for drugs sold under the National Health Service.

pharmacist A practitioner of **pharmacy**, whether in the pharmaceutical industry, universities, hospital pharmacies or shops and high-street pharmacies.

pharmacoanthropology The study of difference in the properties of drugs (**pharmacodynamics** and **pharmacokinetics**) between different genetic groups.

pharmacodynamics The study of the effects of drugs on the body, including mechanisms and the interaction of drugs with cells. See **pharmacokinetics**.

pharmacogenetic polymorphism The existence within a population of more than one phenotype with respect to the effects, or more usually metabolism, of a drug (e.g. hydrolysis of SUXAMETHONIUM, acetylation of drugs such as ISONIAZID, and of phenylthiourea taste-thresholds).

pharmacogenetics The study of the modification of pharmacological effects resulting from hereditary differences. See **pharmacogenetic polymorphism**.

pharmacognosy The study of the pharmacological agents derived from plants. See **pytopharmacolology**.

pharmacokinetics The study of the handling of a drug within a body, including study of **absorption**, **distribution**, **metabolism** and **excretion** of a drug and its metabolites.

pharmacology The science of drugs. The effect of chemical substances on living processes. It can be divided into **pharmacodynamics** (what the drug does to the body) and **pharmacokinetics** (what the body does to the drug). It is much concerned with the development of novel drugs.

pharmacopoeia A book listing drugs used in medicine. It includes details of their chemical formulae, preparation, dosages and other properties.

pharmacy The preparation (formulation), supply and dispensing of medicines (and the place where this is done).

phase contrast microscopy An optical microscopic method which enables unstained, living cells to be observed by use of the way different cell components diffract light resulting in a high-contrast image.

phases of clinical trials There are four phases to the clinical study of new drugs: phase I, clinical pharmacology; phase II, clinical investigation; phase III, formal therapeutic trials; phase IV, post-marketing/licensing studies.

phenotype The expression of observable characteristics (visual, biochemical or otherwise measurable) determined by an individual's genes (**genotype**) and their interaction with the environment. Two individuals with identical genotypes (e.g. identical twins) may express different phenotypes.

phenotypic See **phenotype**.

phenylketonuria A deficiency of the enzyme that metabolizes phenylalanine. It is an inherited condition.

pheromone A substance secreted by an animal that influences the behaviour of other individuals of that species.

PHI PEPTIDE HISTIDINE ISOLEUCINE.

PHM PEPTIDE HISTIDINE METHIONINE.

phosphatase An enzyme that catalyses removal of a phosphate group.

phosphodiesterase An enzyme that hydrolyses phosphodiester bonds For example, cyclic AMP to adenosine monophosphate to terminate the activity of this **second messenger**.

phosphoinositide system An important intracellular **second messenger** system where G-protein coupled receptor stimulation leads to **phospholipase C** activation, which breaks down the phospholipid phosphatidyl inositol (4,5)bisphosphate into diacylglycerol (DAG) and inositol (1,4,5) - trisphosphate ($InsP_3$), both of which function as second messengers, DAG to activate **protein kinase C**, $InsP_3$ to release Ca^{2+} from intracellular stores.

phospholipase An enzyme that catalyses **phospholipid** hydrolysis, resulting in **diacylglycerol** and a phosphate of the phospholipid headgroup.

phospholipase C The **phospholipase** enzyme that breaks down phosphatidylinositol (4,5)bisphosphate into diacylglycerol and inositol (1,4,5)- trisphosphate both of which function as **second messengers**. Activation of phospholipase C is via stimulation of **G-protein** coupled receptors.

phospholipid (phosphatide) Ester of phosphoric acid, containing one or two fatty acid molecules, a nitrogenous base and an alcohol. The major component of the lipid bilayer in all biological membranes.

photophobia An intolerance to light, such that normal levels are uncomfortable. It occurs in some eye disorders (e.g. iriditis, corneal damage and chronic **glaucoma**), in some

systemic infections (e.g. **meningitis**) or can be induced by drugs that dilate the pupil (MYDRIATICS).

photoreceptor A sense organ that responds to light.

photosensitivity An abnormal reaction to sunlight (e.g. a rash). Phototoxicity is where drug treatment lowers sensitivity of the skin to ultraviolet light, so that there is burning. One form is photoallergy, where the drug combines with skin proteins to form an **allergen**, to which the body reacts with an **allergic reaction**. Undesirable photosensitization is caused by a wide variety of drugs in standard usage (e.g. phenothiazines, SULPHONAMIDES, sulphonylurea HYPOGLYCAEMICS, TETRACYCLINES, CONTRACEPTIVES). SUNSCREENS applied to the skin help in treatment.

phylum The taxonomic group immediately above (more inclusive) that of **class** and below **kingdom** in zoology. It corresponds to the category **division** in botany.

physical mapping A linear map of the locations of **genes** on a **chromosome** as determined by physical detection of overlaps between cloned DNA fragments.

physiological salt solution (normal saline) A sterile solution of sodium chloride in purified water: 0.9g sodium chloride in 100ml. It is **isotonic** with body fluids.

physiology The study of functions and activities of living organs.

physo- A prefix denoting air or gas.

phyt- (phyto-) A prefix denoting of plant origin.

phytopharmacology The study of the interaction of plants and drugs, both the derivation of botanical sources of drugs and the effect of drugs on plants. See **pharmacognosy**.

phytotoxin A poisonous substance produced by a plant.

pia mater The vascular membrane covering the surface of the brain and spinal cord.

pico 10^{-12}.

pigment A substance that gives colour.

PIL **patient information leaflet**.

pills Solid spherical or ovoid drug, dose forms (originally often made by a rolling process), which are now largely superseded by **tablets**. 'The Pill' is slang for oral contraceptives, which actually are in tablet form.

pilo- A prefix denoting hair.

PIP_2 phosphatidylinositol 4,5, bisphosphate.

pK_A A logarithm of acid ionization constant (K_A)

pK_B Equivalent to $-\log_{10}K_B$, where by convention K_B is the equilibrium dissociation constant of an antagonist. Numerically, identical to pA_2 for simple equilibrium competition at a single site. The term apparent pK_B may be used when there is no evidence whether or not there is competition, but there is assumed to be (e.g. when calculating pK_B from a single concentration of antagonist).

PKC **protein kinase C**.

PL product licence.

placebos Dummy treatments, having only psychological effects.

-plasia A suffix denoting formation.

plasma The fluid component of blood or lymph.

plasma extravasation The movement of **plasma** from blood vessels, e.g. post-capillary venules into surrounding tissues. During **inflammation** this gives rise to **oedema**. It results from the formation of gaps between endothelial cells due to endothelial cell contraction caused by release of inflammatory mediators. It may be **neutrophil**-dependent.

plasmid An autonomously replicating **DNA** element, separate from the **chromosome**. These units, which occur only in bacteria, can be used as **vectors** of small (up to about 10kb) fragments of foreign DNA.

plasmid cloning vector A **plasmid** that is used in recombinant DNA studies because it accepts foreign DNA.

plasmin The enzyme present in blood plasma that degrades **fibrin** and therefore is involved in **fibrinolysis**.

plasminogen The inactive precursor of the enzyme **plasmin**.

platelet (thrombocyte) A component of blood 1–2 μm in diameter and disc-shaped. They contain biologically active mediators, e.g. histamine. Their functions are many, including those involved in blood coagulation and aggregation.

pleio- (pleo-) A prefix denoting multiple.

pleiotrophy When a gene has more than one **phenotypic** effect.

pleiotropic May refer to a **gene** or **mutation** that has multiple effects; e.g. a pleiotropic gene may affect more than one **phenotypic** characteristic. See **pleiotropic response**.

pleiotropic response Where the response to a drug is mediated through more than a single mechanism. The term is used particularly in relation to a receptor coupling through more than one G-protein pathway (sometimes called **promiscuous** coupling).

pleomorphism The inherent varibility among e.g. cells in a pure culture or clone of a given organism, in terms of shape or size.

pleura The covering of the lungs (viscera pleura) and inner surface of the chest wall (parietal pleura).

pleural cavity The space between the parietal and visceral pleura.

plexus A network of interlacing nerves or vessels.

PMN polymorphonuclear granulocyte; any of several types of **leucocyte** characterized as having granular cytoplasms and lobed nuclei, including **eosinophils**, **basophils**, **mast cells** and **neutrophils**.

PMS post-marketing surveillance.

PNS peripheral nervous system.

p.o. *per os*; by mouth (drug administration).

-poiesis A suffix denoting production or formation.

point mutation A **mutation** where a single **nucleotide** is replaced by another.

poisons 'All things are poisonous and there is nothing that is harmless, the dose alone decides that something is no poison' (Paracelsus, 1493-1541). This statement still holds, and many compounds previously regarded as poisons are today used as medicines, e.g. curare, belladona, alkaloids, vinca alkaloids.

Poisson distribution In statistics, the **frequency distribution** characteristic of events that are randomly distributed in a period of time (e.g. radioactive disintegrations) or space (e.g. haeocytometer squares).

polar A molecular structure that has two oppositely charged regions that are spatially separated.

polyclonal Pertaining to cells or molecules that have arisen from more than one clone.

polyclonal antibody Specific **antibodies** obtained from **immunization** of an animal. The antibodies are therefore the products of different clones of antibody-producing cells: see **monoclonal antibody**.

polymer A large molecule that is composed of repeating identical or similar subunits.

polymerase An enzyme that joins **nucleotides** together.

polymerase chain reaction (PCR) An enzyme-based experimental technique used for copying and amplifying a specific DNA sequence.

polymodal See **bimodal**.

polymorphism The ability of an organism in a

population to occur in two or more morphologically distinct forms, as a result of two or more relatively common **alleles** at a given genetic locus.

polynucleotide A linear sequence of **nucleotides**.

polypeptide A chain of amino acids linked by **peptide bonds**, but of lower molecular weight than a protein.

POM prescription-only medicine

porphyria One of a group of six uncommon disease states characterized by disturbed metabolism of the pigment haem (which occurs in the blood pigment haemoglobin), leading to the accumulation in the body of porphyrins, causing red, brown or bluish urine. There are a number of diseases. Aside from a number of porphyric disease states, some drug-induced porphyrias are known (e.g. that caused by TAMOXIFEN), and many drugs should not be used in individuals who suffer from porphyria.

positional cloning Isolation of a **gene** based on the knowledge of the gene's position on the **chromosone**.

positive cooperativity See **allosteric interaction**; **Hill equation**.

positive gene control Enhancement of gene expression which occurs as a result of the binding of specific expressor molecules to **promoter** sites.

posology The science of dosage. See **dose**.

post-synaptic potential The **membrane potential** of a **neuron** which results from the action of a transmitter at a synapse.

post-transcriptional modification Changes to some **tRNA** and **rRNA** transcripts prior to **translation**.

post-translational modification Alteration to a **polypeptide** that occurs after synthesis of the polypeptide chain on the ribosome.

potency The potency of a drug is how strong it is, usually in terms of the dose required to achieve a given effect. However, sometimes in therapeutics, it can be regarded as what determines the **maximum response** that is achievable (e.g. the analgesic 'ceiling' for morphine in alleviating intense pain is higher than that of aspirin). Potency can be expressed in absolute terms (e.g. the dose necessary to obtain a half maximum response; EC_{50}), or relative terms (e.g. twice as potent in terms of dosage than some standard drug). Though the absolute potency depends on the particular system studied, nevertheless, potency is a drug-related variable, whereas **sensitivity** is a system-related variable.

p.p.b. parts per billion (10^9).

PPI patient package insert (medicines information).

PPRS pharmaceutical price regulation scheme (UK).

Prausnitz–Kastmer reaction A specific **allergy** produced in a non-allergic individual following injection of serum from an allergic individual.

Prescription-only Medicine (POM) A medicine that must be prescribed by an appropriately qualified doctor on a prescription form, and cannot be bought over-the-counter. Some drugs are subject to special restrictions, such as **controlled drugs** (e.g. opiates), or those used only in certain hospitals or clinics and on a 'named-patient-only' basis

prevalence (of events) The number existing at any instant within a given time period, and is related to the average number exposed to that risk.

priapism A prolonged and painful penile erection caused by failure of the blood to drain from the spongy tissue of the penis. It can occur due to an **adverse drug reaction**, nerve damage or infection.

primary cell culture A cell **culture** that is prepared directly from tissue.

primary transcript The original **RNA** product that has not been modified. The initial transcription of a ribonucleic acid molecule in DNA.

primase The RNA **polymerase** which synthesizes the RNA **primer** for DNA synthesis during replication.

primer (oliogonucleotide primer) A short **DNA** sequence used to initiate the synthesis of DNA, as in a **polymerase chain reaction**.

priming The initiation of synthesis of a **DNA** strand.

prion A modified, disease-causing form of a protein, e.g. that apparently causing Creutzfeldt-Jakob disease.

probability distribution In statistics, is a function that gives the probability of observing each value that the variable may have. Graphically, the probability (probability density for continuous variables) is plotted against the value of a variable, and has a characteristic shape for a number of common distributions (e.g. **Normal** or Gaussian; log-normal; **binomial**; **Poisson**). Experimentally, data are generally plotted as a **histogram** which shows the frequency of a particular value, or range of values. See also **frequency distribution**.

probability value In statistics, is the probability of obtaining a result at least as unlikely as the observed one, if the null hypothesis of no effect is true. Probability levels of 5% ($P<0.05$); 1% ($P<0.01$),); 0.1% ($P<0.001$) are commonly used in biology.

probe A **labelled** biochemical agent used to identify or isolate a gene, gene product or a protein, e.g. in hybridization techniques to detect complementary sequences in a sample of genetic material.

probit (probability unit) A **transformation** used to linearize data that has an underlying **quantal** type of **probability distribution**, especially used for dose-response curves. See **normal equivalent deviate**.

prodrug A chemical form of a drug that is not in itself pharmacologically active, but is converted in the body to the active drug (e.g. phenacetin to paracetamol). The prodrugs may be chemically more stable or better absorbed than the active drugs.

programmed cell death See **apoptosis**.

prokaryote An organism (e.g. bacteria and other simple microorganisms) whose nuclear **DNA** is not enclosed within a special membrane to form a eukaryotic membrane but is in the form of a single circular molecule. See **eukaryote**.

promiscuous A colloquial term used of a drug that has low selectivity and so acts on several systems. Promiscuous coupling of receptor responses is where a given receptor can couple to two or more pathways (see **pleiotropic response**).

promoter A region of **DNA** which is necessary for initiation of **transcription**. It includes the binding site for **RNA polymerase** and also sites where gene regulatory proteins can bind.

proprietary drug name The trade name of a drug. See also **names of drugs**.

proprioceptor (sense receptor) A receptor that signals movement and spatial movement. See **sensory receptor**.

prostaglandin See **prostanoids**.

prostanoids **Local hormones, eicosanoids** that are products of the cyclooxygenase pathway.

protease An enzyme that digests protein.

proteolytic enzyme Any enzyme that catalyses the breakdown of proteins.

protein binding (of drugs) Binding sites on plasma and other tissue proteins that bind drugs but do not mediate biological effects but act as stores.

protein kinase An enzyme that phosphorylates certain amino acid residues in a protein. Some forms of this enzyme are regulated by **second messengers**. See PROTEIN KINASE INHIBITORS.
protein kinase A **cAMP** activated serine-threonine protein kinase.
protein kinase C A ubiquitous serine-threonine protein kinase.
protein tyrosine kinase See **tyrosine protein kinase**.
proteolysis The breakdown of a protein molecule by hydrolysis of **peptide bonds**.
prothrombin A precursor of **thrombin**.
proto-oncogene A **gene** that normally regulates cell growth and proliferation but which when mutated can cause cancer. See also **mutation**; **oncogene**.
pruritus Itching: as well as occuring in several disease states, it is a very common side-effect of certain drugs, especially those that release HISTAMINE in the body.
psoriasis A chronic skin complaint characterized by thickened patches of itchy scaling skin. Treatment is problematical, but includes phototherapy and drugs, including CORTICOSTEROIDS and METHOTREXATES.
PSS **physiological salt solution**.
pulmonary hypertension Raised blood pressure within the blood vessels supplying the lungs.
pulsed-field gel electrophoresis An **electrophoresis** technique for separating large **DNA** fragments by applying an electric field first in one direction and then at an angle to the first direction.
purine A heterocyclic compound containing fused pyrimidine and imidazole rings. They are biologically active mediators and are components of **nucleic acids** and **coenzymes**.
purinoceptor A cell surface receptor that recognizes PURINES. See ADENOSINE RECEPTOR AGONISTS; PURINE P2 RECEPTOR AGONISTS.
purinergic Nerves that secrete PURINES acting as neurotransmitters.
py- (pyo-) A prefix denoting pus.
pyelonephritis **Inflammation** of the kidney, usually due to bacterial infection.
pyrexia (fever) A body temperature raised above normal, and is usually taken as indicating an infection. It is treated with ANTIPYRETICS, e.g. PARACETAMOL, NSAID ANALGESICS.
pyrimidine Heterocyclic organic compounds which exist as components of **nucleic acids** and **coenzymes**.
pyrogen A substance that produces fever (e.g. PGE_2). Normally they are produced via **cytokine** action as a result of microbial or other infection, with the result that the body's 'thermostat' in the brain is set to high. Prostaglandins are pyrogens, and NSAID ANALGESICS, such as ASPIRIN, which prevent their production are commonly used ANTIPYRETICS.
pyrogenesis Increasing body temperature caused by a **pyrogen**.
pyschoactive drug A drug that has mood and/or behavioural modifying properties.
Q10 (temperature coefficient) The increase in the rate of a chemical process due to raising the temperature by 10°C.
quantal responses Are 'all-or-none' responses, or qualitative responses, e.g. death or survival (in contrast to quantitative responses which are continuous variables). The underlying distribution is the **binomial distribution**. Log dose-response lines for quantal responses are frequently sigmoidal in shape, and since this is the same form as the integrated **frequency distribution** curve, the slope of the curve reflects the variance in sensitivity to the drug of the experimental units under study.
quantile In statistics, one fourth of the data in a sample when these are ordered and divided into four equal numbers of observations. It is a useful method for displaying data, and, graphically, they can be incorporated into a Tukey ('box and whisker') plot.
quantitative Relating to size or amount.
quantitative variation Continuous variation.
quaternary structure The relationship of the various subunits in a protein to each other.
quench-freezing A process used to rapidly freeze a specimen by plunging it into liquid nitrogen.
racemic mixture See **isomers**.
radioimmunoassay (RIA) A very sensitive experimental technique by which substances are detected and quantified using radioactive **labelled** specific **antibodies**.
radioisotopes Unstable **isotopes** that spontaneously disintegrate (with a characteristic **half-life**), losing mass and emitting particles (e.g. neutron, positron, electron, α-particle etc.) or photons (γ-ray, X-ray). Radioisotopes can be used for diagnosis (e.g. rate of clearance of a labelled compound) or treatment (^{131}I for goitre), or as **probes** or **tracers** in experimental work.
radioligand Radioacitivity labelled ligand used, for example, in **radioligand receptor binding** experiments.
radioligand-receptor binding A technique developed for assessing the characteristics of receptors or of drugs through the use of radioactively labelled ligand molecules. See **displacement analysis**; **saturation analysis**.
radiopharmaceutical See **radioisotopes**.
radionuclide An unstable atomic nucleus which emits radiation and changes from one element to another, or to a different isotope, as a result of spontaneous radioactive decay.
randomized block design An experimental design for distributing treatments or doses between subjects. Having its origins in agricultural field trial, all combinations of treatment, subjects etc. under investigation are allocated into blocks. It allows analysis of effects and interactions between treatments and subjects. Factorial analysis shows whether factors are independent or not, and yields unbiased estimates of effects of treatments. See **factorial design**.
random sample A subgroup of a large population selected by a random process.
range The lowest and highest value in a set of data.
ranked response Ranked or ordered data e **non-parametric** measures that may be used to est ig responses, especially in behavioural pharmac
rbc red blood cell.
RC-IUPHAR Receptor Committee of the I rnat nal Union of Pharmacology.
RCT randomized controlled trial.
reading frame A nucleotide sequence t begins with an **initiation codon**, ends with a **terminati odon** and partitions the **nucleotides** into a series of a acid-encoding triplets in between.
receptive field (of a neuron) The restri l area on a sensory organ which when stimulated influences the activity of that neuron.
receptor The receptor protein is a macromolecule at which drugs bind in order to produce their responses. Agonists mediate their responses through activating the receptor, whereas **syntopic** antagonists bind at the same sites without activating responses. The receptor was originally visualized in empirical terms. Ehlich (late 19th/early 20th

century) postulated a specific binding site with which biological stains, drugs and antibodies fit an anchor as pieces in a jigsaw. Langley theorized a 'receptive substance' in relation to the interactions of pilocarpine and atropine at muscarinic receptors (1878), and nicotine and curare at nicotinic receptors (1905); a formulation that for the first time specifically identified the affinity and active mass of the drug as determinants of reaction with the receptor. The reaction of agonists and antagonists in terms of biological response has been extensively modelled in the absence of a detailed knowledge of the nature of the receptor (see **agonist**; **antagonism – pharmacodynamic**; **efficacy**; **Gaddum–Schild equation**; **Hill equation**; **Langmuir equation**; **stimulus**). However, it is now recognized that in structural and coupling terms, receptors fall into superfamilies with common characteristics, including: (a) direct ligand-gated ion channel receptors; (b) G-protein-coupled receptors; (c) tyrosine-kinase-linked or guanylyl-cyclase-linked receptors; (d) intracellular receptors (normally intranuclear receptors). Other types of binding sites with which drugs interact include, enzymes, ion channels, carrier molecules, nucleic acids; plasma albumin; but unless the drug produces a specific activation (that can, in principle, be antagonized by an **allotopic** interaction) such sites are not normally considered as being drug receptors. These structural and mechanistic considerations are now considered as important criteria in receptor classification, taken as complementary to properties defined in terms of recognition characteristics (see **receptor classification**).

receptor classification Receptors can be classified into families on the basis of a number of criteria. Operational classification based on the recognition characteristics is evidently the most relevant to the use of drugs in analytical pharmacology and in therapeutics. The property of **selectivity** (or **specificity** where this is achievable) is a vital drug attribute, and through the use of selective agonists and antagonists, receptors can fairly readily be divided into major families: for example, muscarinic cholinoceptors, nicotinic cholinoceptors, α-adrenoceptors, β-adrenoceptors etc. It might be noted that the examples chosen are sometimes referred to as subtypes of receptor, but additional classificational criteria (especially receptor structure and coupling mechanism; see **receptor**) suggest that it is more helpful to distinguish by separate families of receptors of very different characteristics (*viz.* nicotinic receptors are of the intrinsic-ion-channel superfamily and are involved in 'fast' signalling; whereas muscarinic receptors are of the G-protein-coupled superfamily and are involved in 'slow' signalling). On the other hand, most families of receptors with quite closely similar recognition characteristics and receptor structure homologies, can meaningfully be subdivided into yet further subsets. For instance ; e.g. β-adrenoceptors all couple positively to adenylyl cyclase and share >60% sequence homology; nevertheless they can be divided into β_1, β_2 and β_3 receptor variants, each with a distinct distribution and pharmacology. Increasingly it is these latter subsets or variants that are most commonly termed *receptor subtypes* (rather than the α- and β-families themselves). However, a further complication arises when there are yet further, very similar, variants (sometimes the product of the same gene, representing alternative transcripts): these are usually labelled with additions to the subscripts (e.g. α_{1A}-, α_{1B}-, α_{1C}-adrenoceptors). The recognition of the existence of **species homologues** or isoforms of receptors has produced some confusion in receptor nomenclature. They have sometimes been referred to as subtypes, but often merely represent a close variant in one species of a recognized receptor in another species. However, in some instances a single alteration in the amino acid sequence of the species homologue produces dramatic changes in recognition properties, and in other instances a given subtype may not be represented in all mammalian species. In these circumstances it has become usual practice to regard the human isoform as the 'standard' receptor, and to denote the species within in the name of the isoform.

receptor occlusion These are studies using **non-equilibrium antagonists** that bind essentially irreversibly to the receptor, e.g. phenoxybenzamine with α-adrenoceptors. Such antagonists can be used to estimate **receptor reserve**, and to estimate the affinity of agonists.

receptor organ See **sense organ**.

receptor potential The local graded depolarization of a **sensory neuron** terminal membrane following stimulation.

receptor reserve A term in receptor pharmacology denoting the same concept as **spare receptors**, but in a more exact sense. A strong full agonist can produce a maximum response without occupying all receptors; demonstrated, for instance, by **receptor occlusion** studies. Thus at any point in time, there are spare receptors not contributing to the agonist response: however, there is a dynamic relationship so no specific population of receptors is 'spare'.

receptor-tyrosine kinase Integral tyrosine kinase activity of a receptor, e.g. for growth factors.

recessive gene A **gene** whose effects are only shown in an individual if its **allele** is the same.

reciprocal plot A graphical method used as a **linearizing transformation**. Single reciprocal plots are where only one axis is transformed, and double-reciprocal plots are where both are transformed. The **Scatchard plot** is an example of a single or semireciprocal plot. The **Lineweaver Burk plot** an example of a double-reciprocal plot. See also **transformation**.

recombinant Any new individual cell or molecule that arises as a result of recombination either naturally or in the laboratory by **recombinant DNA technology**.

recombinant DNA technology Procedures used to join **DNA sequences** from different sources. The introduction of new genetic material (e.g. that of another species) or reorganized genetic material into host cells. When done by artificial techniques, it is a form of **genetic engineering**. It is used particularly in biotechnology to produce biopharmaceuticals, normally proteins, e.g. insertion of human genes for INSULIN or GROWTH HORMONE, into bacterial cells, which multiply rapidly in culture and synthesize large amounts of the human protein in question.

recombinant protein A protein produced from a recombinant **DNA** template.

redox potential (oxidation-reduction potential) A measure of the tendency of a system to donate electrons or accept electrons.

referred pain Pain felt in a part of the body at some distance from its cause.

refractory period The time of recovery needed for a **neuron** that has just transmitted an impulse, or a muscle fibre that has just contracted.

regression analysis A statistical method of analysing and describing the dependence of one variable on one or more other variables. A linear relationship is most readily analysed, so non-linear data are normally subjected to a linearizing **transformation** (e.g. **logarithms**, logits, **probits**,

reciprocals) before analysis (though modern computer programs now more readily allow nonlinear curve fitting, for example, to the **logistic equation** in pharmacology). In regression analysis the data are normally displayed in the form of a scatter diagram plotting the dependent variable (y), e.g. drug response against the independent variable (x), e.g. logarithm of drug concentration. Analysis yields a straight line fitted through the data, summarized in the parameters of **regression coefficient** (slope, b) and y-intercept, and their 95% confidence intervals. In pharmacology, the EC_{50} and its confidence interval, may often be estimated. The P value testing the null hypothesis that the slope equals zero can be calculated. Linear regression calculation assumes that any relationship between x and y is linear, and that the y values (at all values of x) follow a **Normal distribution** with a standard deviation that does not vary with x.

relative activity See **relative potency**.

relative molecular mass (Mr) The ratio of the mass of one molecule of a substance to $^1/_{12}$ the mass of an atom of ^{12}C. Formerly known as molecular weight.

relative potency In determination of potency of drugs, there is a contribution to responses that is a function of tissue or subject sensitivity, and a contribution that is drug-dependent (see **receptor**, **efficacy**). Potency can be expressed in absolute terms (EC_{50} etc.) or relative terms. The relative approach compares one drug with another, often a reference or standard drug. The comparative method that yields a relative potency is satisfactory in terms of experimental design, because biases due to between-subject or between-tissue variability can be eliminated through the use of suitable experimental designs.

replication The process by which **DNA** makes copies of itself during cell division.

repolarization When a neuronal membrane returns to its normal electrically charged state after a **nerve impulse**.

reporter gene A **gene** whose product, an enzymatic marker or protein, can be used as a genetic **label**. For example, a gene for neomycin resistance incorporated into a **plasmid** before **transfection** allows the subsequent detection of successfully transfected cells.

repressor protein A protein that inhibits mRNA **translation** by binding to **mRNA**.

respiratory burst (metabolic burst) Where cell-surface stimulation of **neutrophils**, e.g. by opsonized bacteria, results in a markedly increased oxygen consumption. Much of the oxygen may be used to form **superoxide radicals**.

resting potential The potential difference across a nerve or muscle cell membrane when not being stimulated.

restriction analysis A technique that uses **restriction enzymes** to cut **DNA** into identifiable sections, and thereby determine the identity of DNA.

restriction endonuclease (restriction enzyme) Any of a group of endonucleases produced by microorganisms. They recognize short palindromic base sequences in **DNA** and cut the double helix at a particular point. Each endonuclease recognizes a different specific DNA sequence. They are used in genetic engineering.

restriction enzyme See **restriction endonuclease**.

restriction fragment length polymorphism (RFLP) Variations between individuals in **DNA** fragments that are recognized as cutting sites by specific **restriction enzymes**. Used as markers in **chromosome mapping**.

restriction mapping A procedure used to characterize a region of **DNA** by using **restriction enzymes** to cut DNA at different sites.

reticulocyte A large, immature erythrocyte or cell of the reticular system.

reverse transcription See **reverse transcriptase**.

reverse transcriptase RNA-dependent (and mainly in retroviruses) **DNA polymerase**. It is the enzyme that synthesizes DNA on an **RNA** template. Enables viral RNA to be integrated into host DNA. The opposite of **transcription**, reverse transcription is used to synthesize DNA for **probes**.

Reye's syndrome A disorder in children which may be caused by ingestion of aspirin (though it may certainly have other causes). It is rare but serious, and since 1986 in the UK aspirin bottles and packets have been labelled as contrindicated in children under 12 years old, unless specifically indicated (as in juvenille arthritis).

rheumatoid arthritis A type of arthritis (joint **inflammation**) in which the joints of the body, particularly of the fingers, wrists and toes, become stiff, swollen, painful and eventually deformed. It is progressive but periodic. Treatment is by NSAID ANALGESICS, CORTICOSTEROIDS, IMMUNOSUPPRESEANTS and a number of other drugs.

rhodamine A group of **fluorochrome** dyes, used to visualize cell structures by immunofluorescent techniques.

RIA **radioimmunassay**.

ribosomal ribonucleic acid A major component of ribosomes, and is the most abundant **RNA** in cells. Involved in protein synthesis.

ribosomal RNA See **ribosomal ribonucleic acid**.

risk-to-benefit ratio In any treatment or medical intervention, there is an inherent risk in the intervention that needs to be assessed in terms of the benefits that accrue from the treatment (if successful).

RNA ligase An enzyme that catalyses **exon** rejoining in the **splicing** of certain **mRNAs**.

RNA (ribonucleic acid) A large linear molecule made up of **nucleotides**, ribonucleotides which contain the **bases** uracil, guanine, cytosine and adenine. RNA occurs in several forms, **transfer RNA** (tRNA), **ribosomal RNA** (rRNA) and **messenger RNA** (mRNA). All are concerned with protein synthesis. All cellular RNAs are synthesized by **transcription** of **chromosomal** DNA which acts as the template.

RNase (RNAse; ribonuclease) An **enzyme** that cleaves **RNA**.

routes of administration of drugs There are many different routes but common ones include: intravascular injection or infusion (into the blood vessels, e.g. by drip, mainly intravenous (into veins) but sometimes intra-arterial (into arteries); intramuscular (injection into muscles); subcutaneous (injection beneath the dermis of the skin); intradermal (injection into the skin); transdermal (across the skin, e.g. from skin patches); topical (application to the skin or mucous membranes); per rectum (by an ointment or suppository into the rectum); intravaginally (by an ointment or pessary into the vagina); intrathecal (by injection into the subarachnoid space of the spinal cord); intranasally (often as a spray); orally (by mouth); inhalation.

rRNA **ribosomal RNA**.

rutherium red A dye used experimentally for staining mucopolysaccharides and as a specific **ATPase** inhibitor.

SAD **seasonal affective disorder**.

sagittal In the median longitudinal plane of the body, or parallel to it.

SAR **structure-activity relationship**.

sarcoma A **malignant** type of **neoplasm**, a cancerous growth, which arises in the connective tissue of skin etc.

saturation analysis Where the amount of radioactivity

in a **radioligand-receptor binding** assay, in the presence of a known concentration of labelled drug, is measured for a range of non-saturating concentrations of drug, under equilibrium conditions. It allows determination of B_{max} and K_d.

scanning electron microscope (SEM) An electron microscope that can produce an image in 3-D from electrons reflected from the specimen's surface.

s.c. subcutaneously (drug administration). See also **routes of administration of drugs**.

Scatchard plot A form of analysis that has been used for the display of radioligand-binding data. It is a form of single-reciprocal plot, where the bound/free ratio of radioligand is plotted on the *y*-axis, and bound concentration on the *x*-axis. The fitted straight line intercepts the receptor concentration (B_{max}) on the *x*-axis. The slope is the reciprocal of the equilibrium dissociation constant (K_d). The plot is used especially to check for one-site binding, but because of statistical difficulties in weighing of points, it is now used only for the display of data, rather than for analysis and parameter derivation.

scatter diagram A plot of observations against another observation or an independent variable. Used particularly in displaying data together with determination of **correlation coefficient** and in **progression analysis**.

Schild plot (Arunlakshana & Schild plot) A graphic method described by Arunlakshana & Schild (1959) used to display data and to estimate the pA_2 value of an antagonist, an index of potency (see **pA_2**; **pA_x**). Observed values of the variable (x-1) (where x is the **dose-ratio** or concentration ratio) are plotted against the $-\log_{10}$ of antagonist concentrations. The intercept of a fitted linear relationship on the concentration axis is the estimated pA_2 value. In the special case where the Schild slope (b) is unity, and there is simple equilibrium competition between agonist and antagonist for a single site, $pA_2 \equiv pK_B$ ($-\log_{10} K_d$ of the antagonist).

Schild slope See **Schild plot**.

schistosomiasis (bilharziasis) A tropical disease caused by blood flukes of the genus *Schistosoma*. ANTISCHISTOSOMES are the drugs used in its treatment.

Schultz-Dale reaction The contractile reaction of an isolated tissue preparation from a sensitized animal, often uterus or intestine, to **allergen** to demonstrate anaphylactic **hypersensitivity**.

scintillator A substance that produces a fluorescent flash when struck by high energy radiation. See also **fluorescence**.

SD **standard deviation**.

SDS (sodium dodecyl sulphate) A detergent widely used to solubilize membrane protein assemblies because of its ability to disrupt protein-lipid and protein-protein interactions.

seasonal affective disorder (SAD) A mental depression related to low light levels, as in winter.

secondary cell culture A cell culture originating from cells taken from a **primary culture**.

second messenger Intracellular compounds, such as **cAMP**, **IP_3**, formed as a result of stimulation of receptors on the cell which then activate the cell's specific response. A given second messenger pathway is generally shared by a number of different receptors (β-adrenoceptors and histamine-H_2 receptors; both couple to G_s to stimulate adenylyl cyclase and so raise cAMP). In molecular terms, each stage represents an amplification of the original signal.

section A thin slice of tissue prepared for microscopy.

selectins A family of **cell adhesion molecules** that are produced by **leucocytes** and epithelial cells and are involved in leucocyte binding to vascular endothelium at sites of **inflammation**.

selectivity In drug action, selectivity is the capacity of agents to effect one system without effecting others. To be useful in therapeutics or analytical pharmacology, drugs are selected for having reasonable selectivity. Nevertheless, no drugs even approach complete **specificity** of drug action. Quantitatively, the margin of selectivity can be expressed in terms of ratios of doses to achieve effects on different systems, receptors etc.

SEM **standard error of the mean**.

semilog plot A graph where one axis only is logarithmic. This device is usually used as a simplifying or **linearizing transformation**. Examples include a logarithmic *y*-axis to linearize an **exponential curve**. Also, a logarithmic *x*-axis used nearly universally to convert **hyperbolic** dose-response relationships to a sigmoidal relationship.

sense strand (coding strand) The strand of a double-stranded **DNA** molecule that is complementary to the RNA formed by **transcription**.

sensitivity A characteristic of tissues, test systems or subjects to recognize or react to a chemical at high dilutions. It is a system-related variable, but clearly also contributes to the measured potency of a drug when this is expressed in absolute units (e.g. EC_{50}). See **potency**.

sensitization The condition where an animal responds with an enhanced **allergic** or immune response on second encounter with an allergen (see **hypersensitivity**).

sensory neuron A nerve that conducts afferent impulses from the periphery to the CNS.

sensory receptors Any cell, or cell part, that is specialized to respond to stimuli such as light, heat, mechanical pressure, and then conveys that information via sensory nerves to the CNS.

serine kinase See **protein kinase**.

serology The study of blood serum and its constituents.

serotoninergic **Neurons** secreting SEROTONIN (5-HT).

serum The liquid portion of blood that remains following centrifugation of spontaneously clotted blood. It differs from plasma by the absence of **fibrinogen**, and is used to provide **passive immunization**.

sex cell See **germ cell**.

sickle-cell disease (sickle-cell anaemia) A hereditary blood disease that occurs mostly in black people and some people of Mediterranean and Indian origin. It is caused in the child when both parents carry the defective gene. In this disease the red blood cells (**erthyrocytes**) are abnormal, containing an abnormal form of haemoglobin, and cause a serious form of **anaemia**, where sickle-shaped erthyrocytes are formed (sickling) when the blood is deprived of oxygen, and these cells are removed from circulation causing jaundice and anaemia. Treatment is supportive, with supplements of folic acid, antibiotics and oxygen therapy.

side-effect An unwanted effect of a drug which is dose-related and commonly predictable (sometimes unavoidable). The term normally is used for relatively trivial unwanted actions of a drug (e.g. dry mouth) rather than potentially serious **adverse drug effects**.

SIF small intensely fluorescent cells (**APUD** cells).

sigmoid curve/relationship A form of curve that is S-shaped, normally inflecting at, and symmetrical about, the 50% response value. This form is common for log dose-response lines with either graded or quantal responses. For graded receptor-mediated responses this curve reflects, amongst other things, the coupling-function between receptor occupancy and biological response (see **Black &**

Leff model). For quantal responses it reflects the *cumulative* **probability distribution**.

signal transduction The process by which a cell responds to an external signal. It may involve activation of **second messengers**, such as enzymes, or opening/closing of **ion channels**.

sign test A (**nonparametric**) significance test allowing quick comparison of two samples. Taking the data as arranged in a **matched-pairs statistical test** the signs of the column differences are noted and the total of + signs compared with the total of − signs (ignoring zeros), and a P value is obtained by consulting tables. The null hypothesis is that the two population medians are equal. This test is rather insensitive to real differences, and other nonparametric tests may be preferred for more exact purposes (e.g. the **Wilcoxon matched-pairs test**).

single-blind study See **clinical trials**.

sinistral On or pertaining to the left.

site-directed mutagenesis Refers to ***in vitro*** techniques where mutations are made at specific predetermined sites in **DNA**.

SI Units Système International d'unités (International System of Units).

skeletal muscle The type of striated muscle that makes up the majority of the musculature of the body. It is attached to the skeleton and is responsible for the movement of limbs, for breathing etc. Nerve supply is by cholinergic fibres of the somatic (voluntary) nervous system, so the muscle is caused to contract by ACETYLCHOLINE and blocked by NEUROMUSCULAR BLOCKING AGENTS.

SLE systemic lupus erythrematosus.

smooth muscle (involuntary muscle; plain muscle) Unlike **striated muscle**, smooth muscle has no cross-striations under the microscope, indicating an organization characteristic of muscle controlled by the **autonomic nervous system**, and reacts more slowly to neurotransmitters than striated muscle (**skeletal muscle**) of the voluntary nervous system.

SOD superoxide dismutase.

sodium pump See **Na^+,K^+-ATPase**.

soft drugs Drugs used for nonmedical social purposes which are less socially disabling and less likely to cause dependence than **hard drugs**.

somatic Body cells as opposed to cells of the germ line. See **germ cell**.

somatic nervous system Refers to that part of the peripheral nervous system that conveys **sensory** information to the CNS and motor commands to the **skeletal muscles**.

somatosensory Sensation arising from muscle, skin or internal organs.

sonicator (sonifer) An instrument that produces sound energy for the disintegration of cells in a liquid medium (sonication).

SOP standard operating procedure.

Southern blot technique A very sensitive experimental technique used to detect the presence of **DNA** sequences, amongst restriction fragments, that are complementary to a radiolabelled DNA or RNA probe. DNA is separated by **electrophoresis** on a gel, transferred to membrane filters and then labelled **probes** are applied to locate **complementary DNA** sequences. See **Northern blot technique**.

spacer DNA DNA that separates one **gene** from another.

spare receptors See **receptor reserve**.

spasm An involuntary strong contraction of a muscle. In the **skeletal muscle** of the body the cause may be of local origin (e.g. certain cramps) or from within the CNS (e.g. hiccups, tics). In **smooth muscle**, the cause may be an imbalance within the **autonomic nervous system** or the release of **local hormones** (e.g. colic, asthma, Raynaud's disease).

Spearman correlation See **correlation coefficient**.

species The basic unit in taxonomy. Individuals are assigned to a species on the basis of similarities in asexual organisms, and also on the basis of ability to interbreed in sexually reproducing organisms. In taxonomic hierarchy, the next (more inclusive) level is genus.

species homologues (of receptors and enzymes) The advent of application of molecular biological techniques to the elucidation of the structure of receptors and enzymes has shown that these macromolecules may vary to the extent of being different in every species studied. These differences in structure may be accompanied by differences in function that vary from trivial to dramatic. Such variation may present difficulties in drug development, to the extent that much testing is now done on cloned human protein material. It should be noted that variants also occur within species (**genetic polymorphism**). See also **receptor classification**.

specificity In pharmacology, this term would infer a special, exclusive and sole action of a drug at only one site (e.g. a **receptor**). This has not yet been achieved; at the best only high **selectivity** can be achieved. In principle, antisense oligonucleotide reactions can come close to specificity.

spinal nerves The 31 pairs of nerves that connect to the human spinal cord. They are part of the peripheral nervous system.

splicing The removal of **introns** from **messenger RNA** and the joining together of adjacent **exons**.

SR sustained release (drug preparation).

SRS-A slow-reacting substance of anaphylaxis (a mix of three **leukotrienes**).

ss single-stranded.

SSRI selective SEROTONIN re-uptake inhibitor (ANTIDEPRESSANTS).

standard deviation (SD) In statistics, the standard deviation of a sample, is a measure of scatter or dispersion of values in that sample, and provides an unbiased estimate of the true population value of the standard deviation. It is useful as a descriptive statistic in its own right; for instance, it is valuable to know the standard deviation of the heights or weights of individuals in a population. It is also used in deriving measures of precision of an estimate of the mean: see **coefficient of variations**; **standard error of the mean**.

standard error of the mean (SEM) In statistics is a measure of precision of an estimate of the mean obtained by repeated sampling. Means of repeated samples from a Normal distribution are themselves distributed about a population mean, but with a smaller **standard deviation** that depends on the size of the sample (n). As a statistic of precision in experimental work it must be quoted together with n; alternatively, it may be converted to a confidence interval (SEM x t, where t is Student's t for appropriate degrees of freedom).

starch blocker A trivial name for the class of drugs (mainly intestinal α-amylase inhibitors) that block dietary conversion of polysaccharides and sucrose to monosaccharides. Such drugs are used in **diabetes** management.

status epilepticus See **epilepsy**.

steady-state In relation to drug metabolism, when the rate of drug intake equals the rate of drug elimination, a steady-state concentration is achieved.

stenosis Narrowing or contraction of a duct.

stimulus In receptor pharmacology, stimulus denotes the ability of an **agonist**, on binding to the **receptor**, to induce activation of that receptor. Stephenson (1956) introduced a parameter, **efficacy**, which is a proportionality constant relating the **stimulus** produced by an agonist on occupying the receptor, to the subsequent biological responses. Thus stimulus is an essentially hypothetical entity, but is essential to mathematical modelling of these events. See also **intrinsic activity**; **intrinsic efficacy**; **null method**.

stochastic process Random processes including those varying randomly in time; e.g. binding and dissociation of drug molecules at the receptor, opening and closing of ion channels. Their analysis involves probability theory.

stoichiometry The relative proportions of molecules in a reaction, e.g. of drug molecules binding to a receptor or a binding protein.

stop codon See **termination codon**.

stretch receptor A **sensory receptor** that monitors the degree of stretch, e.g. muscle spindle.

striated muscle Any muscle type showing cross-striations under the miscroscope, including **skeletal muscle** and **cardiac muscle** but not **smooth muscle**.

stringency A term used in **DNA hybridization** which refers to the degree to which different DNA sequences will form duplexes. High stringency conditions (e.g. high temperature) result in duplex formation only between identical DNAs, low stringency (e.g. low temperature) allows duplex formation between non-identical, but related, DNAs.

structure-activity-relationship The relationship between chemical structure and biological activity.

Student's t-test See **matched-pairs statistical test**; **one-sample t-test**; **unpaired t-test**.

sub- A prefix denoting below.

subtype (of receptor) See **receptor classification**.

superinfection A second infection during infection by one organism by a microorganism resistant to the treatment for the first infection.

superior Situated uppermost in the body in relation to another structure or surface.

superoxide See **superoxide radical**.

superoxide dismutase (SOD; superoxide oxidoreductase) A term used to describe a range of metalloenzymes which catalyse the dismutation of **superoxide**, thereby protecting cells from the toxic effects of superoxide radicals with the formation of hydrogen peroxide and molecular oxygen.

superoxide radical Refers either to O_2^- (superoxide anion) or peroxide anion. Superoxide is generated during the **respiratory burst** in activated neutrophils. The potentially harmful effects of endogenously formed superoxide are prevented through degredation by **superoxide dismutase**.

suppository A drug preparation formulated for insertion into any orifice of the body, normally the rectum. The term used for the vagina is pessary. The active drugs may have a local action (e.g. local anaesthetics), or be designed for systemic action (e.g. antiasthmatics).

suppressor gene A **gene** that reverses the effect of a **mutation** in another gene.

suppressor T-cell A **T-lymphocyte** whose main function is to suppress the activity of other cells which play a role in cell-mediated **immunity** or humoral immunity.

supra- A prefix denoting above.

surmountable antagonism See **antagonism – pharmocodynamic**.

sustained-release formulation A preparation where the drug is released gradually over time. Also known as controlled- or modified-release formulation.

symbionts See **symbiosis**.

symbiosis An intimate, obligatory and mutually beneficial association between two different species (symbionts). See **commensual**; **mutualism**; **parasite**.

sympathetic nervous system See **autonomic nervous system**.

sympathin The name given by early physiologists Cannon and Rosenblueth (1933) to the **neurotransmitter** substance released from **sympathetic neurons** that did not exactly match the physiological effects of ADRENALINE, and which is now known to be NORADRENALINE.

syndrome A collection of signs and symptoms that, in occurring together, constitute a given disease.

synergism Where the combined effects of responses to two drugs is more than simply arithmetically additive.

synomyn Any of two or more **codons** that specify the same amino acid.

synovial fluid The fluid in the joint cavities that lubricates the joint.

syntopic Interaction of two drugs acting at the same sites on a receptor; as opposed to **allotopic**, where they act at different site on the receptor. Competitive antagonism is an example of syntopic interaction. See also **antagonism – pharmacodynamic**.

syrup A concentrated aqueous solution sweetened with sugar or some other substance. It may be used for localized soothing on the throat, or to disguise the taste of drugs.

systemic Affecting the whole body. The systemic administration of a drug, the opposite of local administration, can be by injection or orally. See also **routes of administration of drugs**.

systemic circulation Blood course from ventricle via the body to atria. As opposed to the pulmonary circulation.

systole The period of the cardiac cycle when the heart is contracting. See **diastole**.

systolic See **systole**.

$t_{1/2}$ half-life.

TEA tetraethylammonium ion.

tablet A solid drug form made by compaction and usually of a rounded disk form. They have now largely superseded **pills**. Tablets may be soluble, effervescent, dispersible, coated or uncoated, **enteric coated**, **modified-release** or **sustained-release**. See also **capsule**.

tachy- A prefix denoting fast.

tachykinin Any of a family of peptide **neurotransmitter** mediators characterized by C-terminal sequence homology –Phe-X-Gly-Leu-Met-NH_2.

tachyphylaxis Progressive diminution of a response with repeated doses

taenia A ribbon-shaped band of nerve or muscle.

tandem repeat sequence Multiple copies of a short DNA sequence lying in series along a chromosome. It is used in **physical mapping** and **linkage mapping** and also **DNA fingerprinting** because each person's pattern of tandem repeats is likely to be unique.

tardive dyskinesia A syndrome with abnormality of movement (particularly of the face, tongue, jaws and limbs), characteristic of long-term use of ANTIPSYCHOTIC drugs, such as phenothiazines, working as DOPAMINE RECEPTOR ANATAGONISTS. See also **extrapyrimidal syndrome**.

TATA box The short nucleotide (7-base) consensus sequence in the promoter sequence preceding the start point of **transcription**, involved in binding of the complex of

transcription factors and **RNA polymerase**.

taxonomy The science of biological classification.

T-cell thymus derived cell: see **T-lymphocyte**.

T-cell receptor A protein on the surface of **T-lymphocytes** that recognizes molecules of **MHC**.

TD_{50} Toxic dose 50% of sample.

$TDIC_{50}$ (TCD_{50}) Tissue culture infective dose (50%). The dose of a viral suspension that when used to inoculate tissue cultures causes observable effects in 50% of those cultures.

teratogen An agent that causes developmental abnormalities in a foetus.

teratogenesis Denotes production, usually by chemical action, of physical or anatomical abnormality in the foetus.

termination codon (stop codon) Any of three **codons** signalling the end of a protein coding region.

tertiary structure When referring to a polypeptide chain, the overall conformation, i.e. the three-dimensional conformation of the polypeptide chain after folding.

thalassaemia A group of inherited disorders that occur mostly in people of Mediterranean, Middle Eastern and Southeast Asian origin caused (in two different forms) in the child when one or both parents carry the defective gene. In thalassaemia, many of the **erythrocytes** are fragile and easily broken up resulting in haemolytic anaemia and iron overload in internal organs (haemosiderosis). Treatment is by whole blood transfusion and bone-marrow transplant. The iron overload can be helped with iron-chelating compounds which promote its excretion.

T-helper cell See **T-lymphocyte**.

therapeutics The branch of medicine that is concerned with the methods of treatment of disease, especially through the use of drugs. Intervention may be curative (e.g. use of antibiotics against infections), suppresive (e.g. use of insulin to maintain diabetics) or prophylactic (e.g. chloroquine in prevention of malaria).

therapeutic ratio/index A concept introduced by Ehrlich to express the ratio of the toxic dose of a drug to the effective dose, as a measure of therapeutic safety. The ratio determined in animal studies has been expressed in various ways, such as LD_{50}/ED_{50}, LD_1/ED_{99} etc. But these measures (often of acute effects) are rarely directly applicable to human therapeutics. However, some drugs clearly have a low therapeutic ratio, e.g. cardiac glycosides, whereas other have a very large ratio, e.g. most antibiotics.

therapeutic trial See **clinical trials**.

threshold The point when a stimulus evokes a response.

thrombin An enzyme formed from the precursor prothrombin which induces **blood clotting** by converting **fibrinogen** to **fibrin** in shed blood.

thrombocytopenia A reduction in the number of blood **platelets**. Because of the importance of these cells in the formation of blood clots, there may be abnormal bleeding associated with this condition. There are a number of causes, including as an **adverse drug reaction** to certain drugs, such as OESTROGENS, PHENYLBUTAZONE, SULPHONAMIDES and (thiazide) DIURETICS.

thrombosis Formation of a blood thrombus (clot). A number of factors can increase clot formation, including obstruction or damage to blood vessels and contact of blood with certain surfaces. Thrombosis in blood vessels results in impaired blood supply and resultant **anoxia**, causing in arteries of the heart, coronary thombosis (See **myocardial infarction**), or in the brain, stroke. Thrombosis in veins is associated with the **inflammation** of phlebitis and phlebothrombosis. When the thrombus becomes dislodged it may become lodged elsewhere. ANTICOAGULANT drugs are used to prevent clot formation in those at risk. See **embolism**.

thyrotoxicosis See **goitre**.

tincture An alcoholic drug solution.

tissue culture The *in vitro* culture and maintenance of isolated tissues, cells or organs.

tissue fluid (interstitial fluid) The watery liquid present in the gaps between cells.

tight junction Refers to the area of closely opposed plasma membrane of two adjacent cells.

tissue plasminogen activator A serine protease that converts **plasminogen** to **plasmin**.

titre The concentration of specific **antigens**, **antibodies** or other particles in a sample.

TLC thin-layer chromatography.

T-lymphocyte (thymus dependent; T-cell) A type of **lymphocyte** involved in cellular immune reactions and aiding in the production of **antibodies**. They originate in haemopoietic stem cells, but undergo essential maturation in the thymus gland. They interact with other cells (e.g. B-lymphocytes) and e.g. **antigens**, lymphokines via receptor sites on their membranes. There are several subsets of T-lymphocytes: see **cytotoxic T-cells**; **helper T-cells**; **inducer T-cells**; **suppressor T-cells**.

TNF tumour necrosis factor.

tolerance A diminished response to a drug due to prior (normally chronic) exposure.

tonicity The effective osmotic pressure of a solution; or the normal state of contraction of a muscle.

topical Application of a drug to surface areas, e.g. skin, eye. See also **routes of administration of drugs**.

toxicity In general, a poisonous or toxic property in a chemical. In relation to drugs, the term applies particularly to **adverse drug reactions**.

toxin A poisonous protein or polypeptide produced by **pathogenic microorganisms**; also extended to toxic peptide and other natural products produced by higher organisms.

toxoid A **toxin** that has been modified to destroy its toxicity but retain its ability to stimulate **antibody** production (immunogenicity).

toxicology The study of **poisons**.

TPA (t-PA) tissue-type plasmogen activator.

tracer A substance that once introduced into the body can be followed, e.g. due to radio or fluorescent **labelling**.

transaminase (aminotransferase) An enzyme that catalyses the transfer of an amino group for an amino acid to a keto acid to form another amino acid.

transcript The **RNA** that is synthesized by **RNA polymerase** on a **DNA** or RNA template.

transcriptase An enzyme that catalyses **transcription**.

transcription The mechanism by which information contained in the genetic code is transferred from **DNA** to **RNA**, i.e. is transcribed.

transcriptional control The control of **gene expression** when exerted at the level of initiation of **transcription**.

transcriptional regulators A group of proteins that initiate or prevent **transcription** and hence **gene expression**, by binding to **DNA** at specific control sites.

transcriptional terminator A sequence in a gene that signals the end of **transcription**.

transcription factor Any protein that binds to a specific DNA sequence and is involved directly in regulating the initiation of **transcription**.

transducin (G_T) A **G-protein** that is involved in transducing the signal from activated rhodopsin in the rod

and cone cells of the sye.

transduction The transfer of genetic material by a viral **vector** from one cell to another.

transfect The genetic modification of cells in culture by adding, e.g. viral DNA to the culture medium which enters the cells and is stably incorporated into the **genome**.

transfection The transfer of new genetic material into cells.

transfer RNA (tRNA) The **RNA** that acts as an adapter molecule during protein synthesis to match amino acids to their **codons** in mRNA.

transgenic Containing artificially introduced **DNA** from one **genome** into the germ line of another by **genetic engineering**.

transgenic technology See **transgenic**.

tRNA See **transfer RNA**.

transformations (transforms) A mathematical device used to change the characteristics of a variable. Some transformations are linear (e.g. most metric to Imperial measurements), whilst others are non-linear (e.g. square root, **logarithmic transformation**, **probits**, **reciprocal transformation**). In statistics and pharmacology, log transforms in particular are used to normalize variance, and to produce symmetrical sigmoid curves for quantal dose-response curves and quantitative concentration-response curves.

transformed cell Cultured cells that can divide indefinitely as a result of e.g. viral infection or treatment with carcinogens.

translated See **translation**.

translation The process by which information in the RNA genetic code is used to direct protein synthesis.

translational control Control of **gene expression** at the level of **translation**.

transmembrane Across the membrane.

trimodal distribution See **bimodal distribution**.

triplet A 3-**base** unit in DNA or RNA that codes for a particular amino acid.

TRIS A buffer used in experimental biology.

tritium A radioisotope of hydrogen, ^3H; widely used as a **tracer**, e.g. **radioligand-receptor binding**.

trophic Pertaining to nutrition.

trypan blue A blue diazo **dye** used for **vital staining**.

TTX tetrodotoxin.

tumor Swelling; one of the classical signs of **inflammation** in a tissue. The other signs are *calor* (heat), *rubor* (redness) and *dolor* (pain). The swelling is due not to a growth of cell size (as in **hypertrophy**) but by the collection of fluid between the cells (**oedema**).

tumour Any abnormal swelling in any part of the body. Correctly, the term can be applied both to relatively harmless swelling (**benign**) or to cancerous (**malignant**) growths.

tumour promotor An agent that hastens the effects of **carcinogens**, but are not carcinogenic in their own right.

tumour suppressor gene (anti-oncogene) A **gene** that normally slows cell growth and proliferation. Mutations in tumour suppressor genes can allow uncontrolled cell division and so can lead to malignancies.

Tween A **buffer** used in experimental biology.

two-sample test See **unpaired t-test**.

type I hypersensitivity reaction (anaphylactic/immediate) An unwanted immune response which occurs when **antigen** evokes **IgE** production, which then fix to mast cells. Subsequent exposure with antigen results in release of mediators, e.g. histamine, PAF, eicosanoids, from the mast cells. It occurs within minutes or hours. Underlies, e.g., hay fever and anaphylactic shock.

type II hypersensitivity reaction (cytotoxic antibody-dependent) When the **immune responses** are directed against cells within the host which appear to be foreign, e.g. when the host cells are altered by drugs. The antigen forms part of the cell surface and this evokes antibody production and activation of complement.

type III hypersensitivity reaction (immune complex-mediated) When **antibody** reacts with soluble **antigen** which then activates complement, or attaches to mast cells with subsequent release of mediators. Underlies **Arthus reaction**.

type IV hypersensitivity reaction (delayed-type/cell-mediated) In a primed individual, is the hypersensitivity reaction which occurs maximally within 24–48 hours after **antigen** contact, and which is mediated by a subset of **T-lymphocytes**. It forms the basis of certain diagnostic skin tests.

tyrosine kinase See **tyrosine protein kinase**.

tyrosine protein kinase (tyrosine kinase; protein tyrosine kinase) An enzyme that phosphorylates tyrosine residues on target proteins. Some receptors have intrinsic tyrosine kinase activity, e.g. **growth factors**. It is also involved in **signal transduction**, transmitting signals from cell-surface receptors. Several potential **oncogenes** specify proteins with tyrosine kinase activity.

ulcer See **peptic ulcer**.

ulcerative colitis See **colitis**.

ultracentrifugation The use of a centrifugal field for the sedimentation of macromolecules, determination of molecular weights, separate organelles from broken cells. The ultracentrifuge can achieve fields of the order of 5000 000g.

ultracentrifuge A machine used to separate cell components by weight by spinning broken cells at various speeds.

ultrafiltration Filtration under pressure.

ultrasonication The use of very high frequency (16kHz or higher) by a **sonicator**.

ultrastructure The fine structure of a cell, e.g. as seen with an electron microscope.

uni- A prefix denoting one or one of.

unipolar Refers to a **neuron** that has one main process extending from the cell body.

unpaired t-test (Student's two-sample t-test) This is a (**parametric**) **significance test** that compares the means of two independent samples. The null hypothesis is that the two population means are equal. Both a P value and the 95% confidence interval for the difference between the two population means can be calculated. The test assumes that the data are representative and randomly sampled from a larger population, that the SD of the two populations are equal, that each observation is independent, and that the populations have a **Normal distribution**. The assumption of equal SDs (equivalent to equal variances) is often problematic. Note that the assumption does not refer to the data in the samples, but rather to the populations from which the data were sampled. A commonly used test of the assumption of equal variances is the F test, which reports a P value testing the null hypothesis that the two populations have equal SDs (equal variances).

upmutation A **mutation**, usually in the **promotor** controlling the **gene** in question, in which **transcription** is much enhanced.

upregulation When referring to receptors, where there is an increase in **receptor** number, B_{max}.

urinogenital tract See **genitourinary tract**.

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urticaria A common skin condition (also called nettle rash or hives) characterized by raised itchy weals. It usually occurs only for a few hours, but may reoccur. It is seen in some disease states, including **angio-oedema**. Commonly, it is caused by an **allergic** reaction to foodstuffs (e.g. shellfish, eggs, nuts), food additives (e.g. tartrazine) or drugs (e.g. penicillin, aspirin). Treatment is with antihistamines, or if severe, corticosteroids. A similar condition in neonates, *erythaema neonatorum*, is of unknown cause.
USAN United States approved name (for a drug).
USP Unites States Pharmacopoeia.
uter- (utero-) A prefix denoting the uterus.
uV; UV ultraviolet (light).
u.v. radiation Electromagnetic radiation with wavelengths in the band between visible light and X-rays (10–400 nm).
vaccination (active immunization) A form of **immunization** where killed or weakened **microorganisms** are introduced into the body. This induces protective immunity against the appropriate **pathogen**, but itself does not cause disease.
vaccine The preparation of **microorganisms** or their **antigenic** components for **vaccination**.
vagotomy The cutting of the vagus nerve.
van der Waals bond (electron correlation attraction) The weak electrostatic bond between molecules.
vasoactive Causing dilation and/or constriction of a blood vessel.
vasoconstriction A narrowing of blood vessels.
vasodilalation A widening of blood vessels, e.g. in response to a vasodilator drug.
vasomotor nerve Any nerve that is involved in the control of the circulation of blood.
vector In **genetic engineering**, is a **phage**, virus, DNA or **plasmid** that another DNA is inserted into in order to introduce the DNA into other cells for DNA cloning or to study, e.g. **gene expression**.
vehicle A substance used to dissolve a drug or otherwise facilitate delivery (e.g. emulsifying agents).
ventral Pertaining to the underside of the body.
ventral root Of spinal nerves, a nerve root with some **motor** fibres; of cranial nerves, a nerve root with some **sensory** fibres.
V gene Any of the gene segments coding for part of the variable regions of **immunoglobulin** molecules.
V_H variable region of antibody heavy chain.
virology The study of viruses.
viscera The collective term for the internal organs.
visceral afferent fibres Nerve fibres that convey sensory information to the spinal cord.
visceral efferent fibres Nerve fibres of the **sympathetic** and **parasympathetic nervous systems** which convery information from the CNS to the periphery, e.g. to glands, smooth muscle.
vital staining Staining of living cells with non-toxic dyes.
V_L variable region of antibody light chain.
VLDL very low density lipoprotein.
voltage clamp A device that clamps the **membrane potential** at a set level and therefore allows study of how membrane conductance changes in response to changes in the membrane potential.
voltage-gated Ion channels in the cell membrane whose opening or closing depends on membrane potential.
v-onc A general designation for viral oncogene, e.g. v-src.
v/v per cent 'volume in volume'; the number of ml of an active constituent in 100ml of solution.
Western blot The separation of proteins by **electrophoresis**.
WHO World Health Organization.
wild type Laboratory stock (normals) from which **mutants** are derived.
Wilcoxon matched-pairs test A (**nonparametric**) **significance test** that compares the median of two related samples. The null hypothesis is that the two population medians are equal. It is the nonparametric equivalent of the **matched-pairs t-test**.
Wilcoxon rank sum test A (**nonparametric**) **significance test** that compares population values in a single **sample** with a theoretical value. The **null hypothesis** is that the population median equals the theoretical value.
withdrawal syndrome An abrupt withdrawal of a drug causing a characteristic syndrome, often with both physical and psychological discomfort or illness. Often the withdrawal effects are the opposite of those of initial use of the drug, and may be incurred both by medical and nonmedical use of drugs. Drugs especially noted for serious withdrawal syndromes include amphetamines, barbiturates, benzodiazepines, COCAINE, NICOTINE and OPIOID ANALGESICS. Treatment may consist of adoption of a gradual withdrawal, or substitution of a weaker drug (e.g. METHADONE for MORPHINE).
w/v per cent 'weight in volume'; the number of grams of an active constituent in 100ml of solution.
xenobiotic A chemical that is present in a natural environment but which does not usually occur in nature, and therefore is foreign to a living cell.
yeast artificial chromosome (YAC) A **vector** constructed from the various DNA sequences needed for replication in yeast cells. It can be used to clone large (up to 400kb) fragments of foreign DNA and is especially useful for **chromosome mapping**.
Zollinger-Ellison syndrome A rare disorder where there is excessive gastric acid secretion due to high GASTRIN levels in the blood produced by an enlarged pancreas or pancreatic **tumour**.
zymogen An inactive **enzyme** precursor.
zwitterion A molecule with positively and negatively charged groups, e.g. an amino acid.

Appendix B

Tables

Amino acid abbreviations (common natural)

alanine	Ala	A
arginine	Arg	R
asparagine	Asn	N (B)
aspartic acid	Asp	D (B)
cysteine	Cys	C
glutamic acid	Glu	E (Z)
glutamine	Gln	Q (Z)
glycine	Gly	G
histidine	His	H
isoleucine	Ile	I
leucine	Leu	L
lysine	Lys	K
methionine	Met	M
phenylalanine	Phe	F
proline	Pro	P
serine	Ser	S
threonine	Thr	T
tryptophan	Trp	W
tyrosine	Tyr	Y
valine	Val	V
(unspecified)	—	X

Amino acid abbreviations (found in literature; related and unnatural)

2-aminobutanoic	Abu
β-alanine	βAla
alloisoleucine	aIle; alloIle
asparagine	$Asp(NH_2)$
asparagine or aspartic acid	Asx
citrulline	Cit
cysteic acid	Cys
pyroglutamic acid (5-oxoproline)	Glp; pGlu; <Glu; 5-oxo-Pro
glutamine	$Glu(NH_2)$
glutamine or glutamic acid	Glx
homocyteine	Hcy
homoserine	Hse
hydroxyproline (4-hydroxyproline)	Hyp (4Hyp)
isovaline	Iva
methionine *S*-oxide	MetO
methionine *S,S*-dioxide	$MetO_2$
muramic acid	Mur
neuraminic acid	Neu
norleucine	Nle
norvaline	Nva; Ape
(3a*S*, 7a*S*)-octahydroindole-2-carboxylic acid	Oic
ornithine	Orn
phosphoserine	Ser(P)
sarcosine	Sar
alloThreonine	aThr
thyroxine	Thx
1,2,3,4-tetrahydroisoquinoline-2-carboxylic acid	Tic
unspecified amino acid	Xaa

Greek and Latin multiplicative prefixes

	Greek	**Latin**
1/2	hemi	semi
1 1/2	—	sesqui
1	mono	uni
2	di	bi
3	tri	tri, ter
4	tetra (tetr)	quadri
5	penta (pent)	quinque (quinqu)
6	hexa (hex)	sexi (sex)
7	hepta (hept)	septi (sept)
8	ocata, octo (oct)	
9	ennea (enne)	nona (non)
10	deca, deci (dec)	
11	hendeca (hendec)	undeca (undec)
12	dodeca (dodec)	
13	trideca (tridec)	
14	tetradeca (tetradec)	
15	pentadeca	
16	hexadeca	
17	heptadeca	
18	octadeca	
19	nonadeca	
20	eicosa, eicos (icosa, icos)	
21	henicosa	
22	docosa	
23	tricosa	
30	triconta	
31	hentriconta	
32	dotrionca	
40	tetraconta	
50	pentaconta	
60	hexaconta	
70	heptaconta	
80	octaconta	
90	nonaconta	
100	hecta (hect)	
101	henhecta	
102	dohecta	
110	decahecta	
120	eicosahecta	
132	doctriacontahecta	
200	dicta (dict)	
300	trica	
400	tetracta	
1000	kilia	

two-times	bis
three-times	tris
four-times	tetrakis