Textbook of Pharmaceutical Organic Chemistry

(As Per Education Regulation 1991)

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TEXT BOOK
OF
PHARMACEUTICAL ORGANIC CHEMISTRY

[As per Education Regulation 1991]

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PREFACE

The extraordinary knowledge about the durg is the blessing endowed by God Jupiter (God of Healing) to the medical fraternity and to the profession of Pharmacy.

The first edition of "Text Book of Pharmaceutical Organic Chemistry" has been written to confirm the needs of students and teachers of Diploma in Pharmacy Part-II as per new syllabus prescribed by Pharmacy Council of India in Education Regulation, 1991.

Pharmaceutical organic (medicinal) chemistry is a very dynamic branch of pharmacy which deals with the basic structural chemistry of drugs. On going research mandates every student and teacher involved with pharmacy to update his/her knowledge about current practice and trends in this subject. Every effort has been made to include these recent trends and knowledge in this textbook.

The structure of this book is simple, self-explanatory and easy for the readers to grasp the subject. The book has been divided into 32 chapters based on classification of drugs. Further, every chapter starts with a brief introduction followed by an updated classification and discussion about the important drugs specified in the syllabus. The structure, IUPAC nomenclature, physical properties, storage actions, uses and official preparations of the drugs listed in Indian Pharmacopoeia have been dealt with in comprehensive but precise text. A detailed index at the end of the book will be of great help to the readers.

We have made every possible effort to make this textbook informative and useful to the teachers and students of Diploma in Pharmacy. We recognised that many areas of controversy still exist and therefore we shall be extremely grateful to our readers for their valuable suggestions and comments.

We sincerely appreciate the help rendered by the teachers, colleagues and students as well as the management of L.M. College of Science and Technology, Jodhpur for providing much needed assistance for preparing this text. We also thank Dr. Manish Parekh for his special assistance in co-editing and updating the text.

We are extremely grateful to Mr. S.K. Jain (CBS Publishers & Distributors) and his staff for preparing an excellent book which hopefully lives to the expectations of our readers.

We feel indebted to all the students of pharmacy who have provided an impetus to embark on this venture and to whom we dedicate this textbook.

Dr. ANIL BHANDARI
Dr. G.K. SINGH

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SYLLABUS

1. Introduction to the nomenclature of organic chemical systems with particular reference to hetero-cyclic system containing upto three rings.
2. The Chemistry of following Pharmaceutical organic compounds covering their nomenclature, chemical structure, uses and the important physical and chemical properties (Chemical structure of only those compounds marked with asterisk (*).
3. The stability, storage conditions and the different types of Pharmaceutical formulations of these drugs and their popular brand names.

Antiseptics and Disinfectants - Proflavine*, Benzalkonium chloride, Cetrimide, Chlorocersol*, Chloroxylene, Formaldehyde solution, Hexachlorophene, Liquified phenol, Nitro furanton.

Sulfonamides - Sulfadizine*, Sulfaguandine*, Phthalyl sulfathiazole, Succinyl sulfathiazole, Sulfadimenthoxine, Sulfamethoxy, pyridazine, Sulfamethoxazole, co-trimoxazole, Sulfacetamide*.

Antileprotic drugs- Clofazimine, Thiambutosine, Dapsone*, Solapsone.

Anti-tubercular drugs - Isoniazid*, PAS*, Streptomycin, Rifampicin, Ethambutol*, Thiacetazone, Ethionamide, Cycloserine., pyrazinamide*.

Antiamoebic and Anthelmintic Drugs - Emetine, Metronidazole*, Halogenated hydroxyquinolins, Diloxanide foate, Paromomycin, Piperazine*, Mebendazole, D.E.C.*

Antibiotics - Benzyl Penicillin*, Phenoxy methyl Penicillin*, Benzthine Penicillin, Ampicillin*, Cloxacillin, Carbenicillin, Gentamycin, Neomycin, Erythromycin, Tetracycline, Cephalexin, Cephaloridine, Cephalothin, Griseofulvin, Chloramphenicol.

Antifungal agents - Undecylenic acid, Tolnaftate, Nystatin, Amphoterecin, Hamycin.

Antimalarial Drugs- Choroquine*, Amodiaquine, Primaquine, Proguanil, Pyrimethamine*, Quinine, Trimethoprim.

Tranqillizers- Chlorpromazine*, Prochlor Perazine, Trifulo Perazine, Thiothixene, Haloperidol*, Triperodol Oxypertine. Chlordiazepoxide, Diazepam*, Lorazepam, Meprobamate.

Hypnotics- Phenobarbitone*, Butobarbitone, Cyclobarbitone, Nitrazepam, Glutethimide*, Methyprylon, paraldehyde, Triclofos - sodium.

General Anaesthtics- Halothane*, Cyclopropane*, Diethyl ether*, Metho-hexital sodium., Trichloroethylene.

Antidepressant Drugs- Amitriptyline, Nortryptyline, Imipramine*, Phenelzine, Tranyl cyromine.

Analeptics - Theophylline, Caffeine*, Coramine*, Dextroamphetamine.

Adrenergic Drugs- Adrenaline*, Noradrenaline, Isoprenaline*, Phenylephrine, Salbutamol, Terbutaline, Ephedrine*, Pseudo ephedrine.

Adrenergic antagonist- Tolazoline, Propranolol*, Practalol

Cholinergic Drugs- Neostigmine*. Pyridostigmine, Pralidoxine, Pilocarpine, Physostigmine*.

Cholinergic Antagonists- Atropine*, Hyoscine, Homatropine, Propantheline*, Benztropine, Tropicamide, Biperiden*.

Diuretic Drugs - Furosemide*, Chlorothiazide, Hydrochlorothiazide*, Benzthiazide, Urea*, Mannitol*, Ethacrynic acid.

Cardiovascular Drugs - Ethyl nitrite*, Glyceryl trinitrate, Alpha methyldopa, Guanethidine, Clofibrate, Quinidine.

Hypoglycemic Agents - Insulin, Chlorpropamide*, Tolbutamide, Glibenclamide, Phenformin*, Metformin.

Coagulants and Anti-Coagulats - Heparin, Thrombin, Menadione*, Bishydroxycoumarin, Warfarin sodium.

Local Anaesthetics - Lignocaine*, Procaine*, Benzocaine.

Histamine and Anti Histaminic Agents - Histamine, Diphenhydramine*, Promethazine, Cyproheptadine, Mepyramine, Chlorphenitramine*.

Analgesics and anti-pyretics-Morphine,. Pethidine*, Codeine, Methadone, Aspirin*, Paracetamol*, Analgin, Dextropropoxyphene, Pentazocine.

Non-steroidal anti-inflammatory Agents- Indomethacin*, Phenylbutazone*, Oxyphen butazone, Ibuprofen.

Thyroxine and antithyroids- Thyroxine*, Methimazole, Methylthiouracil, Propylthiouracil.

Diagnostic Agents - Iopanoic Acid, Propyliodone, Sulfobromophthalein sodium, Indigotindisulfonate sodium (Indigo carmine), Evans blue, Congo red, Fluoresein sodium.

Anticonvulsants, Cardiac glycosides, Antiarrhythmic, Antihypertensives and Vitamins.

Steroidal Drugs - Betamethazone, Cortisone, Hydrocortisone, Prednisolone, Progesterone, Testosterone, Oestradiol, Nandrolone.

Anti-Neoplastic Drugs - Actinomycins, Azathioprine, Busulphan, Chlorambusil Cisplatin, Cyclophosphamide, Daunorbicin hydrochloride, Fluorouracil, Mercaptopurine, Methotrexate, Mitomycin.

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CHAPTER 1

INTRODUCTION

Pharmaceutical organic chemistry is the branch of chemistry dealing with drugs having an element carbon obtained from naturally or synthetically. The natural sources may be from plants, animals or minerals. These agents are classified as alkaloids, vitamins, glycoside, hormones, antibiotic, etc.

Most of the naturally occurring active compound is structurally modified to obtain semisynthetic and synthetic drugs. All these agents are classified according to their use. These drugs are generally nonionic and have readily absorbed by the body tissue and effected organisms. Biological action of these agents varies with their isomeric forms.

Medicinal chemistry is concern with techniques of isolation, purification, synthesis, preparation of synthetic analogs, metabolism and made of action. The various pharmacopoeias describe the standards of drugs, their common applications and various dosage forms.

The physical standards are discuss as form, colour, odour and solubility parameters. These solubility parameters are at average room temperature. The following terms used and their meanings are as under:

Insoluble	1 in more than 10,000
Very slightly soluble	1 in 1,000 to 1 in 10,000
Slightly soluble	1 in 100 to 1 in 1000
Sparingly soluble	1 in 30 to 1 in 100
Soluble	1 in 10 to 1 in 30
Freely soluble	1 in 1 to 1 in 10
Very soluble	1 in less than 1

Storage of drugs is also an important parameter. Sunlight, moisture, temperature, etc are certain factors that can promote the degradation of potent medicaments. The specific condition of storage, as well as information regarding incompatibility of drugs is also vital. All the drugs are covers in the subsequent chapter according to syllabus as per E.R. 1991 covering all the important aspects, necessary for the Diploma students.

A special chapter has included to stress the naming of these drugs under IUPAC nomenclature. This book incorporates only those drugs that have commonly used and prescribed in syllabus.

CHAPTER -2

NOMENCLATURE

Organic compounds are numerous. There are different names for a single compound. In Geneva a system for naming organic compounds was established and is called IUPAC system. This system is adopted by "International Union of Pure and Applied Chemistry" (IUPAC). This system of naming organic compounds is called IUPAC system of nomenclature.

The organic compounds are classified into two groups:

ORGANIC COMPOUNDS

Aliphatic		**Cyclic compounds**	
Open chain	**Alicyclic**	**Homocyclic** (Aromatic)	**Heterocyclic**
Butane	Cyclopropane	Benzene	Pyrrole
Pentane	Cyclobutane	Naphthalene	Thiophene

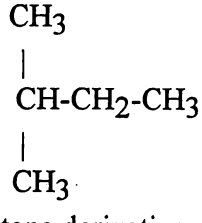
There are different IUPAC system for open chain, Aromatic and Heterocyclic compounds.

IUPAC System for open chain organic compounds

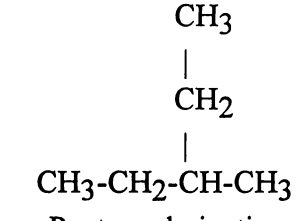
This system is a basic system for naming various organic compounds. It is applicable to aliphatic compounds. The following rules govern the nomenclature of aliphatic compounds.

1. **Selection of the longest carbon chain**

A longest unbranched carbon chain is selected, the compound is considered as the derivative of the alkane containing that chain.



Butane derivative
(not a propane derivative)

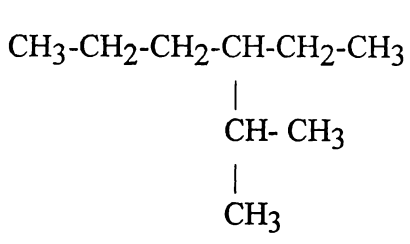


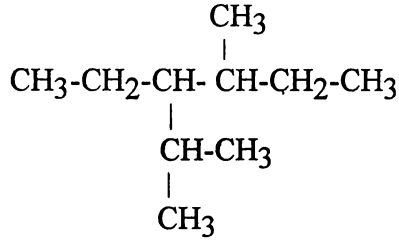
Pentane derivative
(not a butane derivative)

CH_4	-	Methane	C_6H_{14}	-	Hexane
C_2H_6	-	Ethane	C_7H_{16}	-	Heptane
C_3H_8	-	Propane	C_8H_{18}	-	Octane
C_4H_{10}	-	Butane	C_9H_{20}	-	Nonane
C_5H_{12}	-	Pentane	$C_{10}H_{22}$	-	Decane

2. **Selection of Carbon Chain**

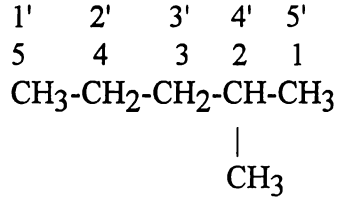
If there are two or more possibilities of longest carbon chain, than the carbon chain having more alkyl substituents is preferred.



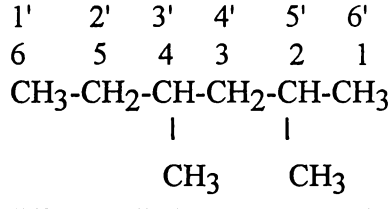


3. **Numbering of Carbon Atom in the Chain**

The numbering of carbon atoms in a carbon chain starts from that end which gives least number to substituent or substituents. If more than one substituents are present then sum of numbers of carbon from which the substituent are attached is least; will be the correct numbering system e.g.

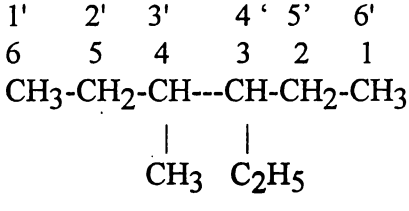


'incorrect
correct



'incorrect
correct

If two different alkyl groups are substituted in the same chain and sum of their numbers remain same using a different number system then numbering will start from that end at which a substituent comes first in alphabetical order. E.g :



' incorrect
correct

If two or more substituents are identical and attached at different positions than di, tri, tetra, penta and hexa prefix is attached before the substituent group with various numbers.

4. Functional group

If a compound contains any of the following group then it is called functional group. These functional groups should get priority over substituent or side chain in numbering the basic chain. While naming such compounds a particular suffix is added to the name of parent alkane chain. The following table shows the suffix for various functional groups. The carbon present in the functional group and is also a number of continuous chain then this carbon is included as the member of longest chain while carbon of substituent will not be included in the chain.

When more than one functional groups are present then the functional group coming first in the below table will act as functional group and rest are considered substituents. This series is called preferential series. When the compound contains Ist to VIII functional group of the table than numbering will start from the carbon of functional group.

5. **Alphabetical rule**

While writing the name of an organic compound substituents are written first followed by name of parent carbon chain as central part and finally suffix if the functional group. In this all the substituents are arranged in the alphabetical order.

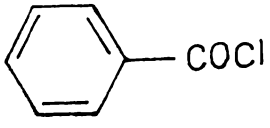
IUPAC for Homocyclic (Aromatic) compounds

Aromatic compounds are divided into two groups

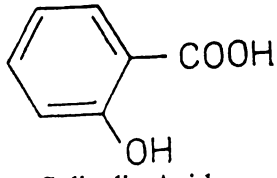
(1) Compounds having one cycle

(2) Compounds having more than one cycle (poly-nuclear).

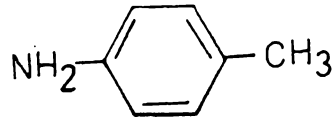
The aromatic compounds have their own names for the purpose of IUPAC. These are :



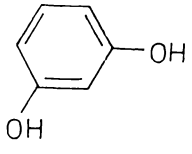
Benzoyl Chloride



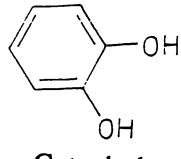
Salicylic Acid



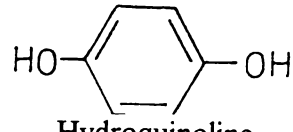
P- Toluidine



Resorcinol

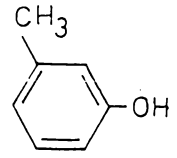


Catechol

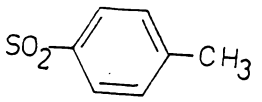


Hydroquinoline

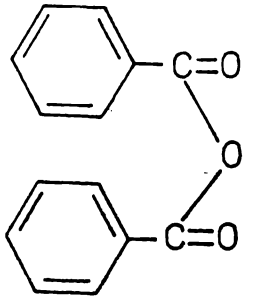
Formula	Common name	suffix	IUPAC Name	Prfix
-C(=O)-OH	Carboxylic acid	Oic acid	Alknoic acid	Carboxy
$-SO_3H$	Sulphonic acid	Sulphonic acid	Sulphonic acid	Sulpho
-C(=O)-OR	Esters	alkyl...oate	alkylalkanoate	Alkoxy
-C(=O)-X	Acyl halide	Oyl halide	alkanoyl halide	Halformyl
$-CONH_2$	Amide	Amide	Alkanamide	Carbamoyl
$-C\equiv N$	Nitrile	Nitrile	Alkane nitrile	Cyano
-CHO	Aldehyde	Al	Alkanal	Oxo, formyl
$>C=O$	Ketone	- One	Alkanone	Oxo, keto
-OH	Alcohol	- Ol	Alkanol	Hydroxy
-SH	Thiol	- Thiol	Alkane thiol	Mercapto
$-NH_2$	Amine	Amine	Alkanamine	Amino
=	Alkene	-ene	Alkene	ene
$\equiv$	Alkyne	-yne	Alkyne	yne
-NH-C(=NH)-NH-C(=NH)-NH_2	Guanidine	-----	Guanidine	Guanidine



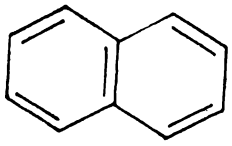
M- Cresol



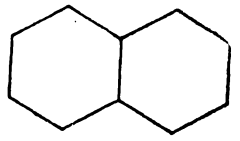
Tosyl



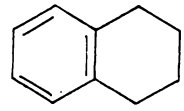
Benzoic Anhydride



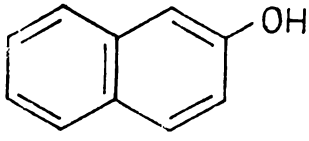
Naphthalene



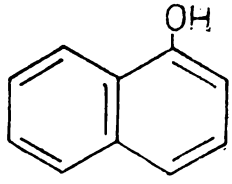
Decalin



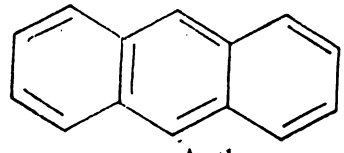
Tetralin



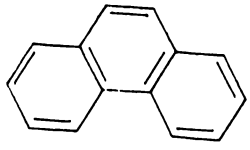
β Naphthol



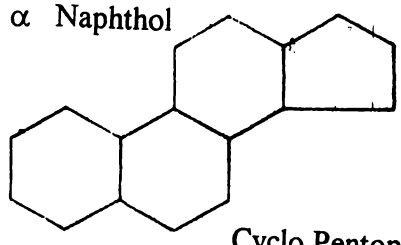
α Naphthol



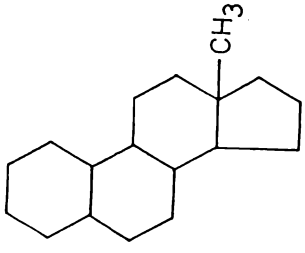
Anthracene



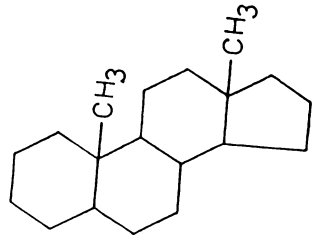
Phenenthrene



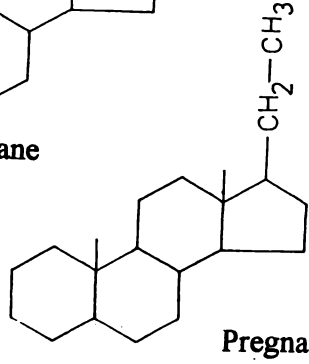
Cyclo Pentophenethrene



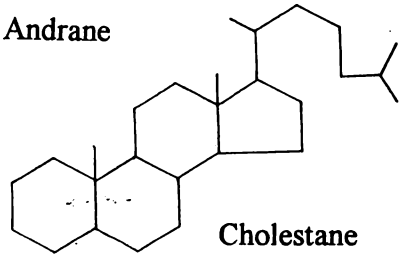
Estrane



Andrane



Pregnane



Cholestane

Apart from these nucleus if any side chain is attached then naming of side chain will be done separately and is added to the IUPAC name of aromatic compounds.

IUPAC for Heterocyclic compounds :

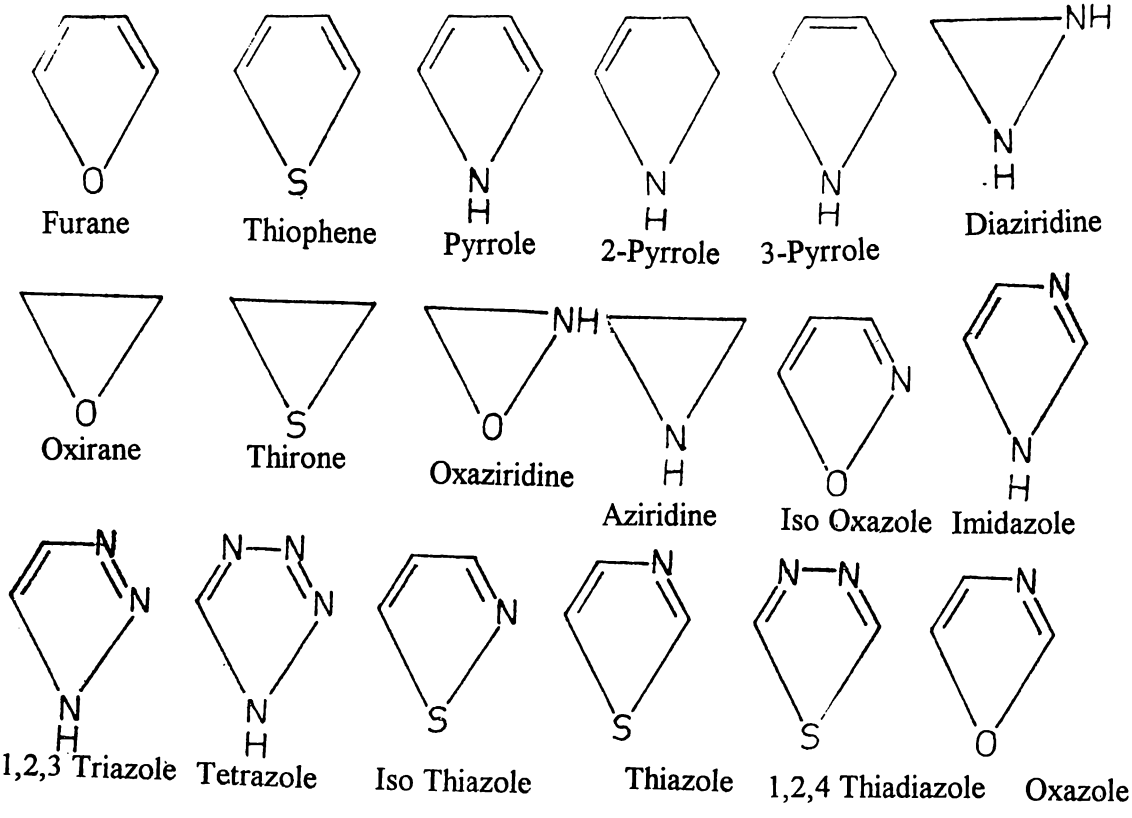
The following rules are followed for the naming of Heterocyclic compounds.

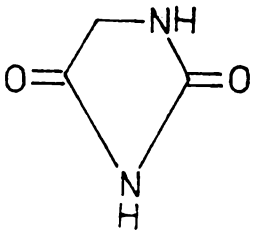
[1] When a heterocyclic compound contain only one hetero atom the numbering will start from the hetero atom. Exceptions are isoquinoline ring and isoindole ring.

[2] If more than one hetero atom is present in the ring then numbering will start as per preferential series (O, S, N, P etc.) and a numbering system is selected in which sum of the numbers given to hetero atoms are least.

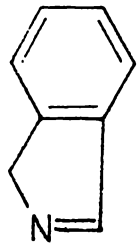
[3] When two or more hetero atoms of a similar atom are present then a prefix like di, tri, tetra, etc. are used. The word oxo for oxygen, thio for sulphur, azo for nitrogen, etc.

[4] There are basic rings having fixed name for IUPAC. They are :-

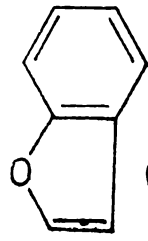


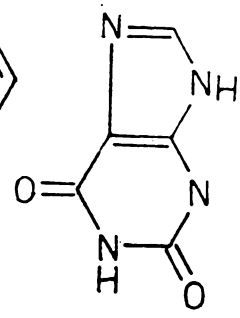


Hydantoin

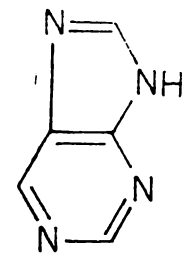


Iso Indole

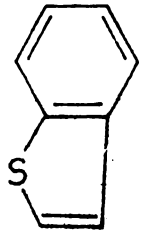




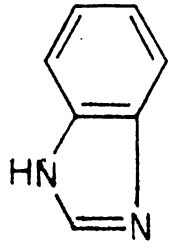
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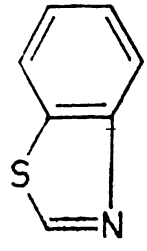
Purine



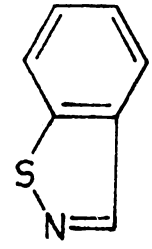
Thio-Napthene



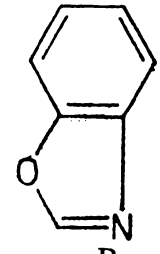
Benzimidazole



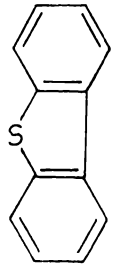
Benzthiazole



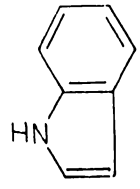
1,2 Benzisothiazole



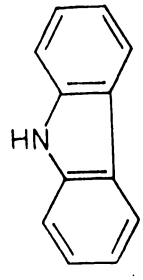
Benzoxazole



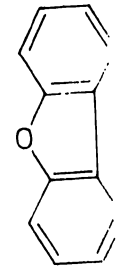
Dibenzothiophene



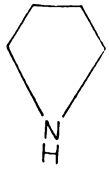
Indole



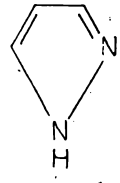
Carbazole



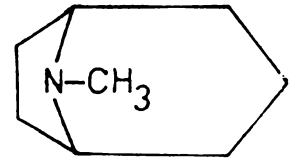
Dibenzo Furane



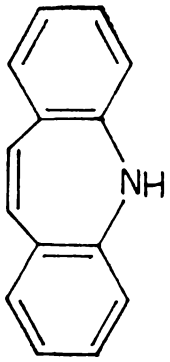
Pyrrolidine



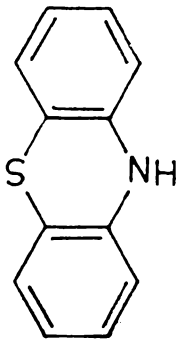
Pyrazole



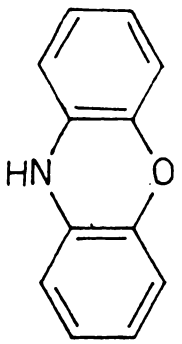
Tropane



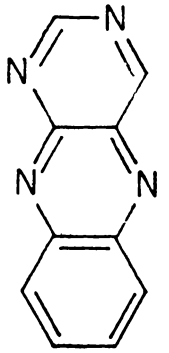
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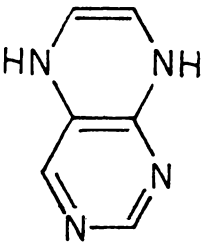
Phenothiazine



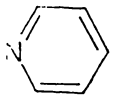
Phenoxozine



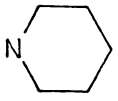
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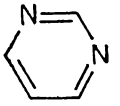
Pteridine



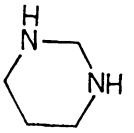
Pyridine

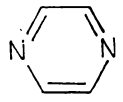


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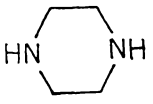


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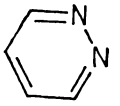




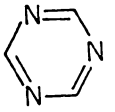
Pyrazine



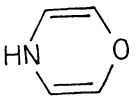
Piperazine



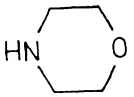
Pyridazine



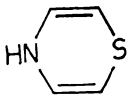
1,3,5 Triazine



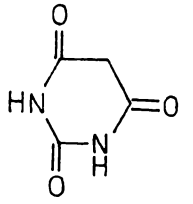
1,4 Oxazole



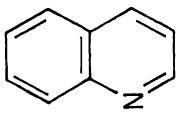
Morpholine



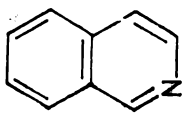
1,4 Thiazine



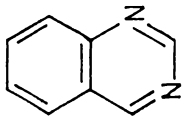
Barbituric Acid



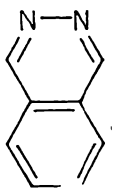
Quinoline



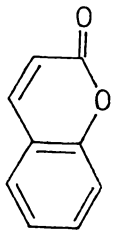
Isoquinoline



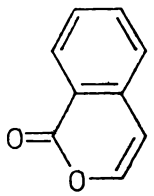
Quinazoline



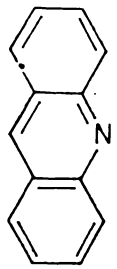
Phthalazinen



Coumarine



Isocoumarin



Acridine

CHAPTER -3

ANTISEPTICS AND DISINFECTANTS

Disinfectants and antiseptics are use to inhibit the growth or to kill pathogenic microorganisms in the vegetative or nonsporing state. There is often confusion between the term antiseptic and disinfectant. The term antiseptic is use to a chemical agent that destroys microorganism on living surface while disinfectant also destroys microorganism on inanimate surface or reduces the number of microorganisms to a safe level on an inanimate (non-living) object.

Sterilization is the total removal or destruction of living microorganisms and spores. Sterilization has done by filtration, dry heat, moist heat, radiation or by chemical agents.

Preservatives are use to prevent microbial spoilage of preparations; in pharmacy, preservatives should be capable of inhibiting the growth or killing of microorganisms and maintain the sterility of the preparation.

Antiseptic and disinfectants are use in hospitals, public buildings, sanitation, farms and in houses for cleaning purpose.

Classification : These are classified as follows -

Alcohols	:	Ethyl alcohol, Isopropyl alcohol
Aldehydes	:	Formaldehyde, Acetaldehyde
Cationic surfactant	:	Benzalkonium chloride, cetramide
Chlorhexidine	:	Chlorhexidine salts
Dyes	:	Acridine derivatives-proflavin, acriflavin
Mercurials	:	Thiomersal,Mercurochrome
Phenols	:	Phenol, chlorocresol, chloroxylenol, Hexachlorophane
Miscellaneous	:	Nitrofurantoin

Alcohol

Alcohols are bactericidal agents having little activity against bacterial spores, it is used as an anti-septic for skin and disinfectant for hard surfaces. It is also used for sclerotherapy. Alcohol is toxic when consumed internally in high dose. It impairs mental co-ordination causes gastric disturbance, respiratory depression, damages brain and liver and produces drug dependency. Ethanol is miscible with water and in organic solvents. It volatalises when exposed to air.

C_2H_5OH CH_3CH_2OH $CH_3CH(OH)CH_3$

Ethanol Isopropyl alcohol (propane 2-ol)

Action and Uses : Ethanol is mainly uses before surgery but some times Isopropyl alcohol can also be use. These are use as disinfectants for hypodermic syringes and needles. Isopropyl alcohol can not destroy spores of clostridium species. It also acts as substituents.

ALDEHYDES

Formaldehyde

A 40% solution of formaldehyde is called formaline. It is a clear colourless liquid, has a characteristic pungent irritating odour. It is miscible with water and alcohol and should be stored in air tight containers between 15-25°C

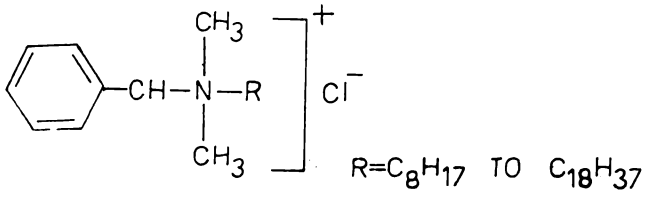
HCHO $H-C(=O)-H$

Formaldehyde (methanal)

Action and Uses : It is a powerful disinfectant, active against bacteria, fungi, viruses and bacterial spores. It is also used for fumigation. It causes dermatitis and sensitivity reactions. Its injection may cause serious effects including pain, damage to mucous membrane, metabolic acidosis, convulsions, etc. When it is applied to skin, it hardens the epidermis and also causes diarrohea, pneumonia and intestinal bleeding while its vapour causes irritation to eyes, respiratory tract and nose, causing coughing, spasm and oedema of the larynx and asthma.

BENZALKONIUM CHLORIDE

Benzalkonium chloride is a quartarnary ammonium cationic surfactant. Chemically it is an alkyl, benzyl, dimethyl ammonium chloride. It is available as a white or yellowish white powder thick gel or gelatinous mass with aromatic odour which is hygroscopic . It is very soluble in alcohol, water and ether but insoluble in organic solvent. Its aqueous solution is alkaline which forms foams on shaking. It is incompatible with anionic surfactant, citrates, iodides, nitrates, permangnate, salicylates, silver salts and tartarate. It is also incompatible with aluminum, cotton dressings, H_2O_2, kaolin, flourescin sodium, hydrous wool fat etc. It should be stored in airtight containers protected from light but it should not be stored in rubber containers.



Benzalkonium chloride

Action and Uses :It is used as a detergent for pre -operative painting of unbroken skin in a dilution of 1 in 500 or on mucous membrane burns, wounds and broken skin in a dilution of 1 in 1000 or more.

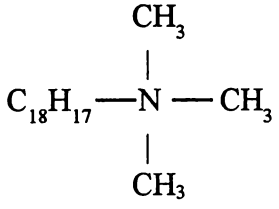
As a very dilute solution it is used for irrigation of bladder, urethra, vagina, throat, and as an eyes wash etc. Repeated use of this agent may cause hypersensitivity.

Official: Benzalkonium chloride I.P.

CETRIMIDE

Cetrimide is a quaternary ammonium cationic antiseptic. Chemically it is a tetradecayl trimethyl ammonium compound. It is a white to creamy voluminous free flowing powder with a faint characteristic odour and soapy bitter taste. It is soluble in water, alcohol and ether. It is incompatible with anionic soaps, Iodine and alkali hydroxides.

It should be stored in air tight containers. Its 4% solution when stored may be contaminated by pseudomonas species therefore 7% ethanol or 4% isopropyl alcohol should be added.

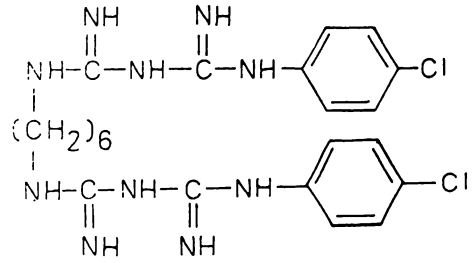


Cetrimide

Actions and uses : It has a similar action as that of benzalkonium chloride but is relatively nontoxic. It is active against gram positive organisms, less active against gram negative and is inactive against acid fast bacilli, and bacterial spores. A 1 to 3% solutions is used for seborrhoea of scalp. Cetrimide should not be applied repeatedly to the skin and a wet dressing should not be left in contact because of skin hypersensitivity.

CHLORHEXIDINE HYDROCHLORIDE

It is a white crystalline, odourless powder with a bitter taste. It is soluble in glycol, slightly soluble in alcohol and almost insoluble in water. It is incompatible with soaps and other anionic materials, alginates, tragacanth, etc. Its acetate salt is incompatible with potassium iodide, borates, bicarbonates, carbonates, chlorides, citrates, nitrates, Phosphates etc.



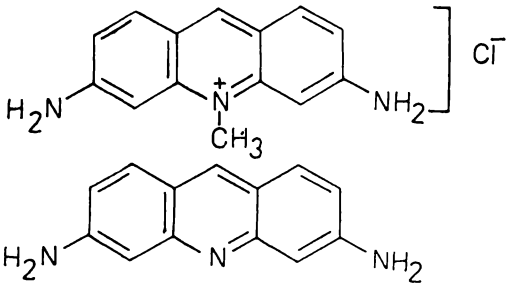
IUPAC Name :1,1'-Hexamethylene bis[5-(4-chlorophenyl) biguanide]

Actions and uses : It is a nontoxic antiseptic, active against gram positive and gram negative organisms but inactive against acid-fast bacilli, bacterial spores and fungi. It is used in the treatment of wounds, burns, irrigation of bladder, serious surfaces. It is also used for the disinfection of hands before surgical procedures, mouth wash to inhibit the formation of bacterial plaque on the teeth. It is used in dusting powders, creams, ointments, lozenges and as antiseptic in surgical dressings. Its strong solutions may cause irritation, in mouthwashes. It also causes burning sensation of tongue and haemolysis on accidental ingestion.

Official preparation :Chlorhexidine gluconate solution I.P.

ACRIFLAVINE

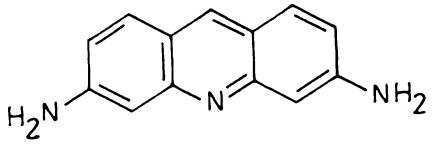
It is a deep orange, odourless granular powder. It is soluble in water, sparingly soluble in alcohol and nearly insoluble in ether, chloroform and ester. It is a reddish-orange dye when dissolved in water, shows fluorescence and is sensitive to light.



Actions and uses : It is an antiseptic and antiinfective used locally in wounds.

PROFLAVINE

It is an acridine derivative. It is an odourless hygroscopic orange to red crystalline powder. It is soluble in boiling water, glycerol, slightly soluble in alcohol; practically insoluble in ether and chloroform. It should be stored in air tight containers protected from light.

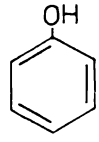


IUPAC Name :- 3,6- diamino acridine.

Actions and uses : Proflavine is a slow acting antiseptic used in the treatment of infected wounds or burns of external ear, mouth, throat and skin. Generally a 0.1% solution is used for wound or burn washing but if treatment is prolonged, a weak solution is used. It provides a stain on skin-which can be washed with very dilute acidic solution.

PHENOL [CARBOLIC ACID]

Phenol is available as deliquescent, colourless or faintly pink needle shaped crystals with a characteristic odour. It is soluble in alcohol, ether, chloroform, liquid paraffin glycerol, alkalis etc. It should be stored in airtight containers protected from light, in a cool place [below 15°C]. It is incompatible with salts of non-ionic surfactant.

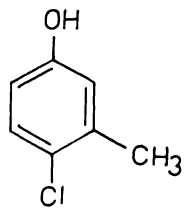


IUPAC Name : Phenol OR Hydroxybenzene.

Actions and uses : Phenol is a corrosive and its injection causes pain and gastrointestinal upset. It is an antiseptic and disinfectant against a wide range of micro-organisms and viruses. A concentrated solution causes destructive effect on tissues also and skin becomes white blue due to precipitation of proteins. When phenol penetrates into deeper tissues it causes paralysis of sensory nerves leading to painless gangrene. Liquid phenol is used in dentistry and as an analgesic in 5% solution to desensatatise the pulp of deciduous teeth.

CHLOROCRESOL

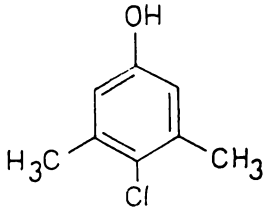
Chlorocresol is a phenol derivative. It is a colourless or faintly coloured crystalline solid powder with characteristic phenolic odour. It is slightly soluble in water, very soluble in alcohol and freely soluble in ether and in fatty oils. It should be stored in air tight containers protected from light. It's aqueous solution acquires yellowish colour when exposed to light and air. It is incompatible with codeine phosphate, dimorphine, quinine, methyl cellulose and non-ionic surfactants.



IUPAC Name : 4-chloro-3-methyl phenol.
Actions and Uses : It is a potent chlorinated phenolic disinfectant active against gram-positive and gram-negative organisms as well as against fungi but less active against bacterial spores. Its 0.1 % concentration in aqueous ingestion is used as preservative. It was also used as a bactericidal for sterilization. It is mainly used as disinfection and preservative for the preparation of external use.
Official: Chlorocresol I.P.

CHLOROXYLENOL

It is a white or cream coloured crystalline powder with a characteristic phenolic odour. It is very slightly soluble in water but soluble in alcohol, ether, terpenes and alkali hydroxides. It is incompatible with non-ionic surfactant and methyl cellulose.

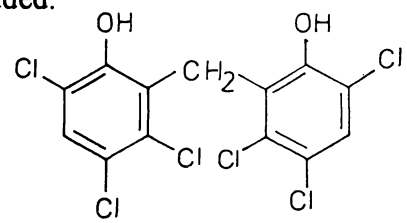


IUPAC Name : 4-chloro-3,5-dimethyl phenol;
OR 4-chloro-3,5-xylenol.

Actions and Uses : Chloroxylenol is a chlorinated phenolic antiseptic and highly active against gram-positive bacteria. Its solution is used for application on skin wounds and other topical preparations. Its activity increases by the addition of adapic acid.

HEXACHLORPHENE

It is a white or pale buff coloured crystalline powder having slightly phenolic odour. It is practically insoluble in water but soluble in alcohol, ether, acetone and solution of alkali hydroxides. It should be stored in air tight containers protected from light. It is incompatible with iron and decolourises solution and the sequestrant such as disodium edetate is added.

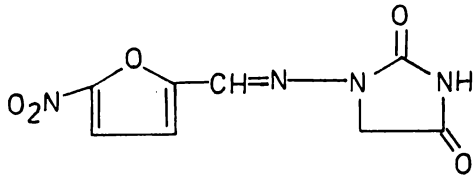


IUPAC Name : 2-2'-methylenebis (3,4,6-trichloro phenol)
Actions and Uses : Hexachlorophene is a chlorinated bisphenyl antiseptic, active

against gram-positive and gram-negative bacteria. It is more active at pH 5 to 6. It is used in soaps and creams in a concentration of 0.23 to 3% for skin disorders. A 3% solution is used for disinfection of, hands before surgery and also to control staphylococcal infection in the new born baby.

NITROFURANTOIN

It is available as odourless yellow crystals or fine powder with a bitter taste. It is very slightly soluble in water, alcohol, glycerol and acetone but slightly soluble in dimethyl formamide and macrogol-300. It should be stored in air tight containers protected from light below 25°C.



IUPAC Name : 1-(5-Nitro furfurylidene amino) imidazolidine -2,4-dione.

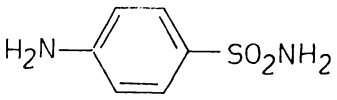
Actions and uses : It is a broad spectrum anti-bacterial agent and effective concentrations can be achieved in tissues without intolerable side-effects. It is used in long term chronic infections in the treatment of urinary tract infection . Some times it may produce nausea, abdominal discomfort, drowsiness, pulmonary-odema etc.

Official: Nitofurantoin I.P.

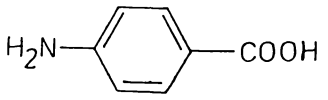
CHAPTER - 4

SULPHONAMIDES

Sulphanilamide was first synthesized in 1908 by '**Gelmo**'. The first clinically important derivative was prontosil, an azo dye that metabolized in vivo to sulphanilamide. The derivatives of sulphanilamide are called sulphonamides.



Sulphanilamide



PABA

Sulphonamides are structural analogues of Para aminobenzoic acid (PABA). PABA is essential for the synthesis of folic acid in bacteria and sulphonamides acts as competitive antagonists of PABA. Sulphonamides are bacteriostatic agents and active against gram-negative, gram-positive bacteria and protozoa. These are cheap and safe antibacterial agents.

Classification : Sulphonamides are classified in following types. :

(A) **Therapeutic classification**

1. Sulphonamides used in eye infections - Sulphacetamide.
2. Sulphonamidesused for intestinal infection - Sulphadiazine
3. Sulphonamides used for systemic infection - Sulfadimethoxine.
4. Sulphonamides used for urinary tract infection - Sulphamethoxy pyridazine.
5. Sulphonamides used for topical infections - Silver Sulfadiazine

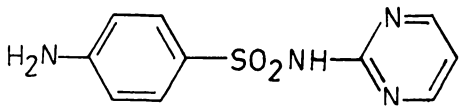
(B) **Classificaton as per duration of action**

1. Short acting (Half life less than 10 hours) - Sulphathiazde, Sulfisoxazole.
2. Intermediate acting (Half life between 10-24hrs) - Sulphasomizole, Sulphamethoxazole
3. Long acting (Half life about 24 hours) - Sulphadimethoxine, Sulphamethoxy - pyridazine.
4. Ultra long acting (Half life more than 36 hours) - Sulphadoxine, Sulphamethopyrazine.

SULFADIAZINE

It is available as an odourless, tasteless, white or yellowish-white crystal

or powder. It is practically insoluble in water, chloroform and ether, very slightly soluble in alcohol and acetone, soluble in alkali hydroxides and carbonates, and dilute mineral acids.



IUPAC Name : N'-(pyrimidin-2-yl) sulphanilamide

or

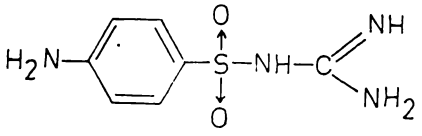
4- amino-N'-2-pyrimidinyl benzene sulfonamide.

Actions and uses : It is affective in the treatment of ß haemolytic strepto-cocci, pneumococci, meningococci, gonococci and E.coli. It is an important agent for acute phase of infection like gas gangrene. It is also recommended with pyrimethamine in the treatment of toxoplasmosis. It may produce nausea, vomiting and diarrhoea as undesirable side effects.

Officials : Sulfadiazine, B.P., I.P.
Sulfadiazine Injection/Tablets, B.P.,I.P., U.S.P.

SULFAGUANIDINE

It is available as odourless, white crystals or powder, which darken on exposure to light. It is soluble in dilute mineral acid and boiling water; slightly soluble in water and alcohol and very slightly soluble in acetone. It should be stored in light resistant and air tight containers.



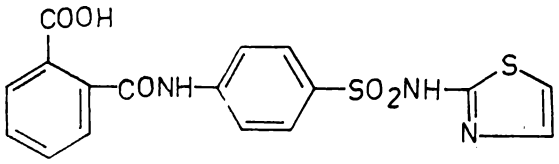
IUPAC Name : 2-(4-Amino benzene sulphonyl) guanidine.

Actions and uses : It is poorly absorbed in G.I.T.,therfore used in the treatment of local intestinal infections such as bacillary dysentery. It is also recommended in amoebic dysentery, ulcerative colitis and other intestinal bacterial infections.

Officials : Sulfaguanidine, I.P.
Sulfaguanidine, Tablets I.P., B.P.C.

PHTHALYLSULFATHIAZOLE

It is an odourless, white crystalline powder, slightly bitter in taste. It is insoluble in chloroform and water but, slightly soluble in ether and alcohol and readily dissolves in alkalis and acids. It should be stored in light resistant and well closed containers, because it slowly darkens on exposure to light.



IUPAC Name : 2-[[[4-{(2-Thiazolyl amino)sulfonyl} Phenyl] amino] carbonyl] benzoic acid or

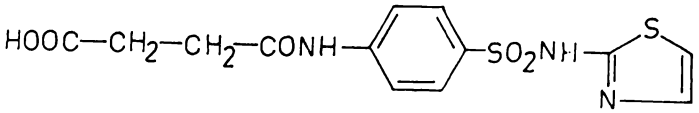
4'-[N -(Thiazol -2 yl) sulfamoyl] phthalanilic acid.

Actions and uses : It is poorly absorbed in G.I.T and used in the local G.I.T infections similar to sulfaguanidine.

Officials : Phthalylsulfathiazole, I.P.
Phthalylsulfathiazole, I.P.

SUCCINYL SULFATHIAZOLE

It is an odourless, white or yellowish white crystalline powder with a slightly bitter taste. It is soluble in alkali hydroxides and carbonates but practically insoluble in chloroform and ether. It should be stored in well closed light resistant containers.



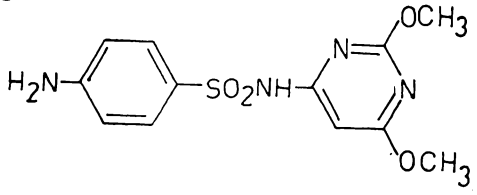
IUPAC Name : 4'-(Thiazol-2-yl sulphamoyl) succinanilic acid.

Actions and uses : Its action and uses are similar to phthalyl sulfathiazole.

Officials : Succinyl sulfathiazole, I.P.
Succinyl sulfathiazole Tablets, I.P.

SULFADIMETHOXINE

It is an odourless, tasteless, white or creamy white crystalline powder. It is soluble in dilute mineral acids, alkali hydroxides and carbonates. It should be stored in well closed light resistant containers.



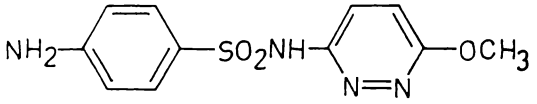
IUPAC NAME : N'-(2,6-Dimethoxy primidin-4-yl) sulphanilamide.

Actions and uses : It is rapidly absorbed in G.I.T. and blood concentrations are maintained for atleast 24 hours. It is highly protein bound which affects its rate of excretion and therefore has a half life of 20 to 40 hours. It is used for systemic-infections.

Officials :Sulfadimethoxine, I.P.
Sulfadimethoxine Tablets, I.P

SULFAMETHOXYPYRIDAZINE

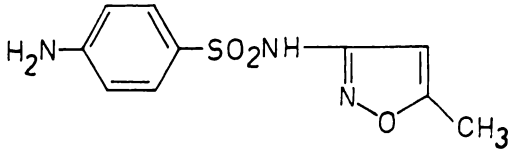
It is an odourless, white or yellowish white crystalline powder, and has bitter taste towards the end. It is soluble in dilute acids and alkali, but very slightly soluble in water, alcohol and acetone. It should be stored in well closed light resistant containers.



IUPAC Name : N'-[6-methoxypyridazin-3-yl] sulphanilamide.
Actions and uses : It has actions, uses and side effects similar to sulfadimethoxine and as with other long acting sulphonamides. If is very soluble in neutral or acidic urine, therefore can be used orally in the treatment of urinary tract infections.

SULFAMETHOXAZOLE

It is an odourless, white or yellowish white, crystalline powder with a bitter taste. It is soluble in alkali hydroxides; slightly soluble in alcohol, acetone and very slightly soluble in water. It should be stored in light resistant airtight containers.



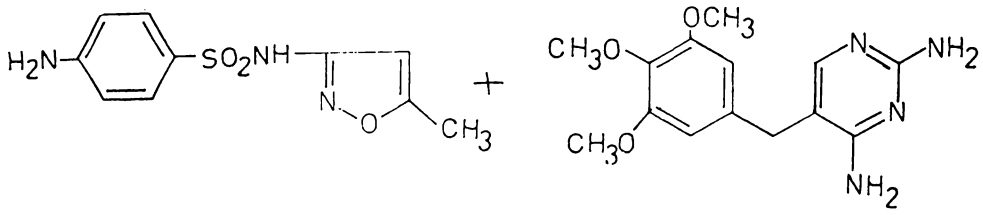
IUPAC Name : N'-5[methyl isoxazole-3-yl] sulphanilamide.
Actions and uses : It is an antibacterial agent similar to sulphadimidine. It's therapeutic blood concentration reaches within 2 hours and maintenance doses are given at an interval of 8 to 12 hours.

It is given in combination with trimethoprim under the name of co-trimethoprim. Trimethoprim acts on folic acid reductase and synergistic actions of combination drug are produced. Co-trimethoprim is very widely used in all type of infections.
Official : Sulfamethoxazole I.P.

CO-TRIMOXAZOLE

Co- trimoxazole is a combination of sulphamethaoxazole and trimethoprim in 5:1 ratio.

IUPAC Name : 5-(3,4,5-Trimethoxybenzyl) pyrimidine-2,4-diamine.
Actions and uses : It acts by PABA inhibition and as folic acid inhibitors by the action



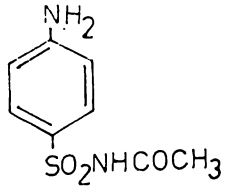
of trimethoprim on folate reductase. It is active against wide varieties of infections, i.e., Genito-urinary tract infections, bronchitis, pneumonia and other infections.

Officials : Co-trimoxazole I.P.

Trimethoprim and sulfamethoxazole tablets I.P.

SULPHACETAMIDE

It is an odourless, white or yellowish, white crystalline powder with slight bitter taste. It is very slightly soluble in alcohol and acetone but soluble in water. It should be stored in air tight containers protected from light.



IUPAC Name : N'-acetyl sulphanilamide.

Actions and uses : It is commonly used as sodium salt in the treatment of prophylaxis of ocular infections and burns. It is also useful in urinary tract infections without any damage to kidney .

Officials : Sulfacetamide I.P.

Sulfacetamide sodium I.P.

Sulfacetamide Eye ointment I.P.

(1) Sufadimenthoxine : Rhone poulene : Madribon Tab.

ADULTS : initial-1gm. maint. 500 mg.

CHILD : 10 mg./kg body wt/kg.

(2) Sulfamethoxazole : Albert-David : Alcorim-F tab.

(3) Co-trimoxazole : Rhone-poulenc : Antrim tabs,

Dec Pharma : Cidal tabs,

Wellcome : Cotrimoxazole tabs, Sepmax, Septran

ADULTS : (160 mg. Trimethoprim+800 mg. Sulphamethaoxyozole) Cotrimoxazle 2 times daily for 7-14 days.

CHILDREN : (6-12 mg. tMP+30-60 mg 5 mg)/kg/24 hrs also inj are available.

(4) Sulfacetamide : Nicholas : Albucid Eye drop

East India : Locula

CHAPTER - 5

ANTIMYCOBACTERIAL AGENTS

Mycobacterium is a genus of acid-fast bacilli belonging to family Mycobacteriaceae. Tuberculosis is a disease caused by *M.tuberculosis*; which is characterised by the formation of tubercles or nodular bodies. *M.leprae* is responsible for human leprosy (Hansen's Disease).

ANTITUBERCULAR DRUGS

Tuberculosis is a chronic disease caused by acid-fast aerobic bacillus Mycobacterium tuberculosis [*M. tuberculosis*]. The bacterial cell wall is compose of high lipid content resulting in a high degree of hydrophobicity and resistance to alcohol, acids, alkali, etc. The organism is transmitted via respiratory route either as droplet form or as desiccated airborne bacilli. The organism appears in water droplets expelled during sneezing or coughing. This disease mainly effects the lungs but can also spread through the bloodstream and lymphatic system to brain, bones, eyes and skin (extra-pulmonary T.B.). Extrapulmonary T.B. is common in HIV infected patients.

Classification : Antitubercular drugs are classified as per choice of agents. The first line agents are used in the initial stage of T.B., but when bacteria become resistant to these agents then the second line agents are used.

(A) **First line agents** :

(I) **Chemotherapeutic agents** : Isoniazid, Pyrazinamide, Ethambutol.

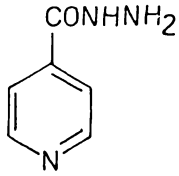
(ii) **Antibiotic** : Streptomycin, Rifampicin.

(B) **Second line Agents** :

(I) **Chemotherapeutic agents** : Ethionamide, Para amino salicylic acid (P.A.S.).

(ii) **Antibiotics** : Cycloserine, Kanamycin.

ISONIAZID



IUPAC Name : Iso nicotinoyl hydrazide
OR
Pyridine-4-carbohydrazide.

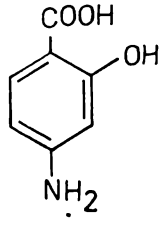
Actions and uses : It acts by affecting electron transport system and conversion of NAD^+ to NADH. It is mainly use in the treatment of pulmonary tuberculosis and is also effective in extra-pulmonary tuberculosis such as meningitis and genito-urinary tuberculosis infections. INH develops resistance within a few weeks therefore it should be combined with some other agents.

Generally it is given orally but in certain cases its intra-muscular injection is also recommended. It may produce constipation, difficulty in starting urination, dryness of mouth, peripheral neuropathy, alteration in liver function, etc.

Official compounds : Isoniazid I.P.
Isoniazid Tablets I.P.

PARA AMINO SALICYLIC ACID

It is an odourless, white to cream coloured crystalline powder, sweet and saline in taste. It should be stored in well closed containers in a dark place. Its solution decomposes slowly and darkens in colour.



IUPAC Name : 4-amino-2-hydroxy-benzoic acid.

Actions and uses : It is bacteriostatic in nature and can arrest the growth of tubercle bascilli, but doses not eradicate them. Bacteria develop immediate resistance to this drug therefore it should be given in combination with other drugs. It may cause epigastric discomfort, anorexia, nausea, vomiting, etc.

STREPTOMYCIN

It is an almost odourless, hygroscopic white powder with a bitter taste. It is soluble in water but very slightly soluble in alcohol, ether and chloroform. It should be stored in airtight containers not exceeding a temperature of 30°C. If it is intended for parenteral use, it should be packed and sealed in sterile containers.

Streptomycin is an aminoglycoside. It is produced by the fungi *Streptomyces griseus*. It acts by inhibiting protein synthesis and also misreading of m-RNA template. The drug diffuses across the cell membrane of *Mycobacterium tuberculosis* and enters the cell. It binds 30s ribosomal sub unit that is its primary site of action.

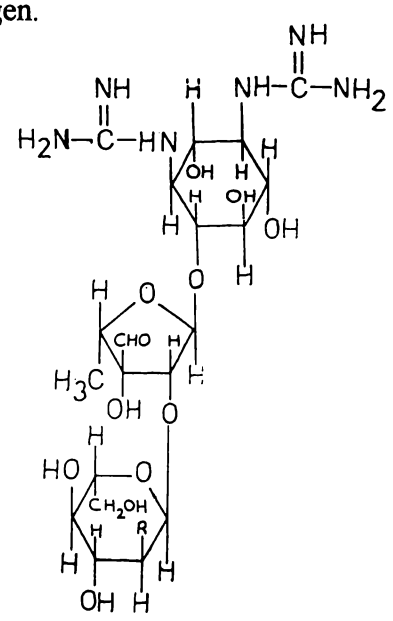
IUPAC Name : O-2 deoxy-2-methyl amino α glucopyranosyl (1-->2)-O-5 deoxy-3-c formyl-α-lyxofuranosyl - (1→4)-N^3 N^3-diamino-D-streptamine.

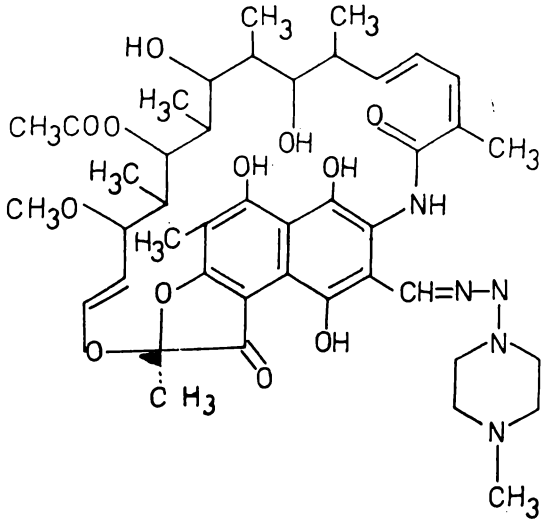
Actions and uses : It is active against infections caused by *Mycobacterium tuberculosis*, E. coli, klebsiella pneumoniae and some species of *salmonella*. This drug produces more toxic effects and resistance develops rapidly. Generally it is given in combination with other chemotherapeutic agents to prevent drug resistance. It causes autotoxicity, nephrotoxicity and neuromuscular blockade on use for some time.

Official : Streptomycin sulphate I.P.
Streptomycin tablet I.P.
Dihydrostreptomycin sulphate I.P.
Dihydrostreptomycin sulphate injection I.P.

RIFAMPICIN

It is an odourless, brick-red to red-brown, crystalline powder. It is soluble in chloroform and methyl alcohol, very slightly soluble in alcohol, acetone and ether. It should be stored in light resistant, air tight containers in a atmosphere of nitrogen.





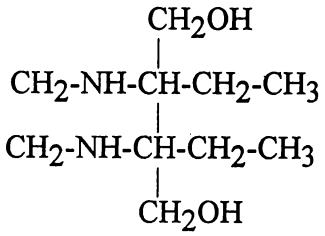
STREPTOMYCIN **RIFAMPICIN**

IUPAC Name : 3-(4-Methyl piperazin-1-yl iminomethyl) rifamycin SV

Actions and Uses : It is a semisynthetic antibiotic prepared from rifamycin B,which is an antibiotic isolated from *Streptomyces mediterranei*. It is used to treat biliary infections and tuberculosis. Generally it is reserved for T.B. and it is given with isoniazide, streptomycin or with ethambutol but not with para amino salicylic acid. Combination therapy prevents the drug resistance. It increases the metabolism of hypoglycemic drugs, anticonvulsants, corticosteroids and oral contraceptives. It causes red staining of secretions, altered liver functions, and a flu like illness on prolong use.

ETHAMBUTOL

It is an odourless, white crystalline powder, bitter in taste. It is freely soluble in water, soluble in alcohol; and slightly soluble in ether and chloroform. It is a hygroscopic compound, stored in well-closed containers.



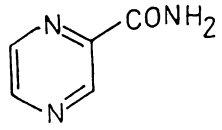
IUPAC Name : N N^1-Bis (1-hydroxy methyl propyl) ethylenediamine

Actions and uses : It is a tuberculostatic drug, which acts by interfering with synthesis of RNA. When it is used alone it clears sputum of myobacteria within three months but relapses may occur. Prevention of relapses is achieve by combination therapy with isoniazide. Ethambutol is also recommend for the patients, who became resistant to other drugs. Ethambutol leads to retrobulbar neuritis and disturbance in colour vision on use for some time.

Officials : Ethambutol Tablet I.P.
Ethambutol Hydrochloride I.P.

PYRAZINAMIDE

It is an odourless, white, crystalline powder with a bitter taste. It is soluble in ether and chloroform, slightly soluble in water and alcohol. It should be stored in air tight containers.



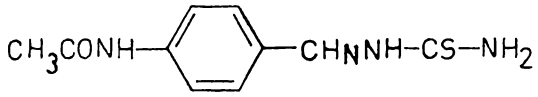
IUPAC Name : Pyrazine-2-carboxamide.

Actions and uses : Pyrazinamide is a tuberculostatic drug. Bacterial resistance to the drug may develop within 6-8 weeks and therefore it should also be given in combination with other drugs. It may cause of liver damage, anorexia, nausea and rashes, etc.

Officials : Pyrazinamide I.P.

THIACETAZONE

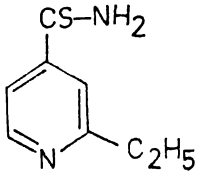
Thiacetazone is available as an odourless pale yellow crystals or a crystalline powder. It is slightly soluble in alcohol and very slightly soluble in water. It should be stored in airtight containers, protected from light.



IUPAC Name : 4-Acetamido benzaldehyde thiosemicarbazone.
Actions and uses : It is a myobacteriostatic agent, used in tuberculosis as well as in leprosy. It is use in combination with streptomycin and isoniazide as first choice of treatment. The undesirable effects of this drug are allergy, skin rashes, nausea, hepatitis, etc.
Official : Thiacetazone I.P.
Thiacetazone and isoniazide I .P.

ETHIONAMIDE

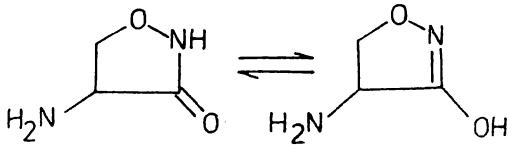
Ethionamide is a bright yellow crystalline powder with a slight odour and an unpleasant sulphurous taste. It is sparingly soluble in alcohol, slightly soluble in chloroform but very slightly soluble in ether and water. It should be stored in well closed containers protected from light.



IUPAC Name : 2-Ethyl pyridine-4-carbothiamide.
Actions and uses : It is also tuberculostatic agent. It is used in combination with amino salicylate in the treatment of pulmonary and extra pulmonary tuberculosis but the organisms readily develop resistance. It should not be given in pregnancy. It also causes metallic taste, nausea, liver damage, etc.

CYCLOSERINE

It is an odourless, white or pale-yellow crystalline, powder with slightly bitter taste. It is soluble in water and alcohol but slightly soluble in ether and chloroform. It is a hygroscopic compound and should be stored in air tight containers below 25°C.



IUPAC Name : 4-amino iso-oxazolidin-3-one.
Actions and uses : It is a natural antibiotic obtained from a fungus, *Streptomycies*

orchidaceae. It is active against both gram-positive and gram-negative bacteria, i.e., M. tuberculosis, Streptococci, E.coli, etc. It is mainly used in pulmonary tuberculosis where organism is resistant to streptomycin or the patient is hypersensitive to streptomycin. It should not be given to patients of epilepsy and other mental disturbances.

ANTILEPROTIC AGENTS

Leprosy is more common in tropical countries. The disease is caused by acid fast, aerobic bacillus *M. leprae*. This bacteria was first invented by Hansen in 1873, hence this disease is also called Hansens disease.

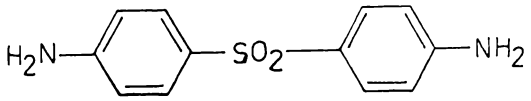
Leprosy is characterized by lesions in the skin and peripheral nerves. Human leprosy can not be transmitted to animals easily. Transmission to human, requires prolonged intimate contact for several years. Treatment of leprosy also requires prolonged drug therapy.

CLASSIFICATION

1. Sulfones	Dapsones, Solapsone.
2. Phenazines and other agents	Clofazimine, Rifampin.
3. Natural Agents	Chaulmoogra oil.

DAPSONE

Dapsone is a white or creamy white, colourles, crystalline powder with a slight bitter taste. It is soluble in dilute mineral acids and acetone but very slightly soluble in alcohol. It is hygroscopic and therefore it should be stored in well-closed containers.



IUPAC Name : bis(4-aminophenyl) sulfone.

or

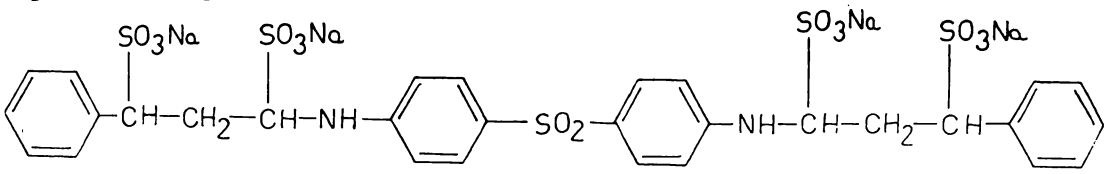
4,4'-Diamino diphenyl sulfone.

Actions and uses : Sulphone acts as a bacteriostatic agent, similar to sulphonamides. It competitively inhibits PABA, thus inhibiting the formation of bacterial folic acid. It is used for lepromatous and tuberculoid types of leprosy. It i also used in dermatitis herpetiformis, in mycetoma and suppresses malaria parasite (*P.falciferum*). It may produce side effects like nausea, vomiting, nervousness, anemia,etc.

Officials : Dapsone I.P.
Dapsone tablets I.P.

SOLAPSONE

Solapsone is a white powder. It is soluble in cold water and practically insoluble in cold alcohol. It is hydrolised in presence of acids into cinnamaldehyde, dapsone and sulphurous acid. Generally it is available as sodium sulphonic salt.

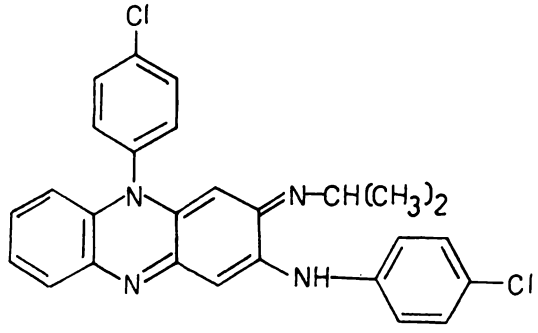


IUPAC Name : Tetrasodium 3,3'-diphenyl -4,4'-sulphonylbis (1-anilinopropane-1,3-disulphonate).

Actions and uses : Solapsone is an antileprotic drug used similar to dapsone. It is given orally, subcutaneously or as an intra-muscular injection which gets converted into dapsone salt.

CLOFAZIMINE

It is a phenazine derivative which is a water insoluble dye [Dark red to orange]. It is soluble in dimethyl formamide and macrogol-400, very slightly soluble in glycols and alcohols, and practically insoluble in water.



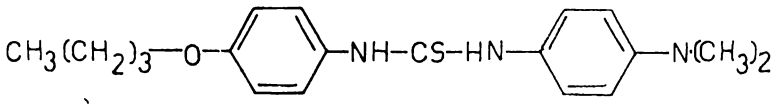
IUPAC Name : 3-(4-chloroanilino)-10-(4-chlorophenyl)-2,10-dihydro 2-phenazin-2-ylidene isopropylamine.

Actions and uses : It is active against mycobacterium, actinomyces, streptomyces, species, etc. It is specially used where bacteria become resistant to dapsone. It is contra-indicated in the first trimester of pregnancy.

Officials : Clofazimine I.P.
Clofazimine capsules I.P.

THIAMBUTOSINE

It is an odourless white or creamy white crystalline powder with a bitter taste. It is soluble in chloroform, acetone and very slightly soluble in water. It should be stored in air tight containers protected from light.



IUPAC Name : 1-(4-butoxy phenyl)-3(4-dimethyl aminophenyl) thiourea.
Actions and uses : It is a thio-urea derivative. It is used in the treatment of leprosy but develops bacterial resistance and its applications are limited. It is generally given with isoniazid. It is also used in the treatment of dermatitis herpetiformis.

ANTILEPROTIC DRUGS

(1)Clfazimine : Astra-IDL : Clopodap, Clofozine Cap.
SG Pharma : Hensepran Cap. 100 mg
200 mg daily for 3 weeks, in child 1-2 mg/kg daily one almost and as directed by the physician.

(2) Dapsone : B. Wellcome : Tab. Dapsone 25,50,100 mg
ADULTS : 100 mg./day depending upon body wt.
CHILDREN : 1-2 mg/kg/body wt.

ANTITUBERCULAR DRUGS

(1) Isoniazid : Pfizer : Isonex Tab. 100 mg, 300 mg
Adults : 3-5 mg/kg body wt. to 300 mg daily once a day.

(2) PAS : MAC : Erbazide tab. 400 mg

(3) Streptomycin : IPCA : Icpazide (liq. 100 ml) and Tab.
Warner : Isokin tabs. 100 mg, 300 mg
CHILDREN : 10-20 mg/kg of body wt. once a day.

(4) Rifampicin : Sarabhai : Ambistryn Inj., Siticox Cap.
Ranbaxy : Tibirim Cap.

(5) Ethambutol : Plethico : Koxi tab.
Lupin : Combutol
ADULTS : 15 mg./kg body wt. daily as single dose, Retreatment 25 mg/kg body wt. as a single dose for 60 days then 15 mg/kg body wt.
CHILDREN : Same dose according to wt. Avoid below 3 Yrs.

(6) Thiacetazone : Parke Davis : Isokin T Forte

CHAPTER - 6

ANTIAMOEBIC AND ANTHELMINTIC DRUGS

Amoebiasis occurs mainly in tropical regions. Amoebiasis is caused by a protozoan *Entamoeba histolytica*. It is transmitted by ingestion of water and foods contaminated by fecal matter from infected persons or flies. Common manifestations of amoebiasis are dysentery, fever, intestinal bleeding, etc. The protozoa affects normal bacterial flora of the large intestine but some times it may spread to other organs (e.g.- liver) of the body. Acute amoebiasis leads to amoebic dysentery associated with mucoid stool and abdominal pain. The drugs used as antiamoebics are classified as :

(I) Natural drugs : Emetine and dehydroemetine.

(II) Synthetic drugs :

(1) **Quinoline derivatives** : Chloroquine, Iodoquinol.

(2) **Miscellaneous** : Diloxanide, Metronidazole, Tinidazole, Secnidazole.

Helminthiasis is a disease caused by parasitic worms, living in the alimentary canal of secondary host (human). three categories of worms normally infect man. They are :

(1) **Nematodes** : *Ascaris lumbricoides* (round worm); *Enterbious vermiculis* (thread worm); *Strongyloides stercoralis* ; *Ancylostoma duodenale* (hook worm).

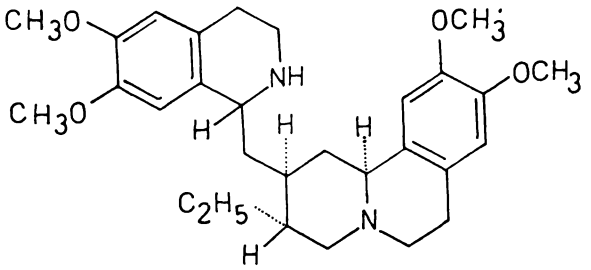
(2) **Cestodes** : *Taenia species* (tapeworm).

(3) **Trematodes** : Flukes or Blood flukes.

Infecting Helminth	Drugs used
(1) **Nematodes** :	
Ascaris lumbricoides (round worm)	Piperazine Thiabendazole Mebendazole.
Strongyloides stercoralis	Mebendazole, Thabendazole
Ancylostoma duodenale (hook worm)	Mebendazole, Thiabendazole
(2) **Cestodes** :	
Taenia species (tapeworm)	Mebendazole, Dichlorophen quinacrine, Niclosamide
(3) **Trematodes** :	
Flukes or blood flukes	Antimony potassium tartrate

EMETINE

Emetine is an alkaloid obtained from the plant *Cephaelis ipecacunha* (Ipecacuanha). It is available as a hydrochloride salt. It is an odourless, white crystalline powder with a bitter taste. It should be stored in air-tight containers protected from light because, on exposure to light it turns faint yellow. It is soluble in water and alcohol.



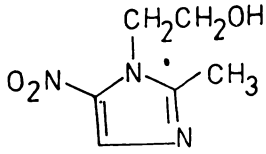
IUPAC Name : Emetan, 6',7',10,11-tetra methoxy.

Actions and uses : Emetine hydrochloride is an amoebicidal agent. It eradicates amoeba from both intestinal and extra-intestinal sites. It has been replaced by less toxic drugs like metronidazole. In hepatic amobisis it is given alongwith chloroquine. Its other analogs are also in practice.

Officials : Dehydroemetine Hydrochloride I.P.
Dehydroemetine Injection I.P.
Dehydroemetine Tablets I.P.
Emetine Hydrochloride I.P.
Emetine Injection I.P.

METRONIDAZOLE

It is a white or creamy white crystalline powder with a slight odour and a bitter saline taste. It is soluble in water, slightly soluble in alcohol and chloroform but very slightly soluble in ether. It should be stored in well closed, light resistant containers.



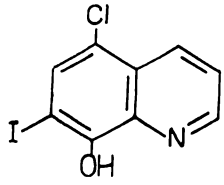
IUPAC Name : 2-(2-Methyl-5-nitro imidazole-1-yl) ethanol.

Actions and uses : Metronidazole is active against Trichomonas vaginalis, Entamoeba histolytica (amoebisis), Giardia lamblia (Giardiasis) and acute ulcerative gingivitis. It is inactive against aerobic and facultatively anaerobic bacteria. It is used in the treatment of both hepatic and intestinal amoebiasis. It is available as metronidazole benzoate. The salt is almost tasteless and acceptable.

Officials : Metronidazole I.P.
Metronidazole Injection I.P.
Metronidazole Tablets I.P.
Metronidazole Benzoate I.P.
Metronidazole Benzoate oral suspension I.P.

IODOCHLORHYDROXYQUIN

It is a spongy brownish yellow coloured salt with a characteristic odour. It is soluble in hot ethyl acetate and boiling acetic acid but practically insoluble in water and alcohol. The drug darkens on exposure to light, therefore it should be stored in light resistant and air tight containers.

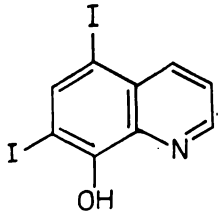


IUPAC Name : 5-chloro-7-iodo-8-quinoline.

Actions and uses : It is a halogenated derivative of 8-Hydroxyquinoline. It is used as topical intestinal anti-infective agent. It is given orally in amoebiasis, but causes neurotoxicity therefore it is not recommended. It is a topical antibacterial and antifungal agent, used as creams and ointments of skin infections.

DI-IODOHYDROXYQUINOLINE

It is an odourless, tasteless, pale yellowish to yellowish -brown crystalline powder. It is very slightly soluble in water, alcohol and ether. It should be stored in well closed containers protected from light.



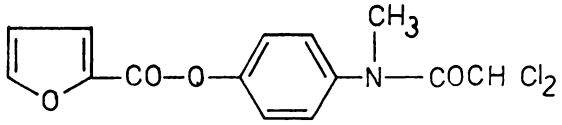
IUPAC Name : 5,7-Di-iodoquinolin-8-ol.

Actions and uses : This drug is used in the treatment of giardiasis and trichomonas infections. It produces rashes on skin, therefore it is used only in endemic area for prophylactic use. It is also used in the treatment of trichomonal and candidal vaginal infections.

Officials : Di-dohydroxy quinoline I.P.
Di-dohydroxy quinoline Tablets I.P.

DILOXANIDE FUROATE

It is an odourless, tasteless and white crystalline powder. It is very slightly soluble in water, alcohol and ether but soluble in chloroform.



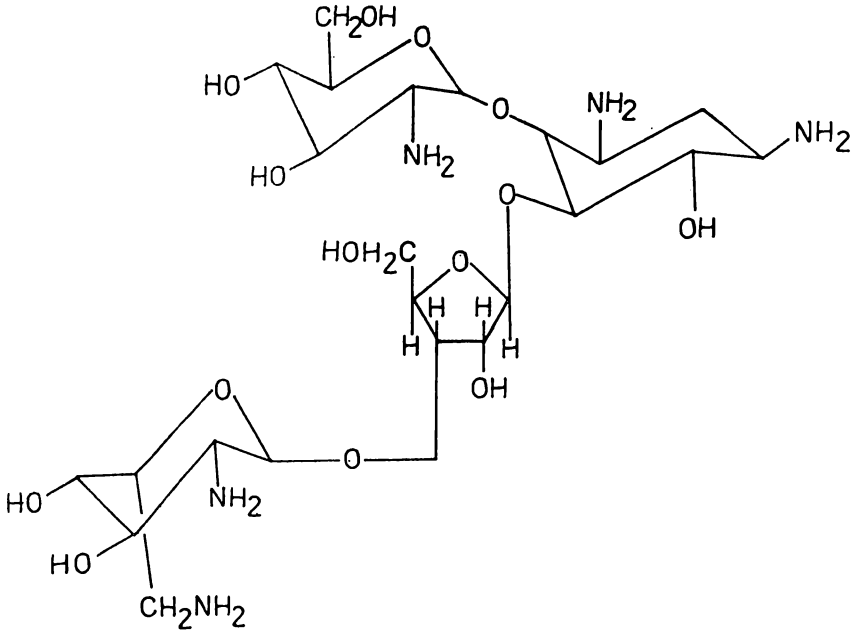
IUPAC Name : 4-[N-methyl-2,2-dichloro acetamido] Phenyl 2-furoate.

Actions and uses : It has a direct effect on amoeba present in the gut. It is used in the treatment of acute and chronic intestinal amoebiasis. It is also used to treat ameobic hepatitis in combination with chloroquine.

Officials : Diloxanide Furoate I.P.
Diloxanide Furoate Tablets I.P.

PAROMOMYCIN

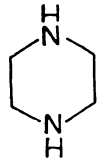
It is a white amorphous powder which is soluble in water and methanol but sparingly soluble in ethanol. Paromomycin sulphate salt is a creamy-white, odourless, hygroscopic and water soluble compound. It should be stored in air tight containers.



Actions and uses : It is an amino-glycoside type of antibiotic, obtained from the culture of *Streptomyces simosus* fungi. Its action is similar to neomycin. It is used in bacterial diarrhoea and intestinal amoebiasis.

PIPERAZINE

Piperazine is available as a colourless glossy deliquescent crystals with a faint characteristic odour. It is soluble in water and alcohol. It should be stored in air tight containers protected from light. The compound is available as piperazine citrate and piperazine adipate. The citrate salt is water soluble, very slightly soluble in alcohol and ether, but adipate salt is less soluble in water and alcohol.

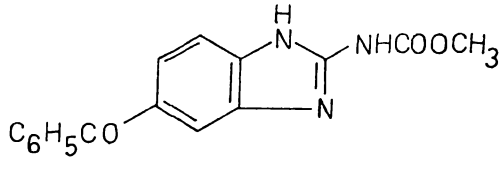


Actions and uses : It is an antihelmintic, effective against thread worm and round worms. The drug stimulates the muscular activity of round worm thereby expels them out of gut with fecal matter. It is the safest drug available for heavy infections.
The patients having thread worm infections over the age of 12 years are treated with this agent. It may act by blocking the action of acetylcholine. It does not have any significant action on hook worm or tapeworm. Prolonged therapy of this drug causes accumulation in tissues and may cause dizziness, muscular inco-ordination, vomiting and blurred vision.

Officials : Piperazine Adipate I.P.
Piperazine Adipate Tablets I.P.
Piperazine Citrate I.P.

MEBENDAZOLE

It is a white or slightly yellow powder, practically insoluble in water, chloroform, alcohol and ether. It should be stored in well closed containers protected from light.

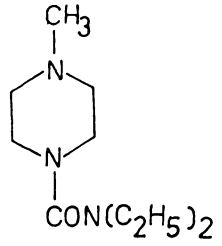


IUPAC Name : Carbamic acid, [5-benzoyl-1-benzimidazole-2-yl]-, methyl ester.
Actions and uses : It is the drug of choice for hook worm, pine worm, and round worm infections. It blocks glucose uptake of helmintic, thereby depleting glycogen stored in parasites which results in decreased formation of A.T.P.. Slowly their reproductive cycle becomes difficult. It is contra-indicated in hyper-sensitive patients and in pregnancy.

Officials : Mebendazole I.P.
Mebendazole Tablets I.P.

DIETHYLCARBAMAZINE [D.E.C.]

The drug is available as a citrate salt. It is an odourless, white crystalline powder with a bitter acid taste. It is very soluble in water, sparingly soluble in alcohol and practically insoluble in acetone, chloroform and ether. It should be stored in air tight containers.



IUPAC Name : N,N-Diethyl-4-methyl-1 piperazine-1-carboxamide.
Actions and uses : Diethylcarbamazine is used as an anthelimenthic and antifilarial agent. It also helps to limit the spread of filarisis from insect vector.

(1) Emetine : Rothe : Dehydroemetinery : Adults : 10-20 mg. thrice daily.
Tablets India : Tilemetin : 1 mg/kg daily for days.

(2) Metronidazole : Rhohepounenc : Flagyl : 1-2 tab tid for 2-5 days.
Unique : Metrogyl : Adults : 200mg-400mg
Children : 100-200mg

(3) Halogenoted hydroxiquinalines : Jagsonpal : Quiss Oint.

(4) Diloxamide furoate : CFL : Amibartin : 1 tab tid for 5 days.
Both : Entamizole: 2 tab tid for 5 days.
Core : Cone : 2 tab b.i.d.

(5) Piperazine : Wellcome : Piperazine citrate Elixir

(6) Mebendazole : Torrent : Meberol : 1 tab only.
Clipa : Mebex : 1 tab bid for 3 days.

CHAPTER - 7

ANTIBIOTICS

Antibiotics are defined as chemical substances produced by various species of micro-organisms (fungi, actinomycetes, bacteria, yeast and moulds) that supress the growth of other organisms and may destroy them. These agents are either bacteriostatic or bacteriocidal. Some times their concentration brings their static or cidal effect on pathogenic organisms. These agents generally act on specific micro-organism but also act on several species and are then known as broad spectrum antibiotics. The ideal method to choose an antibiotic is to identify the type of infection in any patient. This can be done by identifying the infecting organism in culture and then determing antibiotic sensitivity.

Antibiotics are agents developed from various micro-organisms therefore they may develop bacterial resistance or patients may be hypersensitive to these drugs. All these problems should be supervised by a physician.

CLASSIFICATION :

Antibiotics can be classified as follows -

1. **According to source** : Antibiotics are classified according to the type of micro-organisms from which they are isolated.
   (a) **Antibiotics from fungi** : Penicillin from fungus *Penicilium-notatum*, and griseofulvin from *Penicillium griseofulvum*.
   (b) **Antibiotics from Actinomycetes** : Streptomycin from *Streptomyces griseus*, chlorotetracyclin from *Streptomyces aureofaciens.*
   (c) **Antibiotics from Bacteria** : Bacitracin from (*Bacillus subtilis*) polymycins from *Bacillus polymyxa*.
2. **According to the mode of action**:
   (a) **Bacterial cell wall synthesis inhibitors** : Penicillins; cephalosporins, bacitracin, Isoniazid.

(b) **Protein synthesis inhibitors** : Tetracycline, Chloramphenicol, aminoglycosides etc.

(c) **Bacterial cell membrane inhibitors** : Nystatin, Amphotericin ß, etc.

(d) **Nucleic acid metabolism inhibitors** : Griseofulvin, Actinomycin.

3. **According to the spectrum of antibacterial activity** :

(a) **Narrow spectrum antibiotics** :- Penicillin, streptomycin, Erythromycin, etc.

(b) **Broad spectrum antibiotics** : Chloroamphenicol, tetracyclines, cephalosporins.

4. **According to chemical nature** :

(a) **Amino acid Antibiotics** :

(i) Antibiotics containing one amino acid : Chloramphenicol, cycloserine, etc.

(ii) Antibiotics containing two amino acids : Penicillin, cephalosporins.

(iii) Antibiotics containing polypeptide chain : Bacitracin, polymyxin.

(b) **Aminoglycoside Antibiotics** : Streptomycin, kanamycin, paromomycin, Neomycin.

(c) **Polyene antibiotics** : Nystatin, Amphotericin B.

(d) **Compounds containing macrocyclic rings** : Erythromycin, spiramycin.

(e) **Miscellaneous** : Griseofulvin, Novobiocin.

PENICILLIN

Penicillin was discovered by **Alexander fleming** in 1929. It is obtained from the mould *Penicillium notatum*. Penicillin now designates a number of antibiotics obtained from various species of penicillium or semi synthetic derivative of 6-amino penicillinanic acid. Penicillin solution is very unstable at pH 5. The solution begins to detoriate upon extending for a few days, even in cold. Certain penicillins are more resistant to acid hydrolysis and therefore can be administered orally.

Penicillins are bacteriostatic at low concentration and bactericidal at high concentration. Penicillin-G, penicillin V, methicillin, etc. are narrow spectrum while ampicillin, amoxycillin are broad spectrum antibiotics. The bacterial cell wall consists of mucopeptide layer which is a support to lipo-protein cell membrane. Penicillin reaches the bacterial cell cytoplasm by penetrating these barriers. It also inhibits synthesis of mucopeptide and acts as bacteriostatic.

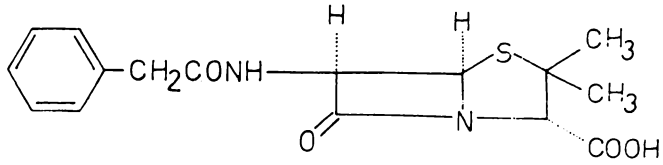
Bacterial resistance to penicilins is usually due to penicillinase (ß-lactomases). This is usually seen with staphylococci species. Potency of penicillin is expressed in units/mg. One international unit is equivalent to activity of 0.6 µg of pure crystalline sodium penicillin G.

Penicillins are effective against gram-positive bacteria such as staphylococcal, streptococci, pneumococcal, clostridia etc. The 6-amino penicilloic acid is a key compound in the synthesis of semisynthetic derivatives. A number of semisynthetic derivatives are prepared, among these few are very active. These compounds are classified as first generation penicillins, second generation, third

generation and fourth-generation penicillin. This classification is in the increasing order of antibacterial activity and also reducing resistance to organisms. The fourth generation penicilins are very effective against gram-positive and gram-negative bacteria.

BENZYL PENICILLIN

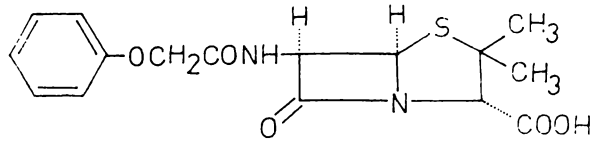
Benzyl penicillin (penicillin G) is a white crystalline hygroscopic powder with a faint characteristic odour. It is very soluble in water but practically insoluble in fixed oils and liquid paraffin. It should be stored in air tight containers, below 30°c.



Actions and uses : It is used to treat infections by gram positive organisms (infection caused by actinomyces, bacillus anthracis, clostridium, spirochaetes, etc. species). It is given by intravenous injections and intramucular injections. This injection is administered only after testing hyper sensitivity to the drug.

PHENOXYMETHYL PENICILLIN

Phenoxymethyl penicillin (penicillin V) is a white fine crystalline powder. It is very slightly soluble in water, soluble in alcohol and insoluble in fixed oils. It should be stored in airtight containers.

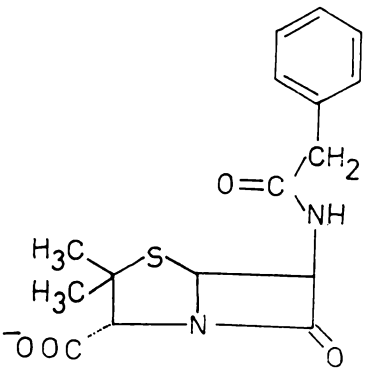


IUPAC Name: 6-(2- phenoxy acetoamido) penicillanic acid

Actions and uses: The compound is stable in acidic medium, therefore can be given orally. It is not used parenterally and topical, orally it is given half an hour before meal. It is indicated like benzylpenicillin in the treatment of susceptible gram-positive infections like meningitis, syphilis, etc.

BENZATHINE PENICILLIN

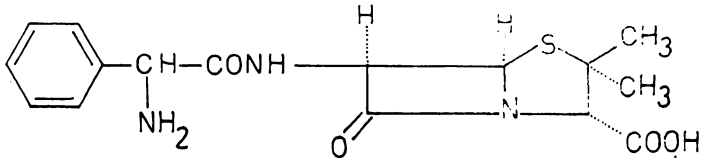
Benzathine penicillin **[PENIDURALA]** is an odourless, white hygroscopic powder; soluble in formamide and dimethyl-formamide (D.M.F.); very slightly soluble in water, alcohol, ether and chloroform. It should be stored in air tight containers protected from light below 25°C.



Actions and uses : It has a low solubility and prolonged action, and is therefore used for sustained action therapy. It maintains benzyl-penicillin level in blood. Its action and uses are similar to benzyl penicillin.

AMPICILLIN

Ampicillin is an odourless, white micro-crystalline powder with a bitter taste. It is slightly soluble in water and almost insoluble in alcohol, ether, chloroform and acetone. It should be stored in air tight containers below 25°C.



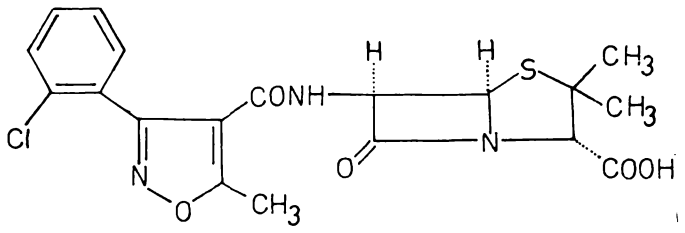
IUPAC Name : 6-(_-D-phenyl glycylamino) penicillinic acid.

Actions and uses: Ampicillin is a semisynthetic acid resistant compound which can be given orally, while its sodium salts are given parenterally. Ampicillin is also available as trihydrate. It is effective against gram-negative bacteria also. To certain extent it destroys bacterial penicilinase. It is useful against haemophilus-influenzae, and enterobacteriacae, etc. It should not be used in staphylococcal infections.

Officials : Ampicillin I.P.
Ampicillin Capsule I.P.
Ampicillin Sodium I.P.
Ampicillin Injection I.P.

CLOXACILLIN

Cloxacillin is an odourless, white , crystalline hygroscopic powder with bitter taste. It is soluble in water, sparingly soluble in alcohol and very slightly soluble in chloroform. It should be stored in air tight containers below 25°C. The compound hydrolyses in the presence of water.



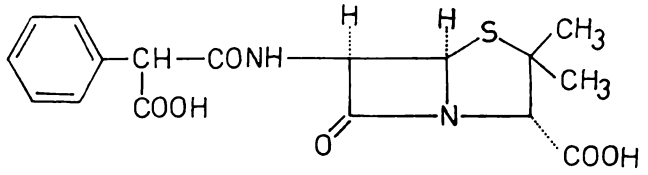
IUPAC Name : 6-[3-(2-chlorophenyl)-5-methylisoxazole-4-carboxamido) penicillanic acid.

Actions and uses : It is used in the treatment of penicillinase resistant staphylococcal infections. It is not effective against gram-negative organism, but in combination with Ampicillin it is used for gram-negative bacilli in urinary tract infection. It is stable in gastric acid and can be given orally.

Officials : Cloxacillin Sodium. I.P.
Cloxacillin Capsules Injection I.P.

CARBENICILLIN

Carbenicillin is an odourless, white , hygrosocpic powder, with a bitter taste. It is soluble in water and alcohol but practically insoluble in ether and chloroform. It should be stored in well closed containers, protected from light, below 5°C.

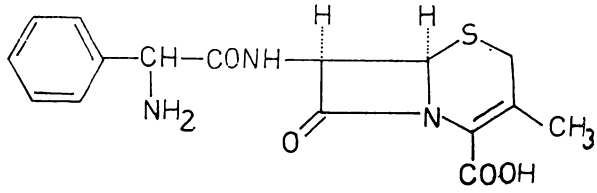


IUPAC Name :- 6 [2-carboxy-2-phenylacetamido] penicillanic acid.

Actions and uses: Carbenicillin is unstable in acid and hence it is not administered orally. An indanyl ester is more stable in gastric pH and is used for oral therapy. It is a IIIrd generation penicillin used in penicillin G resistant species and strains. It is used in the treatment of pseudomonas infections and urinary tract infections caused by gonorrhea, entero bacteriaceae, etc.

CEPHALEXIN

Cephalexin is also a beta-lactum antibiotic. Its antibacterial activity is similar to ampicillin. It is a white to cream coloured hygroscopic powder with a characteristic odour. It is slightly soluble in dilute hydrochloric acid and water; very slightly soluble in alcohol, ether and chloroform. It should be stored in air tight containers, protected from light, below 30°C.

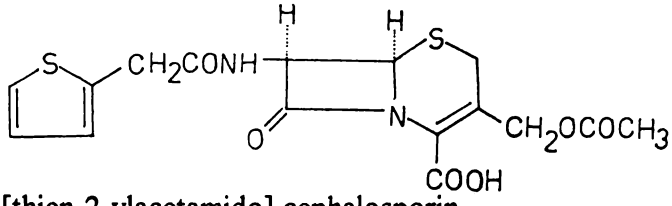


IUPAC Name : 3-methyl-7-[α-D phenyl glylcylamino] ceph-3-ene-4-Carboxylic acid.

Actions and uses: Cephalexin is a first generation cephalosporin. It is used against respiratory infections caused by pneumococcus, staphylococcus, streptococcus, H-influenza, bone and joint infections, skin infections, urinary tract infections, etc. The side effects of cephalexin are vomiting, diarrhoea, skin rashes, nausea, etc.

CEPHALOTHIN

Cephalothin is an odourless, white to off white crystalline, hygroscopic powder which decomposes on heating. It is freely soluble in water, saline and dextrose solution, slightly soluble in alcohol and insoluble in organic solvents. It should be stored in air tight containers protected from light below 25°C. Cephalothin is available as its sodium salt.

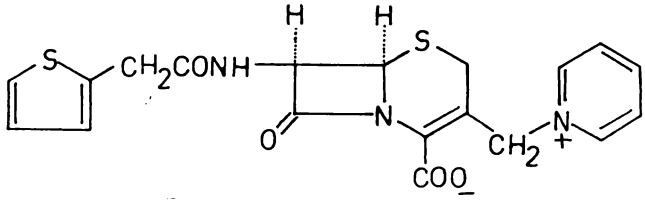


IUPAC Name : 7 [thien-2-ylacetamido] cephalosporin.

Actions and uses: It is not affected by penicillinase and hence used against pencillinase producing strains. It is recommended to those patients who are allergic to penicillin or does not respond to penicillin G . It is also used in the treatment of staphylococcal and pneumococcal .Side effects include eosinophillia, leukopenia, rashes and urticaria .

CEPHALORIDINE

Cephaloridine is a white crystalline powder having slightly pyridine like odour. It is soluble in water .



IUPAC Name : 7-(2 thienyl lactamido)-3-cephem-3 yl methyl pyridinium-4-carboxy acid.

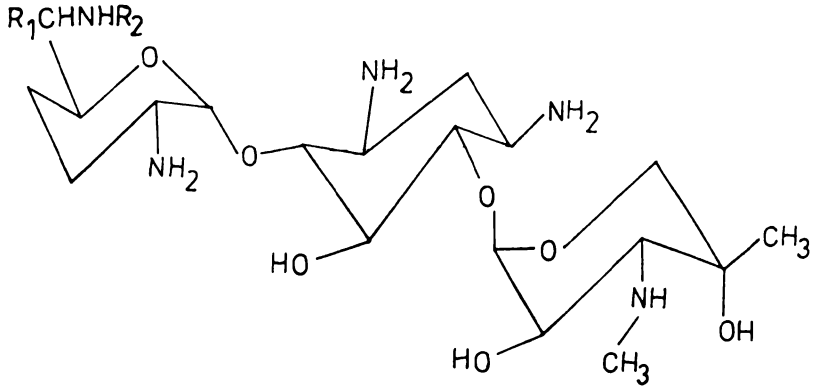
Actions and uses: It is used in the treatment of urinary tract and respiratory infections caused by penicillin resistant staphylococci . Potency of this drug is reduced by the presence of penicillinase and abolished by cephalosporinase. It causes less renal damage as compared to other cephalosporins.

Official : Cephaloridine I.P.
Cephaloridine Injection I.P.

GENTAMYCIN

Gentamycin is a mixture of gentamicin C_1, gentamicin C_{1A} and gentamicin C_2. This mixture is produced by Micromonospora purpurea. It is closely related to aminoglycosides. It is official as gentamycin sulphate.

Gentamycin sulphate is an odourless, white powder, soluble in water and insoluble in alcohol, acetone and benzene. It should be stored in airtight containers.



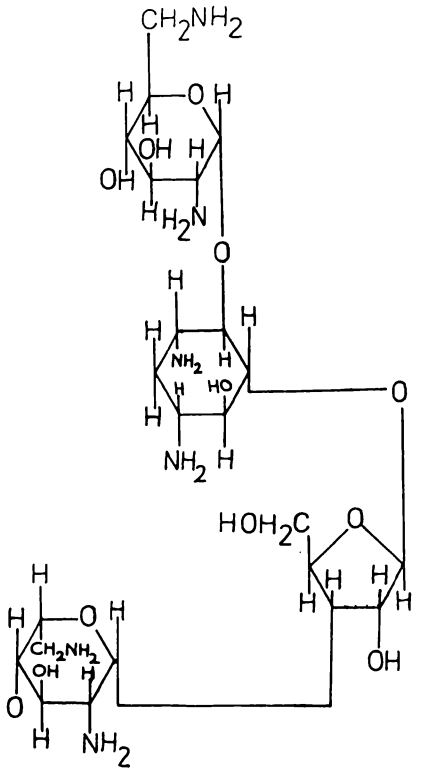
Actions and uses : It has a broad spectrum antibacterial activity. It is very useful in the treatment of Gram negative bacteria. Gentamycin is an effective antibiotic for pseudomonas infections. It is also used topically in the treatment of impetigo, bed sores, nasal staphylococcal infections etc.

Officials: Gentamycin Sulphate I.P.
Gentamycin Injection I.P.

NEOMYCIN

Neomycin is an aminoglycosidal antibiotic, produced by the growth of *Streptomyces fradiae*. It is also a mixture of three compounds neomycin B,C and A; out of which 'A' is inactive.

Neomycin sulphate is an odourless, hygroscopic and white to yellowish white powder. It is soluble in water, very slightly soluble in alcohol; and insoluble in acetone, chloroform and ether. It should be stored in airtight containers, protected from light, below 30°C.



Actions and uses: Neomycin is a broad spectrum antibiotic. It is effective against gram positive infections like *C. diphtheriae, M.tuberculosis, S. aureus,* etc. and gram negative infections like *E.coli, Enterobacter, Bordetalla pertussis,* etc. as Gram negative organism. It is widely used on infected dermatoses, burns, wounds, ulcers, conjunctivitis, etc.

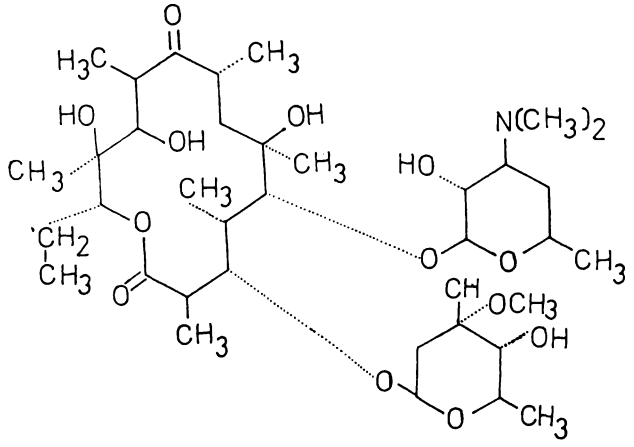
Officials : Neomycin Sulphate I.P.

ERYTHROMYCIN

Erythromycin is a macrolide containing macrocyclic lactones containing 12-20 carbons antibiotic. It is produced by strains of *Streptomyces erythreus.* It is a mixture of erythromycin A, B and C; out of which 'A' is present in large quantity. Erythromycin readily forms salts with inorganic and organic acid and also forms esters. The official salts available are erythromycin estolate ,erythromycin ethyl-succinate and erythromycin stearate.

Erythromycin estolate is an odurless, tasteless and white crystalline powder. It is soluble in chloroform but very slightly soluble in water. It should be stored in airtight containers, protected from light.

Erythromycin ethylsuccinate and erythromycin stearates share all the properties of estolate salt but these compounds are yellow in colour and E. stearate salt is soluble in water and acetone. These salts are tasteless while erythromycin is bitter in taste, therefore its salts are recommended for oral therapy. They are stored in airtight containers, protected from light, below 30°C.



Actions and uses : Erythromycin has a similar spectrum as that of penicillin. The drug is effective against both penicillin sensitive and penicillin resistant strains. It serves mainly as a reserve drug for penicillin resistance or in penicillin allergic conditions .

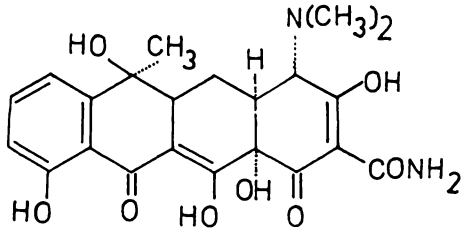
It is effective against Gram -positive cocci such as enterococci, pneumococci, streptococci and S. aureus. It is also effective against N. meningitis,N. gonorrhoea, C. diphtheria, etc. The drug is an antibiotic of choice in Pneumonia, Diphtheria, Food poisoning, etc. It is also effective against Gram negative bacteria . Erythromycin is usually given as enteric coated tablets while its estolate and stearate salts are more stable in gastric juice.

Officials :

Erythromycin, I.P.
Erythromycin Tablet, I.P.
Erythromycin Estolate, I.P.
Erythromycin Estolate Tablet, I.P.
Erythromycin Sterate, I.P.
Erythromycin Sterate Tablets, I.P.

TETRACYCLINES

Tetracyclines are broad spectrum bacteriostatic antibiotics. Chemically they are phenyl anthracence (naphthalene) derivatives. They bind 30" S ribosomal sub unit of the bacteria and prevent tRNA from combining with mRNA, therefore protein synthesis is inhibited. They are broad spectrum antibiotics, active against gram positive and gram negative bacteria, rickettsiae, etc. It forms a crystalline salt with strong acids and bases. They are yellow in colour and bitter in taste. Tetracyclins are produced by the growth of *Streptomyces aureofaciens*. Tetracyclines act as ligand to form a complex with various metal ions. It also forms complex with calcium, therefore it is not administered with calcium diet. e.g. Milk, Antacid containig calcium salt, etc.



IUPAC Name : 4-dimethyl amino-1,4,4a,5,5a,6,11,12a-octahydro-octahydro-3,6,10,12,12a-pentahydrox-3,6,10,12,12a-penta hydroxy-6- methyl-1, 11,-dioxo naphthacene -2-carboxamide. (Tetracyclin)

Actions and uses : Tetracyclin alone is the drug of choice in the treatment of cholera relapsing fever and other infections like pneumonia and gonorrhea. It is a second choice of drug in the treatment of actinomycosis, rat bite fever, plague, syphilis, tetanus and staphylococcal infections. It is also a drug of choice in cholera and urinary tract infections.

Tetracyclins cause gastrointestinal toxicity by local irritation and alteration of intestinal flora leading to nausea, vomiting, diarrhoea and esophageal ulceration, etc. It may also cause hypersensitivity, hepatotoxicity, reversible cerebral toxicity, etc.

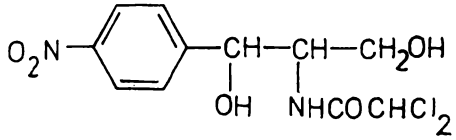
Officials :

Dimethyl chloro tetracycline Hydrochloride, I.P.
Dimethyl chloro tetracycline Capsules, I.P.
Doxycycline Hydrochloride, I.P.
Doxycycline Capsule, I.P.
Oxy-tetracycline, I.P.
Oxy-tetracycline Injection, I.P.
Oxy-tetracycline Hydrochloride, I.P.
Oxy-tetracycline Capsules, I.P.
Oxy-tetracycline Eye Ointment, I.P.
Oxy-tetracycline Hydrochloride Injection, I.P.
Tetracycline, I.P.

Tetracycline Hydrochloride, I.P.
Tetracycline Capsules, I.P.
Tetracycline Eye Ointment, I.P.
Tetracycline Injections, I.P.
Tetracycline Tablets, I.P.

CHLORAMPHENICOL

Chloramphenicol is obtained from the culture of *Streptomyces venezuleae*. It can also be synthesized chemically. It is available as odourless, fine white to greyish white or yellowish white, needle like crystals and bitter in taste. It is freely soluble in alcohol and sparingly soluble in water. It is soluble in water. It is rapidly destroyed in alkaline solution. It is also available as chloramphenicol palmitate and chloramphenicol sodium succinate. Both these salts are palatable in taste and hydrolysed in the body to chloramphenicol. The sodium succinate salt is freely soluble in water while palmitate salt is insoluble in water but soluble in acetone and chloroform. It should be stored in air tight containers protected from light.



IUPAC Name : 2,2-dichloro-N-[(α- R, ßR)-ß-hydroxy--hydroxy methyl-4-nitro-phen ethyl] acetamide.

Actions and uses: Chloramphenicol is a wide spectrum antibactrial agent. The drug is effective in rickettsial infections and many other bacterial infections caused by *E.coli, K. pneumoniae, B. Pertussis, V.cholera, staphylococcus, streptococcous, actinomycetes*, etc.

The drug is still a choice for typhoid fever and, in combination with ampicillin for meningitis. Topically it is used in conjunctival infection.

Toxic effects of chloramphenicol are bone marrow injury, granulocytopenia and aplastic anemia. Aplastic anemia can also be precipitated even on topical application.

Officials : Chloroamphenicol, I.P.
Chloroamphenicol, Capsules, I.P
Chloroamphenicol, Eye Ointment, I.P.
Chloroamphenicol, Palmitate, I.P.
Chloroamphenicol, Palmitate Oral Suspenison, I.p.
Chloroamphenicol, Sodium Succinate, I.P.
Chloroamphenicol, Sodium Succinate Injection, I.P.

(1) Benzyl penicillin : Alembic : Benzyl Penicillin : vials are given only as directed by the physician.

(2) Phenoxy methyl penicillin : HAL : Kaypentabs: Adults : 125-500mg 4-6 times daily.
Children : 10mg/kg/dose.

(3) Benzathine penicillin : Wyth : Penidure vials : Vials as directed by physician.
Alembic : Pencomvial : Vials as directed by physician.
Hal : Longacillin : Inj as directed by the physician.

(4) Cloxacillin : Biochem : Biocillin cap & vials.
PCI : Synthocillin cap & vials.
Torrent : Torcillin : vials.

(5) Ampicillin : Biochem : Ampilox : Cap & vials & syrup.
Bluecross : Blueclox : vials & cap. 250mg Ampicillin+250 mg (cloxacillin) for adults.

(6) Carbenicillin : Biochem : Biopence : 1-5gm IV or 1-2gm in every 4-6 hours upto 30gm in or 0gm daily.
German Remedes : Pyopen : vials.

(7) Gentamycin : Fulford : Garamycin vials : Adults : 3-5mg/kg body wt..
Core : Gentamycin vials : Children : 5-7.5mg/kg/24 hrs.

(8) Neomycin : Unichem : Neomycin sulphate cap. : Adults : 0.25-1gm four times.
Children : 12.5mg/kg/dose orally.

(9) Erythromycin : Alembic : Althrocin tabs, drops, liquids ; Adults : 250-500mg 3-4 times daily.
T.D.P.L. : Etomin tab, sus : Children : 30-50mg/kg/24 hrs.

(10) Tetracycline : Dabur : Tetracycline tab : Adults : 1gm daily in 2-4 divided doses.
IDPL : Threocycline cap : Children : 25-30mg/kg body wt. daily in 3 doses.

(11) Cephalexin : Searle : Nufex tab.: 1-4 gm. daily for 4 days on empty stomach.
Ranbaxy : Sporidex cap : Children : 25-30mg/kg body wt.daily for 4 days.

(12) Cephaloridne : Biochem .: Cephaxining : 500mg. IM or I.V. 2-3 times daily.
Children : 15-30 body wt.

(13) Griseafulvin : CFL : Cricactin terte : Adults : 250 mg. tid.
Children : 10mg/kg body wt daily.
Glaxo : Gnsovin F.P. : 500-1000 daily in 4 div doses with meals.

(14) Chloramphenicol : Boehringer M : Chloramphenicol syp : Adults : 50mg/kg body wt. daily.
Mac : Kemicitive cap vials : 50-100/kg body wt.

CHAPTER - 8

ANTIFUNGAL DRUGS

Fungi comprise five widely different class of flora. The variations in the cell physiology and in bio-chemistry are diverse. Most of the chemicals used as antifungal agents are narrow spectrum. Broad spectrum antifungal agents are generally toxic, irritant and have less absorption through epidermis. Most of the antifungal agents are fungistatic. The various fungal infections of hair mucous membrane, skin and nails are caused by genera" Candida [condidiasis] , Epidermophyton", Microsporum and Trichophyton (Tinea, ringworm). Certain antibiotics are also used for fungistatic action. e.g. Griseofulvin and amphotericin B.

CLASSIFICATION : Antifungal drugs can be classified as under :

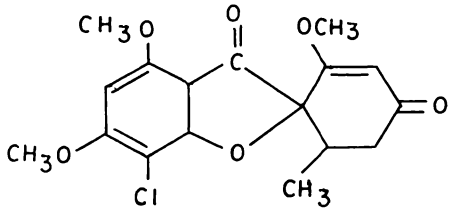
(1) Antifungal Antibiotics
  (A) Griseofulvin.
  (B) Polyenes-Nystatin, Hamycin, Amphotericin, Hachimycin.

(2) Synthetic Antifungal agents
  (A) Dapsone.
  (B) Co-trimoxazole (Sulphomethoxazole-trimethoprim).
  (C) Imidazoles : Clotrimazole, Miconazole, Econazole, Ketoconazole.

(3) Miscellaneous Antifungal Agents :
  (A) Tolnaftate. (B) Undecylenic acid.

GRISEOFULVIN

It is an antifungal substance produced by the culture of *Penicillium griseofuluum*.It is a white to pink-cream colour odourless and tasteless powder. It is soluble in chloroform, sparingly soluble in alcohol and very slightly soluble in water. It should be stored in well closed containers.



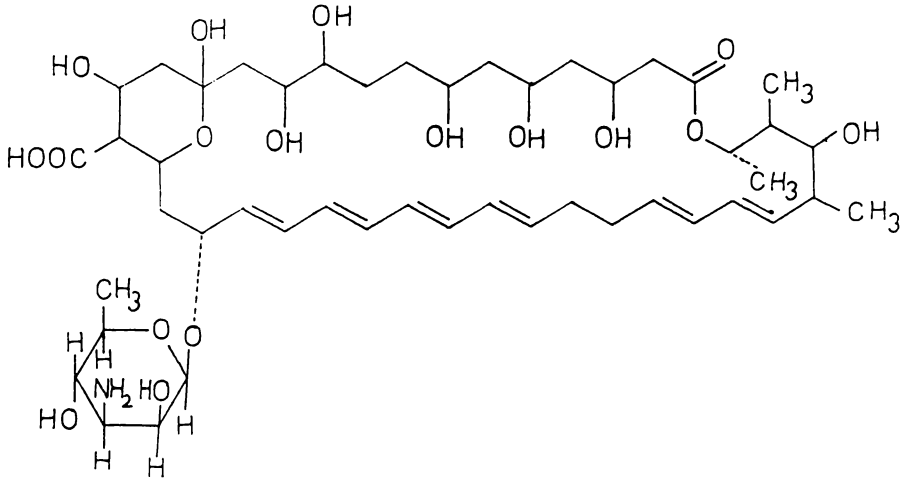
IUPAC Name : 7-chloro-2',4,6-trimethoxy-6'methyl benzofuran 2-spiro-1"-cyclohex- 2'-ene-3,4'-dione.

Actions and uses : Griseofulvin is a fungistatic and arrests reproduction of the organism. It is given systematically in the management of various species of Tinea and Microsporom. Treatment of fungal infections by griseofulvin may relapse frequently because it does not kill the fungi. It is also used in the management of cutaneous inflammatory conditions and several polyarthritis syndromes.

Officials : Griseofulvin I.P.
Griseofulvin Tablets I.P.

NYSTATIN

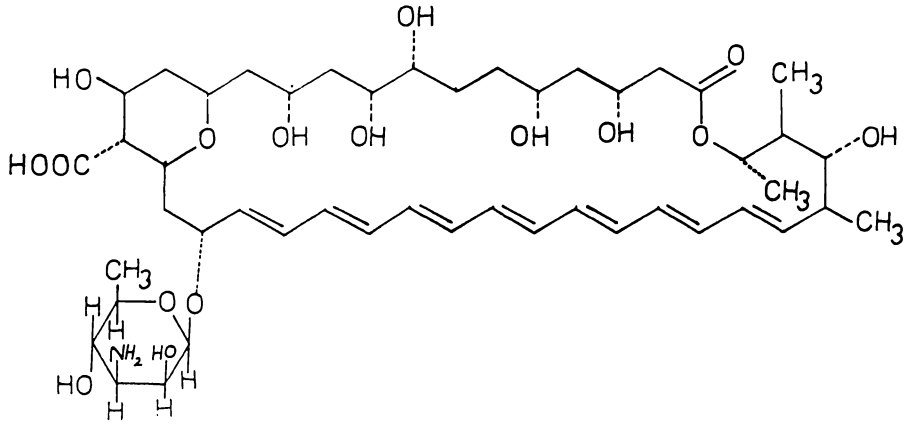
Nystatin is a polyene antifungal antibiotic. *Streptomyces noursei* strain is used to produce nystatin. It is a yellow to light brown hygroscopic powder with a characteristic odour. It is very slightly soluble in water, alcohol and methyl alcohol, practically insoluble in ether and chloroform. It should be stored in air tight containers protected from light below 5°C.



Actions and uses : It is active against a wide range of fungi and yeast. It is poorly absorbed after oral administration and is not absorbed through skin and mucosa. It is used in the treatment of candidal infection of mouth, skin and nails.

AMPHOTERICIN

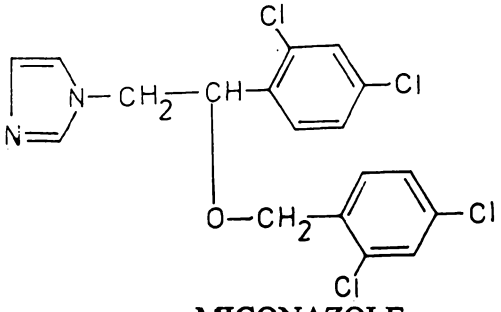
It is a polyene antibiotic obtained from the strain of *(Streptomyces nodasus*). It is an odorless, yellow to orange powder. It is insoluble in water, alcohol and ether. It should be stored in air tight containers protected from light and stored at a temperature between 2 to 10°C.



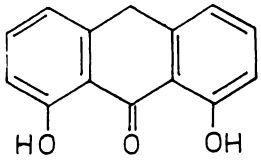
Actions and uses : It is a wide-spectrum antifungal. It acts systematically on various fungus like Coccididomycosis, systemic moniliasis, histoplosmosis, phycomycosis etc. This drug should not be given with saline dextrose injection because it is precipitated by sodium chloride. It is also incompatible with heparin (anticoagulant).

HAMYCIN

It is a polyene antifungal antibiotic obtained from the strains of *Streptomyces pimprina*. It is a yellow amorphous powder. It is practically insoluble in water, benzene, chloroform and ether, but soluble in basic solvents such as pyridine.



MICONAZOLE

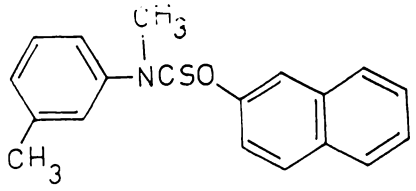


DITHRANOL

Actions and uses: Hamycin has been used as antifungal and anti-trichomonal properties. Structurally it was believed to be identical to trichomycene and candicidin.

TOLNAFTATE

It is an odourless, white to creamy white fine powder. It is freely soluble in chloroform, sparingly soluble in ether, slightly soluble in alcohol and insoluble in water.



IUPAC Name : O-Naphth-2-yl N-Methyl-m-tolylthio-carbanilate.
Actions and uses : It is used in the superficial treatment of fungi like Tinea pedis [athlete foot] and other species of Tinea, epidermophyton floccosum. It is ineffective against infection of hairs and nails, and relapses are common. It is ineffective over the thick horny layers like soles and palms.

UNDECYLENIC ACID

It is a colourless or pale yellow liquid or a white or pale yellow crystalline mass with characteristic odour. It is miscible with alcohol, ether, chloroform, fixed and volatile oils but practically insoluble in water. It should be stored in air-tight containers protected from light.

$$CH_2{=}CH\text{-}CH_2\text{-}[CH_2]_7COOH$$

IUPAC Name : Undec-10-enoic acid.
Actions and uses : It is a pyrolysis derivative of ricinolic acid obtained from castor oil. It is employed in the treatment of dermatophytosis of head, ears, feet, axilla and Tinea capitis. It is mixed with astringents like zinc to reduce irritation. Some times it is also used in Tinea pedis (Athlete foot.)
Officials : Zinc undecylenate ointment I.P.

(1) Tolnaftate : Dabur : Tinavate cream & soln. : Apply evenly to affected area and rub gently 2-3 times daily.
Jagsonpal : Tolsol Soln.
(2) Nystatin : Sarabhai : Kenacomb ont. : With rubbing gently on the affected area.
Sarabhai : Mycostatin tab.
(3) Amphoterecin : Sarabhai : Talsutin vag. tab.: 1-2 tab. daily inserted deep in vagina using applicator.
(4) Hamycin : Hin.Anti.Ltd. : Hamycin sus : Apply to affected area with sterile cotton 2-3 times daily.

CHAPTER - 9

ANTIMALARIALS

Malaria is a widespread infectious disease caused by protozoan parasite (species of plasmodium). In human beings malaria may be caused by Plasmodium malariae (Quatran malaria), Plasmodium vivax (benign malaria), P.falciparum (malignant tertian malaria), P.ovale (ovale tertian malaria). These plasmodiums are found in female anaphales mosquito, which is a primary host of the protozoa . They are transmitted to human beings by the bite of mosquito (present in saliva of infected mosquito).

Man is a secondary host and during bite mosquito injects sporozoites into blood circulation. These sporozoites get attached to the parenchymal cells of liver and multiply vegetatively to forms merozoites. On maturity these merozoites are liberated in blood stream and enter in erythrocytes for erythrocytic cycle or schizogony. After schizogony haem is liberated from hemoglobin by the rupture of erythrocytes. This produces shivering and elevation in body temperature as well as reduction in R.B.C. count. At this stage symptoms of malaria arise.

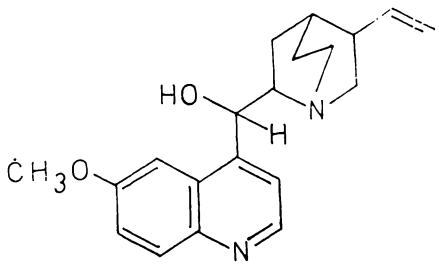
In 1643 European countries used to import cinchona plant from peru, which is capable of suppressing the disease. Later various semisynthetic and synthetic derivatives are synthesized for the treatment of malaria.

CLASSIFICATION :

(1) Cinchona alkaloids : Quinine, cinchonine
(2) 4-amino quinolines : Amodiaquine, Chloroquine.
(3) 8-amino quinolines : Primaquine.
(4) Acridine derivative : Quinacrine.
(5) Biguanides : Proguanil, chloroproguanil.
(6) Diaminopyrimidine : pyrimethamine.
(7) Miscellaneous : Trimethoprim, Mefloquine.

QUININE

Quinine alkaloid are present in the bark of plant ***Cinchona officinales***. The plant is grown in Peru, Jawa and other parts of South America. This plant contains 6 to 10% of quinine alkaloid. Quinine is available as quinine sulphate. These are white fine needle like crystals which are odourless, very bitter in taste and when exposed to light become light brown. It is soluble in water and alcohol. The alkaloid quinine is insoluble in water but soluble in organic solvents. It should be stored in air tight containers.



IUPAC Name : α -(6-methoxy-quinolin-4-yl)- α -[(2R,4S,5R)-(5-vinylquinuclidin-2-yl)]-methanol.

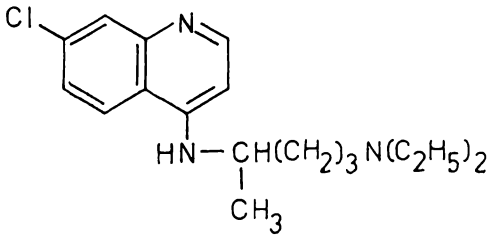
Actions and Uses : Quinine only affects the erythrocytic cycle of plasmodium and acts as schizonticidal. It is used as a suppressive in the management of acute attack of P. vivax, malariae, and ovale and also affects falciparum. Quinine in combination with pyrimethamine and sulfadiazine is the choice of treatment for chloroquine resistant cases. Quinine has been largely replaced by new drugs, but resistance to newer drugs makes quinine more superior. Quinine is also used in Thomsen's disease, nocturnal leg cramps,and as an abortifacient.

Officials : Quinine Bisulphate I.P.
Quinine Bisulphate, Tablets I.P.
Quinine Dihydrochloride I.P.
Quinine Dihydrochloride Injection I.P.
Quinine Sulphate I.P.
Quinine Sulphate Tablets I.P.
Quinine Ethyl Carbonate I.P.
Quinine Hydrochloride I.P.
Quinine Hydrochloride Tablet I.P.
Quinine and Urethane Injection I.P.

CHLOROQUINE

Chloroquine is available as a hydrochloride and phosphate salt. Chloroquine-phosphate is an odourless white powder with a bitter taste. It discolours on exposure to light. It is freely soluble in water, practically insoluble in alcohol,

chloroform and in ether. It should be stored in well closed containers protected from light.



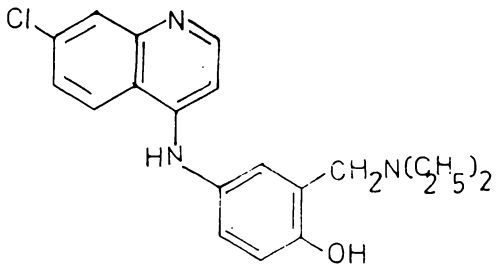
IUPAC Name : 7-chloro-4-(4-diethylamino-1-methyl-butylamino) quinoline.

Actions and uses: Chloroquine prevent or terminates clinical symptoms of malaria by suppressing or by killing malaria schizonts at all stages of erythrocytic cycle. It does not effect the sporozoites or merozoites present in liver. It is active against all species of plasmodium except falciparum. Chloroquine is also effective against extra intestinal amoebiasis especially amoebic hepatitis.

Officials : Chloroquine Phosphate I.P.
Chloroquine Sulphate I.P.
Chloroquine Sulphate Injection/Tablet I.P.
Chloroquine Sulphate Injection, I.P.
Chloroquine Sulphate Tablets, I.P.

AMODIAQUINE

Amodiaquine is available as amodiaquine hydrochloride. It is a yellow crystalline powder, odourless and bitter in taste. It is soluble in water, sparingly soluble in alcohol and very slightly soluble in chloroform and ether. It should be stored in air tight containers.



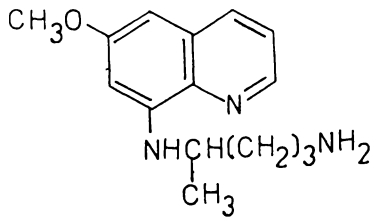
IUPAC Name : 4-(7-chloroquinol-4-ylamino)-2-(diethylaminomethyl)-phenol

Actions and uses: Amodiaquin has similar actions and uses as chloroquine. It can also cure malaria caused by *plasmodium falciparum* by eradicating parasites from erythrocytes. It is also used in the treatment of lupus erythematosus, giardiasis and extra intestinal amoebiasis.

Officials: Amodiaquine Hydrochloride I.P.
Amodiquine Tablets I.P.

PRIMAQUINE

Primaquine is a 8 aminoquinoline derivative and is available as a phosphate salt. It is an odourless orange red crystalline powder which is bitter in taste. It is slightly soluble in water, practically insoluble in alcohol, ether and chloroform. It should be stored in well closed containers protected from light.



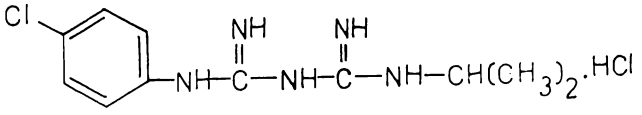
IUPAC Name : 8-(4-Amino-1-methylbutylamino)-6-methyoxyquinoline.

Actions and uses: It is used to prevent relapse of malaria. It is also used for the persons returning from malaria's area to cure plasmodium infections. It kills plasmodium at exo erythrocytic stage and also gametocytes but does not affect erthrocytic form. It affects erythrocytic stage of only P. falciparum. It is generally not recommended for acute infections. For this stage it is given in combination with chloroquin or amodiaquine. (schizonticidal).

Officials : Primaquine Phosphate I.P.
Primaquine Tablets I.P.

PROGUANIL

Proguanil is a biguanide derivative and available as hydrochloride salt. It is an odourless, white crystalline powder with a bitter taste. It is slightly soluble in alcohol water and very slightly soluble in ether and chloroform. It is a hygroscopic compound and should be stored in well closed containers.



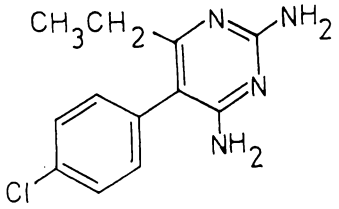
IUPAC Name : 1-(4-Chlorophenyl)-5-isopropyl biguanide.

Actions and uses: The action of proguanil depends upon the formation of active metabolic cycloguanil. It kills parasites undergoing schizogony in the red blood cells and tissue, therefore acts as causal prophylactic and cures radically. It does not kill gametocytes.

Officials : Proguanil Hydrochloride I.P.
Proguanil Tablets I.P.

PYRIMETHAMINE

Pyrimethamine is a diamino pyrimidine derivative. It is an odourless and white crystalline powder. It is soluble in warm, dilute mineral acids, slightly soluble in alcohol and chloroform and is insoluble in water. It should be stored in well closed containers.



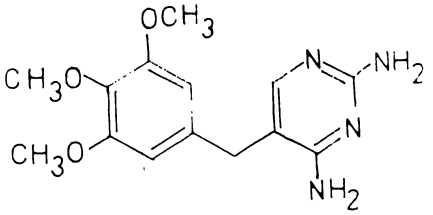
IUPAC Name : 5-(4-chlorophenyl)-6-ethylpyrimidine-2,4,-diamine.

Actions and uses: Pyrimethamine is an antimalarial drug with similar use as proguanil hydrochloride. It is slow to control a malarial attack. It affects the nucleoprotein metabolism of parasites by interfering in the folic-folinic acid system. It usually kills the primary exoerythrocytic stage and also effects gametocytes.

Officials : Pyrimethamine. I.P.
Pyrimethamine and Sulphadoxine Tablets I.P.

TRIMETHOPRIM

Trimethoprim is an odourless white powder with a bitter taste. It is slightly soluble in water, alcohol and chloroform insoluble in ether. It should be stored in well closed containers protected from light.



IUPAC Name : 5-(3,4,5-Trimethoxy benzyl) pyrimidine -2,4-diamine.

Actions and uses: Trimethoprim is an antibacterial agent similar to sulfonamides. It inhibits bacterial dihydrofolate reductases which neutralises the substrate. It is used in combination with sulfonamides in the treatment of malaria due to susceptible strains of plasmodium falciparum. It is an important ingredient of co-trimoxazole.

Officials : Trimethoprim I.P.

(1) Chloroquine : IPCA : Larigo tab. inj. susp.
Rhonepouletic : Nivaquine p tab. inj. susp.
P.C.I. : Malaquin tab. :

Adults : Initially 600mg, after 6 hours 300mg followed by 300mg daily for 2 days. inj. IM 10ml. after 6 hrs 5ml followed by 5ml daily for 2 days.

(2) Amodiaquine : Parke davis : Camoquin Tab.
Adults : 10mg/kg body wt. as a single dose. Children : 10mg/kg body wt.

(3) Primaquine : Unicure : Primaline tab. : 15ml daily for 14 days along with std. chloroquine therapy.

(4) Proguanil : Unicure : Laveran tab. : 200mg daily for adults.

(5) Pyrimethamine : Helics : Malicure tabs.
Plethico : Reziz tab. susp.
Adults : Prophylaxiz 1 tab. once a week; Treatment : 2 tabs. in single dose.
Children : 3/4 to 1 tab. depending upon the age as a single dose.

(6) Quinine : Clipa : Quinarsol.
P.C.I.: Rubiquin Tabs.
Adults : 300-600mg three times daily for 5-7 days.
Children : 25mg/kg/day div. every hour for 7 days.

CHAPTER - 10

TRANQUILIZERS

The term tranquilization or ataraxia can be defined in various ways but all are synonyms of "peace of mind". Originally the term was used for psychic effects of reserpine and chlorpromazine which makes a person calm without causing hypnosis or anesthesia. The main object in psychiatric therapy is to induce an improved mental state in mentally disturbed patients. These agents are effective in the condition of excitation, agitation, aggressiveness and impulsiveness by suppressing central nervous system.

CLASSIFICATION : Tranquilizers can be classified in two categories :

(1) **Major Tranquilizers or Anti-psychotics** - These drugs reduce agitation and disturbed behavior associated with hallucinations. These are classified as :

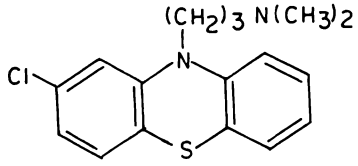
(a) **Phenothiazines** : Chlorpromazine, Prochlorperazine
(b) **Rauwolfia alkaloids** : Reserpine
(c) **Butyrophenones** : Haloperidol, Trifluperidol
(d) **Thioxanthines** : Thiothixene
(e) **Indolic derivatives** : Molindone
(f) **Miscellaneous** : Oxypertine

(2) **Minor Tranquilizers or Antianxiety drugs** : These drugs have a calming effect in anxiety states associated with neurotic personality or physical disease (situational crisis). These are classified as :

(a) **Benzodiazepines** : Diazepam, Lorazepam, Chlordiazepoxide
(b) **Miscellaneous** : Meprobamate, Buspirone

CHLORPROMAZINE

Chlorpromazine is an odourless white or creamy white powder or waxy solid. It is soluble in chloroform, ether, alcohol and practically insoluble in water. It should be stored in well closed container, protected from light. Its hydrochloride salt is soluble in water and is incompatible with phenobarbitone sodium.



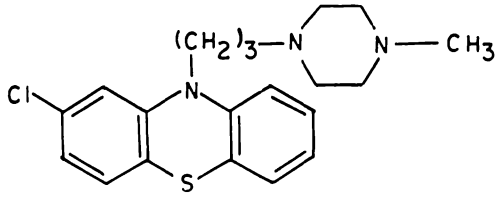
IUPAC Name : 2-Chloro-10-(3-dimethylaminopropyl) phenothiazine.

Actions and uses: Chlorpromazine is a central nervous depressant which blocks dopamine receptors. It has a weaker antihistaminic action and strong local anesthetic action. It reduces the efficiency of heat regulating centres so that vasodilatation produces a fall in blood pressure, but does not reduces cardiac output. It reduces salivary and gastric secretions and acts as a transient antiadrenergic. It is successfully used in several psychomotor excitements.

Officials : Chlorpromazine Hydrochloride, I.P.
Chlorpromazine Injection, I.P.
Chlorpromazine Tablets, I.P.

PROCHLORPERAZINE

Prochlorperazine is available as maleate salt. The salt is an almost odourless white or pale-yellow crystalline powder with a slightly bitter taste. The drug is practically insoluble in ether but very slightly soluble in water and alcohol. It should be stored in well closed containers, protected from light.

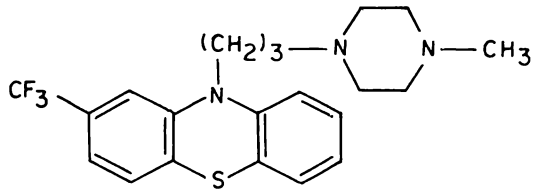


IUPAC Name : 2-Chloro-10-[3-(4-methyl-1-piperazin-1-yl) propyl]-10H-phenothiazine.

Actions and uses: Prochlorperazine has actions and uses similar to chlorpromazine hydrochloride. It is less sedative and more effective as an antiemetic drug, therefore it is used for the prevention and relief of vomiting. The side effects are parkinsonisms and drowsiness.

TRIFLUOPERAZINE

It is available as a hydrochloride salt. It is an odourless, hygroscopic, white to pale yellow, crystalline powder with a bitter taste. It is soluble in water, very slightly soluble in alcohol and practically insoluble in ether. It should be stored in air tight containers protected from light.



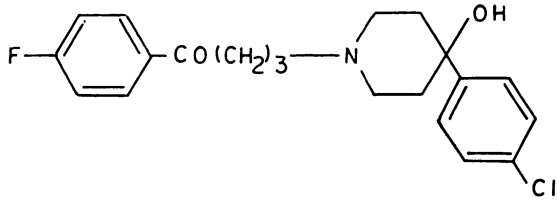
IUPAC Name : 10-[3-(4-Methyl piperazin-1-yl)-propyl]-2- (trifluoromethyl)-10H-phenothiazine.

Actions and uses: Its action and uses are similar to chlorpromazine hydrochloride but is effective in much smaller dose. It can be given to those patients who do not respond to chlorpromazine. It acts rapidly in blocking conditioned response and as an antiemetic. It may cause drowsiness and dizziness.

Officials : Trifluoperazine Hydrochloride, I.P.
Trifluoperazine Tablets, I.P.

HALOPERIDOL

Haloperidol is a butyrophenone. It is an odourless, tasteless, white to yellowish powder. It is soluble in chloroform, slightly soluble in chloroform and ether and practically insoluble in water. It should be stored in well closed containers.



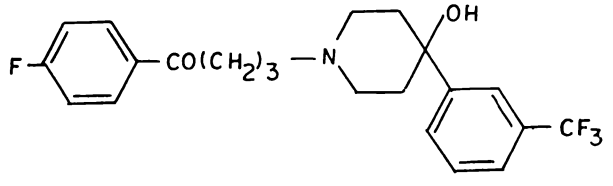
IUPAC Name : 4-[4-(p-Chlorophenyl)-4-hydroxy pipieridino]-4'-fluorobutyrophenone.

Actions and uses: Haloperidol is a selective central nervous system depressant. It is used in the management of severe agitation, anxiety, tension, hallucinations, hyperactivity, etc. Usually it is recommended in mania, hypomania and in chronic psychoses. It is a powerful antiemetic and enhances the action of barbiturates, analgesics and other central nervous system depressants.

Officials : Haloperidol Injection, I.P.
Haloperidol Tablets, I.P.

TRIPERIDOL

Triperidol is a white crystalline powder with a slight odour and is slightly soluble in water. It should be stored in well closed containers protected from light.

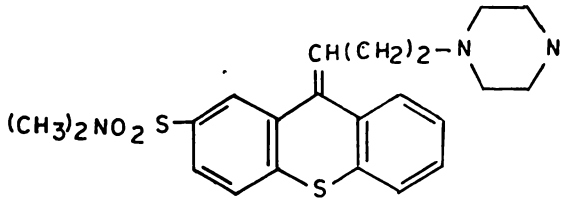


IUPAC Name : 4'-Fluoro-4-[4-hydroxy-4(α,α,α-trifluoro-m-tolyl) piperidino] butyrophenone.

Actions and uses: It has actions and uses similar to haloperidol.

THIOTHIXENE

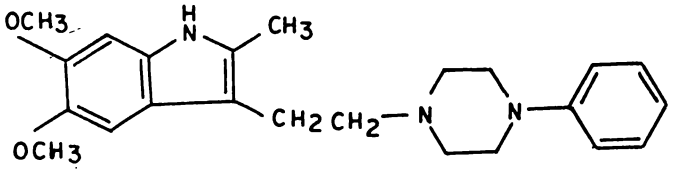
Thiothixene is a white to tan coloured, almost odourless crystalline powder. It is slightly soluble in alcohol, ether and practically insoluble in water. It should be stored in air tight containers protected from light. It is available as hydrochloride salts. The salt is soluble in water.



IUPAC Name: N,N-Dimethyl-9-[3-(4-methyl-piperazine-1-yl) propydine] thioxanthene- 2-sulphonamide.

Actions and uses: Thiothixene is a thioxanthene neuroleptic agent having action and uses similar to phenothiazine and chlorpromazine.

OXYPERTINE

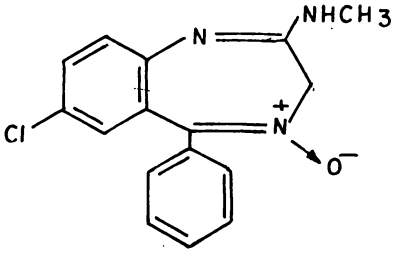


IUPAC Name : 5,6-Dimethoxy-2-methyl-3-[2-(4-phenyl-1-piperazinyl) ethyl]-1-H-indole.

Actions and uses: Oxypertine has similar neuroleptic actions as thiothixene. It is used in the treatment of psychoses. The side effects are similar to phenothiazines.

CHLORDIAZEPOXIDE

Chlorodiazepoxide is available as a hydrochloride salt. It is a white crystalline powder, very bitter in taste and with a slight odour. It is soluble in water, sparingly soluble in alcohol and very slightly soluble in chloroform and ether. It should be stored in airtight containers protected from light.



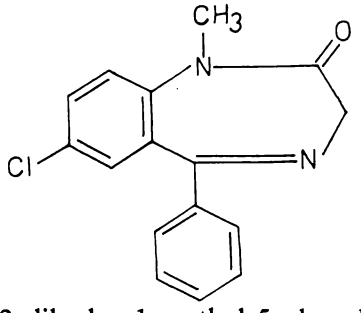
IUPAC Name: 7-Chloro-N-methyl-5-phenyl-3H-1,4-benzodiazepin-2-(1H)-one.

Actions and uses: Chlordiazepoxide relieves nervous tension and anxiety, thereby acts as a tranquilizer. It also possesses muscle relaxant activity. Its side effects are addiction and abuse.

Officials : Chlordiazepoxide, I.P.
Chlordiazepoxide, Tablets, I.P.

DIAZEPAM

It is a white crystalline, odourless powder. It is soluble in chloroform and alcohol, slightly soluble in ether and very slightly soluble in water. It should be stored in airtight containers protected from light.



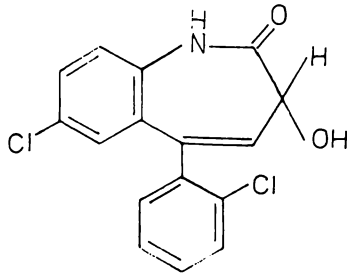
IUPAC Name : 7-Chloro-1,3-dihydro-1-methyl-5-phenyl-2H-1,4, benzodiazepin-2-one.

Actions and uses: Diazepam is a benzodiazepine derivative. Its actions and uses are similar to chlordiazepoxide. It is used to control muscle spasms in tetanus and in the management of alcohol withdrawl symptoms. It is also given in minor surgery to calm patients.

OFFICIALS : Diazepam, I.P.
Diazepam Capsule, I.P.
Diazepam Tablets, I.P.

LORAZEPAM

Lorazepam is a benzodiazepene derivative. It is an odourless, white to off white powder. It is slightly soluble in alcohol and chloroform, but practically insoluble in water. It should be stored in well closed containers.

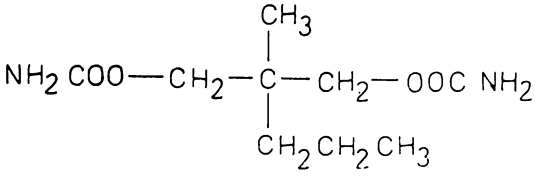


IUPAC Name : 7-Chloro-5[2-chlorophenyl] 1,3,-dihydro-3-hydroxy-2H-1,4-benzodiazepin-2-one.

Actions and uses: Lorazepam is a pre-anesthetic medication, produces sedation and decrease ability to recall events related to surgery. Other actions are similar to diazepam. Its side effects are weakness and dizziness.

MEPROBAMATE

Meprobamate is an odourless, white, granular crystalline aggregate with a bitter characteristic taste and soluble in alcohol, slightly soluble in ether and almost insoluble in water.



IUPAC Name : 2-methyl-2-propyl trimethylene dicarbamate.

Actions and uses: It is used in the treatment of psychoneuratic disorders when anxiety and nervous tensions are present. It also possesses anticonvulsant and muscle relaxant properties.

Officials : Meprobamate I.P.
Meprobamate Tablets, I.P.

(1) Chlorpromazine : Rheon Poulanc : Chlorpromazine tabs.
La Pharma : Emetil : Adults : 25 mg thrice daily.
Children : Depending upon the age.

(2) Prochlorperazine : Rheon poulanc : Stemetil : inj. are given 12.5mg deep.

(3)Trifuloperazine : Intas : Neocalm Plus tab.
Torrent : Trinicalm tab.
Adults : 5-10 mg daily orally 2.5 mg two times daily.
Children :6 years age and above : 1mg 1-2 times a day.

(4) Haloperidol : Searle : Serenace tab. liquid inj. : As directed by the physician.
La pharma : Benzydol 5mg, 10mg, 1.5mg tab.

(5) Chlordiazepoxide : Jagsonpal : Equarex Tabs.
Roche : Librium tabs. Adults : 20-40 mg daily.
Children : 5-10mg daily.

(6) Diazepam : Ranbaxy : Calmpose syp. inj.
Roche : Valium tabs. : Adults : 2-10 & 10-30mg at bed time.

CHAPTER - 11

HYPNOTICS AND SEDATIVES

Sedatives are drugs used to allay excitement and reduce motor activity without inducing sleep, while hypnotics help in production of sleep. Both sedative and hypnotic action may be present in the same drug. A small dose of a drug may act as sedative, where as a large dose may act as hypnotic.

Hypnotics have a common ability to induce a non-selective reversible depression of central nervous system. Hypnotics are generally used in insomnia, anxiety and restlessness.

CLASSIFICATION :

(I) Barbiturates	:Phenobarbitone, Butobarbitone, Cyclobarbitone.
(II) Aldehydes	: Paraldehyde, Choral hydrate.
(III) Acetylene derivative	: Ethchlorvynol
(IV) Acyclic compounds	: Ureides
(V) Piperidinediones	: Methyprylone, Glutethimide
(VI) Benzodiazepens	: Nitrazepam
(VII) Imidazopyridines	: Zolpidem, Alpidem

PHENOBARBITONE [Phenobarbital]

Phenobarbitone is an odourless white crystalline powder, slightly bitter in taste. It is soluble in alcohol, ether and chloroform but practically insoluble in water. It should be stored in air tight containers.

Barbiturates act on central synaptic transmission process of reticular activating system to depress cerebral cortex. Barbiturates calm the individual, whose normal electrical activity increases with emotions, tension, anxiety or use of C.N.S. stimulant.

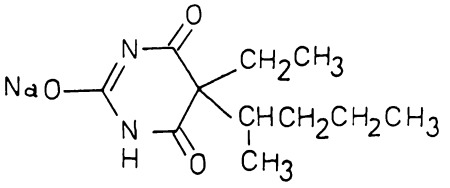
IUPAC Name : 5-Ethyl-5-phenylbarbituric acid.

Actions and uses: Phenobarbitone is a long acting barbiturate. It has the basic property of barbitone and is also used in the treatment of migraine and epilepsy. It reduces the frequency of attacks. It is also available as a sodium salt that is soluble in water.

Officials : Phenobarbitone I.P.
Phenobarbitone Tablets I.P.
Phenobarbitone Sodium I.P.
Phenobarbitone Sodium Injection I.P.
Phenobarbitone Sodium Tablets I.P.

PENTOBARBITONE

Pentobarbitone is an odourless, hygroscopic, white crystalline powder. Its sodium salt is soluble in water. It should be stored in well-closed containers protected from light.



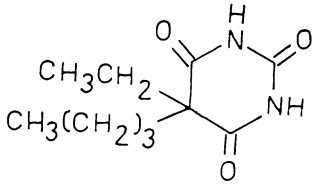
IUPAC Name : 5-Ethyl-5-(1-methyl butyl) barbiturate.

Actions and uses: Pentobarbitone sodium is an intermediate acting barbiturate. Its actions and uses are similar to barbiturates. It is uses as a basal anesthetic in pre-operative conditions.

Officials : Pentobarbitone I.P.
Pentobarbitone Sodium Tablets I.P.

BUTOBARBITONE

It is a colourless or white crystalline powder with a very slight odour and slightly bitter in taste. It is soluble in chloroform, ether and solutions of alkali hydroxides but poorly soluble in water. It is a hygroscopic compound and should be stored in well closed containers.

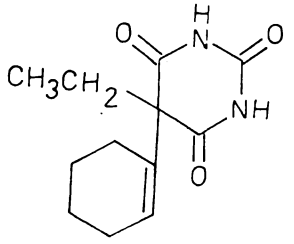


IUPAC Name : 5- Butyl-5-ethylbarbituric acid.

Actions and uses: Butobarbitone is an intermediate acting barbiturate. Its action and uses are similar to barbiturates.

CYCLOBARBITONE

Cyclobarbitone is available as a calcium salt. Its calcium salt is a white or slightly yellowish, odourless crystalline powder with a bitter taste. It is very slightly soluble in alcohol, ether and chloroform. It should be stored in air tight containers.



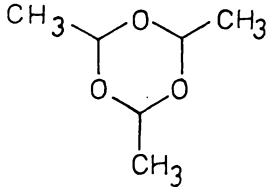
IUPAC Name : 5-[Cyclohex-1-enyl]-5-ethyl barbituric acid.

Actions and uses : Cyclobarbitone is also an intermediate acting barbiturate. Its actions and uses are similar to barbituric acid.

Officials : Cyclobarbitone I.P.
Cyclobarbitone Tablets I.P.
Cyclobarbitone calcium I.P.
Cyclobarbitone calcium Tablets I.P.

PARALDEHYDE

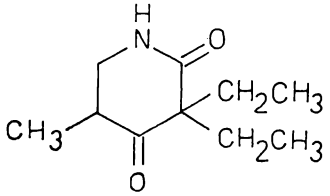
Paraldehyde is a polymer of acetaldehyde. It is soluble in water and miscible with alcohol, ether and chloroform. It should be stored in small well filled, air tight bottles in dark. If it is solidified then contents are mix by liquefaction with the help of gentle heat.



Paraldehyde is a powerful quick-acting hypnotic and anticonvulsant. It is an irritant to mucous membrane unless it has been well diluted.

METHYPRYLONE

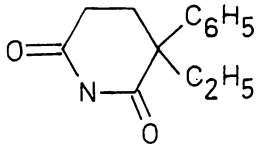
Methyprylone is a white crystalline powder having characteristic odour. It is soluble in alcohol, chloroform and ether but sparingly soluble in water. It should be stored in well closed containers.



IUPAC Name : 3,3-Diethyl-2,4-dioxo 5-methylpiperidine.
Actions and uses: It is used as a hypnotic and sedative. It induces sleep for 5 to 8 hours and is given orally in the management of insomnia.

GLUTETHIMIDE

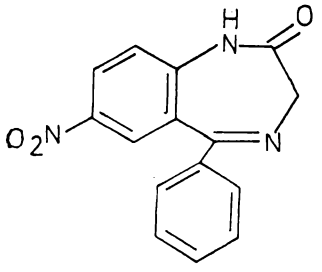
Glutethimide is an odourless, colourless or white crystalline powder with a bitter taste. It should be stored in air tight containers protected from light.



IUPAC Name : 2-Ethyl-2-phenylglutatrimide.
or
3-Ethyl-3-phenyl piperidine-2,6-dione.
Actions and uses: Glutethimide acts as inter-mediate acting barbiturate. It produces sleep that lasts for 4 to 6 hours.

NITRAZEPAM

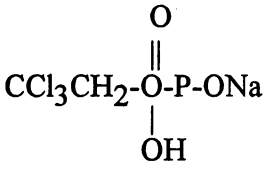
Nitrazepam is an odourless yellow crystalline powder. It is slightly soluble in chloroform and alcohol but almost insoluble in water and ether. It should be stored in air tight containers protected from light.



IUPAC Name : 1,3-Dihydro-7-nitro-5-phenyl-2H-1,4-benzodiazepin -2-one.
Actions and uses: Nitrazepam is a hypnotic-sedative but has similar properties as chlordiazepoxide. It produces sleep for 6 to 8 hours.

TRICLOFOS - SODIUM

Triclofos - sodium is an odourless, white hygroscopic powder with saline taste. It should be stored in air - tight containers. It is incompatible with calcium and magnesium salt of heavy metals and alkaloids.



IUPAC Name : 2,2,2- Trichloro ethyl sodium hydrogen phosphate.

Actions and uses: Trichlofos- sodium is a hypnotic and sedative, and suitable for domiciliary midwifery. The side effects are nausea, headache, and abdominal distension.

(1) **Phenobarbitone** : Rhone-poulanc : Gardenal tab. inj. : Adults:30-200mg per day in divided doses and as directed.
Bayer : Luminal tabs. : Adults : 1,2 tabs.3-4 times daily.

(2) **Nitrozepam** : PCI : Hypnex : Adults : 5-10mg at bed time.
Anglo french : Nitravel : 2.5-5mg at bed time.

(3) **Triclofos sodium** : Glaxo : Trichloryl liquid

CHAPTER - 12

GENERAL ANESTHETICS

The term anesthesia means loss of sensation. Local anesthetics abolish pain sensation in a localised area while general anesthetics bring about loss of all sensations particularly pain with reversible loss of consciousness. Anesthesia proceeds through following stages :

(I) **Stage of Analgesia** : This stage is also called as cortical stage. In this stage gradual depression of cortical centers makes patient sleepy but there is analgesia with retained consciousness.

(II) **Stage of delirium** : It is also called as excitement stage. In this stage depression of higher motor centres cause's excitement and loss of consciousness. In these stage pupils may dilate with marked hypertension.

(III) **Stage of surgical anesthesia** : In this stage smooth muscles are relaxed which is characterised by loss of reflexes, also relaxation of skeletal muscles with regular deep breathing starts. This stage is suitable for surgery.

(IV). **Stage of Medullary paralysis** : It is also called as respiratory paralysis. In this stage depression of respiratory function of medulla and brain stem take's place leading to vasomotor collapse and respiratory failure.

An ideal anesthetic agent should be inert non-inflammable, non-irritant to mucous membranes and non-toxic. It should be potent, produces rapid induction of anesthesia and be compatible with other anesthetics.

CLASSIFICATION : These are classified according to their nature of volatilisation.

(1) Inhalants (Volatile)

(A) **Volatile liquids** : Diethyl ether, Halothane, trichloroethylene.

(B) **Gases** : Cyclopropane, Nitrous-oxide.

(2) Non-volatile or intravenous anesthetics

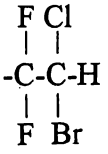
(A) **Ultra short acting Barbiturates** : Thiopental sodium and methohexital sodium.

(B) **Non-Barbiturates** : Propanidid, ketamine.

HALOTHANE

Halothane is a colourless-mobile heavy liquid with a characteristic odour. It is miscible with dehydrated alcohol, ether and chloroform, but slightly soluble in water. Its boiling point is about 50°C, therefore volatilise in hot climate. It decomposes to halogen acids and free-halogens when exposed to UV-radiation. It should be stored in air-tight containers protected from light below 25°C.

CF_3-CHBrCl OR



IUPAC Name :- 2-Bromo-2-chloro-1,1,1-trifluro ethane.

Actions and uses: Halothane is a volatile anesthetic and is more potent than chloroform and ether. It is non-inflammable, does not cause explosion with oxygen. It neither produces necrosis when spilt on tissue nor produces irritation on mucous-membrane nor skin. An adequate dose of atropine should be administered to the patient before its medication. Its induction is rapid, without signs of excitement, ventricular tachycardia and other cardiac irregularities. It produces moderate deep level of muscle relaxation. It blocks transmission of nerve impulses through ganglion

Officials : Halothane I.P.

DIETHYL ETHER

Diethyl ether contains 0.002% w/v propyl gallate or hydroquinone as stabilizer, to prevent the formation of ether peroxide. It is a clear, colourless, very mobile liquid with a characteristic odour and a sweet burning taste. It is soluble in water and insoluble in alcohol, chloroform, fixed and volatile oils. It is highly inflammable and with certain concentrations of oxygen it causes explosion. It should be stored in dry, air tight containers in a cool place, protected from light. The containers or closer should not contain metal foil.

CH_3-CH_2—O—CH_2-CH_3

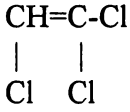
IUPAC Name : Di-ethyl ether.

Actions and uses : It is less-depressant to medullary centers, causes less fall in blood pressure as well as less depression of respiration. Prolonged use of ether does not produce direct toxic action on the heart, but a transient toxic effect on liver and kidney is seen. It has a wide margin of safety and is given with atropine or hyoscine that inhibit bronchial secretions produced by respiratory stimulation of ether. Ether poisoning should be treated with artificial respiration and care must be taken to prevent collapse.

Official : Anesthetic Ether I.P.

TRICHLOROETHYLENE

Trichloroethylene contains blue colouring matter to distinguish from ether. It is a colourless or pale blue transparent mobile liquid with a characteristic odour resembling chloroform. It is very slightly soluble in water and miscible with dehydrated alcohol, chloroform and ether. It should be stored in air tight containers, in cool place, protected from light (It decomposes on exposure to air and bright light).

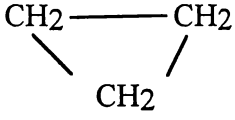


IUPAC Name : 1,1,2-Trichloro ethene.

Actions and uses: It is least volatile but less potent than chloroform and ether. It is neither irritant nor-inflammable. It induces smooth and rapid anesthesia but does not produce deep anesthesia and full muscular relaxation. It may also increase respiratory rate and cardiac irregularities. Its poisoning should be treated by artificial respiration.

CYCLOPROPANE

Cyclopropane is a colourless inflammable gas having a characteristic odour. It is soluble in alcohol, ether, chloroform, water and fixed oils. It is stored in metallic cylinders. These cylinders should with-hold sufficient pressure of compressed gas. It should be stored in special cool room free from inflammable material. The whole cylinder should be painted with orange colour having a chemical symbol " C_3H_6 "of this gas.

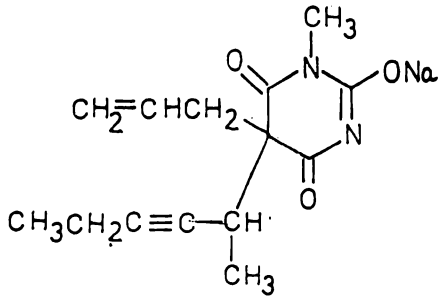


Cyclopropane

Actions and uses: It is a potent gaseous anesthetic and does not produce irritation. Its recovery and induction period are less. It can be administered with oxygen. It may cause respiratory depression, cardiac irregularities and bronchospasm.

METHOHEXITAL SODIUM

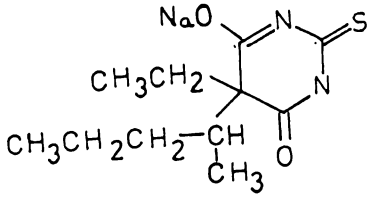
Methohexital sodium is a non-volatile anesthetic. Methohexital is available as a sodium salt. The salt is an odourless, white and hygroscopic powder. It is soluble in water. It should be stored in air-tight containers.



IUPAC Name : 1-methyl [5-allyl,5-(1-methylpent-2-ynyl) barbituric acid sodium.
Actions and uses: Methohexital is a very short acting barbiturate. It is used as an anesthetic for intravenous administration and its actions and uses are same as thiopentone sodium. It is incompatible with acidic substances or acidic solutions.

THIOPENTONE SODIUM

Thiopentone sodium is also non-volatile, barbiturate type of general anesthetic. It is available as a sodium salt. It is a hygroscopic yellowish - white powder with a characteristic alliaceous odour and bitter taste. It is soluble in water and alcohol but insoluble in ether. Its aqueous solution should not be stored more than 24 hours because salt decomposes vigorously. It should be stored in well closed air-tight containers.



IUPAC Name : 5-Ethyl-5-[1-methylbutyl]-2-thiobarbiturate sodium.
Actions and uses: Thiopentone sodium is a very short acting barbiturate. It is administered intravenously for the induction of general anesthesia as a complete anesthesia for short duration and is therefore useful in short operation as in dental practice. Care should be taken so that none of the solution is injected outside the vein, because it may cause tissue necrosis.
Officials : Thipentone Sodium I.P.
Thiopentone Injection I.P.

(1) **Halothene** : ICI : Fluothane liquid : Adults Induction : Upto 5% in air, O_2 maint:

(2) **Thio pentol sodium** : May & Baker : Intraval Sodium

CHAPTER - 13

LOCAL ANAESTHETICS

Local anaesthetics prevent generation and conduction of nerve impulses. When they are applied to a nerve fibre, the threshold of excitation increases, impulse conduction slows and rate of rise in action potential and amplitude decreases and slowly abolishes generation of action potential. They also bind and block sodium channels which block propagation of impulse, in the nerve tissue. Local anaesthetics are of two types :

(1) Slightly soluble local anesthetics are used for topical application.[they are slowly absorbed and are safe for use on the ulcers, wounds and mucous surfaces].

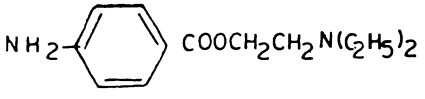
(II) Soluble local anaesthetics : They are used to anesthetise local tissuse by a direct injection on the tissue or to the nerve supplying the tissue.

Classification

(I) Natural agents	: Cocaine
(II) Synthetic nitrogenous compounds	:
(A) Derivatives of PABA.	: Procaine, benzocaine.
(B) Acetanilide derivative	: Lignocaine [Lidocaine].
(C) Quinoline derivative	: Cinchocaine.
(III) Synthetic non-nitrogenous compounds	: Benzyl alcohol.
(IV) Miscellenous	: Clove oil, phenol etc.

PROCAINE

Procaine is available as a hydrochloride salt. The salt is an odourless, colourless or white crystalline powder with a salty or bitter taste followed by numbness. It is soluble in water, slightly soluble in alcohol and very slightly soluble in chloroform. It should be stored in well closed containers protected from light.



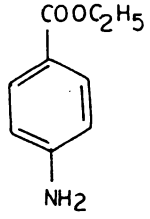
IUPAC Name : 2-Diethyl amino ethyl, 4-amino benzoate.

Actions and uses : Procaine is a short acting local anaesthetic. It is less toxic because of its poor penetration of intact mucous membrane. Procaine should not be given intravenously. It may produce dermatitis. Procaine poisoning should be treated with diazepam or with artificial respiration.

Officials : Procaine, I.P.
Procaine and Adrenaline Injection, I.P.

BENZOCAINE

Benzocaine is a colourless or white crystalline powder with a bitter taste followed by numbness of tongue. It is soluble in chloroform, ether and alcohol but very slightly soluble in water. It should be stored in air tight containers protected from light.



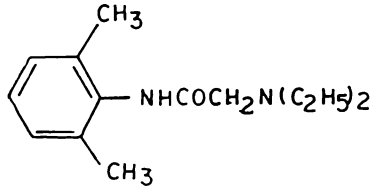
IUPAC Name : Ethyl 4-amino benzoate.

Actions and uses: It is a sparingly soluble salt with less toxicity than cocaine. It can be given orally to relieve pain of gastric carcinoma and in symptomatic treatment of tuberculous laryngitis. It is given as injections in the treatment of pruritus and anal fissure, lozenges are used to prevent nausea and vomiting while ointments are applied on burns and cancerous ulceration, etc.

Officials : Benzocaine Sulphate, I.P.
Benzocaine, I.P.

LIGNOCAINE

Lignocaine is available as lignocaine hydrochloride, which is an odourless, white crystalline powder with a slightly bitter taste followed by numbness. It is soluble in water, alcohol and chloroform and is practically insoluble in ether. It is precipitated in the presence of alkali. It is a hygroscopic compound and should be stored in well closed containers.



IUPAC Name : NN - Diethyl [(2,6-dimethyl phenyl) carbamoyl] methyl amine.

Actions and uses: Lignocaine is widely used as injections and for local application to mucous membranes. It is used for infiltration with adrenaline. It is also used in the treatment of cardiac arrhythmias and for epidural anaesthesia.

Officials : Lignocaine Hydrochloride, I.P.
Lignocaine and Adrenaline Injection, I.P.

(1) Lidocain : Astra IDL : Xylocard 2% Inj.
S.G. pharma : Gesicard

(2) Benzocain : Parke Davis : Chlormycetin Ear drop

CHAPTER -14

ANTIDEPRESSANTS

Antidepressant drugs are also called as psychic energizers. Antidepressant medication is used to treat endogeneous depression or are helpful in agitated depression and phobic anxiety states. Common symptoms of depression are anxiety, tension, guilty feeling and emotional withdrawls. Severe depression causes depression of C.N.S. and includes suicidal tendencies.

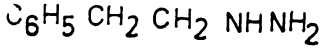
CLASSIFICATION

(I) Mono amine oxidase inhibitors (MAO)
- (a) Hydrazine derivatives : Phenelzine
- (b) Non-hydrazine derivatives : Tanycypromine

(II) Tricyclic compounds : Imipramine, Nortriptyline, Amitriptyline
(III) Lithium compounds : Lithium carbonate
(IV) Miscellaneous : Caffeine, Amphetamine.

PHENELZINE

Phenelzine is available as a hydrogen sulphate salt. It is a white powder or is present as pearly platelets with a pungent odour. It is soluble in water, slightly soluble in alcohol, and practically insoluble in ether and chloroform. It should be stored in airtight containers protected from light.

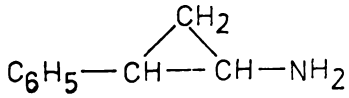


IUPAC Name : Phenyl ethyl hydrazine.
Actions and uses : Phenelzine is an antidepressant drug. It inhibits monoamine oxidase (MAO) enzyme which influences the metabolism of transmitter substances (Eg. Noradrenaline, 5-hydroxy-treptamine) in the brain. It is used in the treatment of

endogeneous depression. The drug should not be withdrawn abruptly because relapse may occur within two days.

TRANYLCYPROMINE

Tranylcypromine is available as a sulphated salt. It is odourless or has a faint odour of cinamaldehyde, and is a white crystalline powder with an acidic taste. It is slightly soluble in water, very slightly soluble in alcohol and ether but practically insoluble in chloroform. It should be stored in well closed containers.

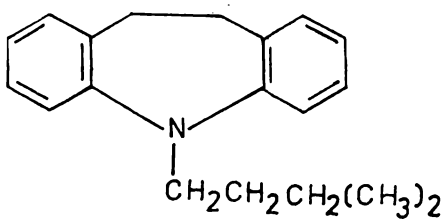


IUPAC Name : 2-phenyl cyclo propyl amine.

Actions and uses : It is also a MAO inhibito Its actions and uses are similar to phenelzine sulphate. It is used for endogeneous and psychoneurotic depression. The side effects are insomnia, dizziness, muscular-weakness, dryness of mouth, etc.

IMIPRAMINE

Imipramine is available as a hydrochloride salt. The salt is an odourless, white or slightly yellow crystalline powder with a bitter taste followed by numbness. It is soluble in chloroform, alcohol and water but very slightly soluble in ether. It is a hygroscopic compound. It is very sensitive to moisture and light. Its degradation increases in the presence of oxygen and water. It should be stored in airtight containers protected from light.



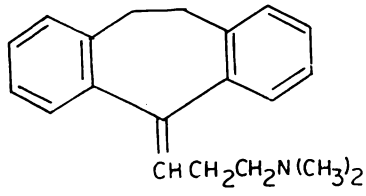
IUPAC Name : 10,11-Dihydro-5-(3-dimethyl amino propyl)- 5H-dibenz-[b,f] azepine

Actions and uses : It is a tricyclic antidepressant. It has weaker anticholinergic activity and less tranquillizing action. It is used to control nocturnal enuresis. This drug should be gradually withdrawn to prevent relapse.

Officials : Imipramine Hydrochloride, I.P.
Imipramine Tablets, I.P.

AMITRIPTYLINE

Amitriptyline is available as hydrochloride and embonate salt. Its hydrochloride salt is an odourless, colourless or white crystalline powder with a bitter burning taste. It is soluble in water, alcohol, chloroform, methanol and insoluble in ether. Its aqueous solution is oxidized in the presence of metal ions for which a chelating agent (Disodium EDTA) is used. It should be stored in airtight containers protected from light.



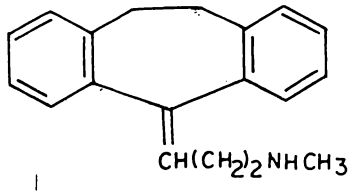
IUPAC Name : 3- (10,11-Dihydro-5H-dibenzo [a,d] cyclohepten-5-yl-idene) propyl-NN-dimethyl amine.

Actions and uses : It is a tricyclic antidepressant. It does not inhibit MAO but blocks the re-uptake of released monoamines into pre-synaptic nerve ending. It also reduces incidence of bed wetting in some children. It may impair alertness when driving car or operating dangerous machinery, so these drugs should be avoided.

Officials : Amitriptyline Hydrochloride, I.P.
Amitriptyline Tablets, I.P.

NORTRYPTYLINE

Nortryptyline is a tricyclic antidepressant. It is available as hydrochloride salt. It is a white powder with slightly characterstic odour, and has a burning and bitter taste followed by numbness. It is soluble in chloroform and alcohol, slightly soluble in water and practically insoluble in ether.It should be stored in well closed containers protected from light.



IUPAC Name : N-10,11-Dihydro-5H dibenzo [a,d] chclohepten-5-ylidenepropyl-N-methylamine.

Actions and uses :Its actions and uses are similar to amitriptyline hydrochloride but is less sedative. Its side effects, contra-indications and other properties are also similar to amitriptyline.

(1) Amitriptyline : Merind : Libotryp tab.
Torrent: Amitol
Adults : 10-25mg initially thrice daily increased by 10-25mg every 2nd and 3rd day till opt.

(2) Nortryptyline : Sun pharma : Primox tab.
Wallace : Sensival tab.
Adults : 50-150mg daily in single or divided dose.
Children : Depending upon the age. 6-20mg and as reqd.

(3) Imipramine : SG pharma : Depsonil tab.
Torrent : Antidep tab.
Adults : Initially 75mg a day which is gradually increased to 300mg a day in single bed time dose and as directed.

CHAPTER - 15

ANALEPTICS

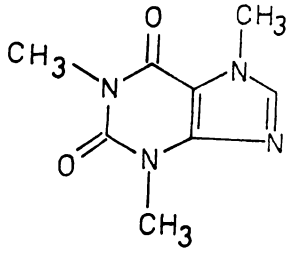
Central nervous system stimulants can increase excitability either by blocking inhibition or by enhancing excitation. The agents that enhance excitation are known as analeptics. They stimulate respiratory centre and also increase flow of blood. Analeptic acts upon sensory area of brain and increase alertness, brighten spirits and combat mental fatigue. These drugs are classified as

(1) **Natural agents** : Caffeine, Theophylline.

(2) **Synthetic agents** : Dextro-amphetamine coramine.

CAFFEINE

Caffeine is an alkaloid obtained from tea and coffee. It is an odourless, white or silky white crystalline powder, having a bitter taste. It is soluble in chloroform, slightly soluble in water and very slightly soluble in alcohol. It should be stored in air-tight containers. It is also available as caffeine citrate and caffeine hydrate.



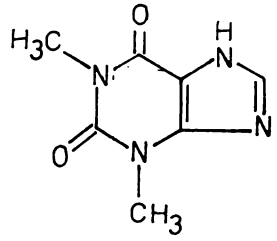
IUPAC Name : 1,3,7-Trimethyl xanthine.

Actions and uses : It is a central nervous system stimulant and a weak diuretic, because it increases renal blood flow. Generally it is given with aspirin, codeine or with ergotamine for the treatment of migraine.

Officials : Caffeine I.P.
Caffeine Citrate, I.P.

THEOPHYLLINE

Theophylline is also a xanthine derivative [alkaloid]. The drug is isolated from tea, coffee and coco plant. It is an odourless, white crystalline powder with a bitter taste.

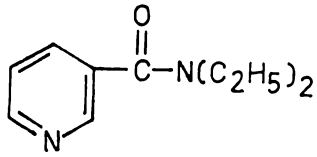


IUPAC Name : 1,3 -Dimethyl xanthine.

Actions and uses: Theophylline has actions similar to caffeine but it has stronger diuretic action and is a powerful involuntary muscle relaxant but it causes gastric irritation, nausea and vomiting.

CORAMINE OR NIKETHAMIDE

Coramine is a colourless or slightly yellow oily liquid or crystalline mass with a characteristic odour and a slight bitter taste followed by burning warm sensation on tongue. It is miscible with water, alcohol and ether. It should be stored in well closed containers.



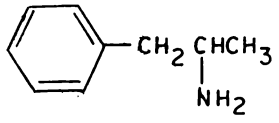
IUPAC Name : N-N- Diethylpyridine-3-carboxamide.

Actions and uses : It is a respiratory stimulant. It acts on the medullary centers of the brain to increase the rate and depth of respiration.

Officials : Nikethamide I.P.
Nikethamide Injection, I.P.

DEXTROAMPHETAMINE

Dextroamphetamine is available as a sulphated salt. It is an odourless, white crystalline powder having slightly bitter taste. It is soluble in water and practically insoluble in alcohol and ether. It should be stored in well-closed containers.



IUPAC Name : ∝-Methyl phenethylamine.

Actions and uses : It is a sympathomimetic drug with uses and actions similar to amphetamine but has an active twice of amphetamine. It is used in the treatment of obesity.

(1) **Theophylline** : Germen Remedia : Deriphyllin syp., tab., inj. : Adults: 1-2 spoon b.i.d., 1-2amp b.i.d and 1-3 tab. daily.
Cipla : Theo asthalin : Adults: 1 tablet tid.
Alembic : Theo SR : Adults: 1-2 tabs b.i.d.

(2) **Caffeine** : John wyeth : Dristan Tab.
Nicholas Piramal : Micropyrin

CHAPTER - 16

ADRENERGIC - DRUGS

The medulla of adrenal gland secretes adrenal hormone. This hormone stimulates heart, increases blood pressure, stimulates central nervous system and relaxes bronchial muscles. The main uses of adrenergic drugs are :

(1) Used to increase blood pressure.
(2) Used as central nervous system stimulants (amphetamine).
(3) Used in allergic reactions (Adrenaline).
(4) Used as smooth muscle relaxants (adrenaline and salbutamol).
(5) Used for local vaso constriction. (Adrenaline and phenyl-ephedrine) and
(6) Used as anorectic [suppress appetite. - fenfluramine].

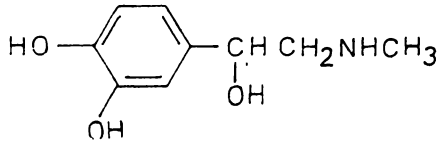
Classification :

Sympathetic drugs [adrenergic or sympathomimmetics] are classified on the basis of presence or absence of catechol nucleus.

(1) **Catecholamines** : Adrenaline, Nor-adrenaline, Iso-prenaline.
(2) **Non-catecholamines** : Ephedrine, Phenyl ephedrine, Pseudo ephedrine, Salbutamol, Terbutaline.

ADRENALINE

Adrenaline is a white or creamy white ,sphaero -crystalline and odourless powder. It is very slightly soluble in water, insoluble in alcohol, ether and chloroform, but readily soluble in mineral acids and alkali hydroxides. Adrenaline darkens slowly when exposed to air, light and in solution form it is converted to inactive racemic form. Adrenaline is available as adrenaline acid tartarate. The drug and its salt are incompatible with oxidising agents, alkalis, tannins, gum and metals like copper, iron, zinc ,etc. It should be stored in air tight containers preferably in nitrogen atmosphere, protected from light.



IUPAC Name : 1-(3,4-Dihydroxyphenyl)-2-methyl amino ethanol

or

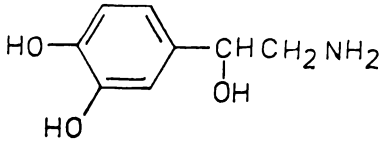
3,4 -Dihydroxy-α- methylaminomethylbenzyl alcohol.

Actions and uses : Adrenaline is life saving in the treatment of bronchial asthma. It relaxes constricted bronchial musculature and reduces bronchial oedema. It is also a vital drug oedema in allergic states and in anaphylactic shock. Adrenaline acts upon both α and ß receptors. Adrenaline acts upon both α- and ß receptors. It is also used in cardiac arrest as cardiac stimulants and in the enhancement of the activity of local anesthetics.

Officials : Adrenaline Bi-tartarate I.P.
Adrenaline Tartarate Injection I.P.
Adrenaline I.P.
Adrenaline Maleate I.P.

NORADRENALINE

Noradrenaline is available as acid tartarate salt. The salt is an odourless white, crystalline powder, having a bitter taste. It is soluble in water, slightly soluble in alcohol, and very slightly soluble in ether. It slowly darkens on exposure to air and light. It should be stored in air tight containers protected from light.



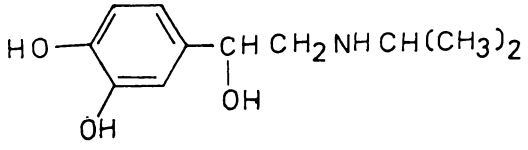
IUPAC Name : ß,3,4 Trihydroxyphenyl ethyl amine

Actions and uses : Noradrenaline is a neurohormone, released at the termination of post-ganglionic adrenergic nerve fibers. It acts on α receptors, thereby causes dilatation of pupils, inhibition of gastric ,intestinal, bladder, smooth musculature. It doesn't act as a bronchodilator or a vosodilator[ß-effects].

Officials : Noradrenaline Acid Tartarate I.P.

ISOPRENALINE

Isoprenaline is available as hydrochloride and sulphated salts. Its hydrochloride salt is an odourless, white crystalline powder. It is soluble in water, slightly soluble in alcohol, and practically insoluble in ether. Isoprenaline sulphate has similar properties as that of hydrochloride salt. It should be stored in air tight containers protected from light.



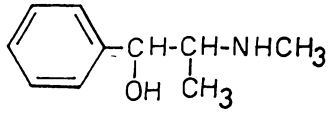
IUPAC Name : N-[2-(3,4-Dihydroxy phenyl)-2-hydroxy ethyl]-N-isopropyl amine.

Actions and uses : Isoprenaline acts mainly on ß-receptors. It is used in the treatment of bronchial asthma. Isoprenaline is a very potent cardiac stimulant and is given in cardiac surgery to combat heart block. It is contra-indicated in the patients suffering from hyper-thyroidism and cardiac patients.

Officials : Isoprenaline sulphate I.P.
Isoprenaline Tablets I.P.

EPHEDRINE

Ephedrine is an alkaloid obtained from various species of *ephedra.* Ephedrine is present as colourless, hexagonal, prismatic crystals or a white crystalline powder; having a bitter taste, and odourless or slight aromatic odour. It is soluble in alcohol, and slightly soluble in water or glycerol. It should be stored in air tight containers protected from light. It is also available as a hydrochloride salt that is soluble in water.



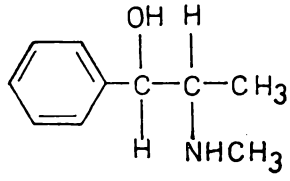
IUPAC Name : 2-Methylamino-1-phenylpropan-1-ol.

Actions and uses : Ephedrine has an indirect effect on adreno-receptors. It increases blood pressure, relaxes bronchioles and decreases peristaltic movements. It dilates the pupil [mydriasis] and constricts the sphincter but relaxes muscles of the bladder. It is a C.N.S. stimulant.

Officials : Ephedrine Tablets I.P.
Ephedrine Hydrochloride Tablets I.P.

PSEUDOEPHEDRINE

Pseudoephedrine is also an alkaloid obtained from species of Ephedra. It is available as a hydrochloride salt. The salt is an almost odourless, white crystalline powder with bitter taste. It is soluble in water, alcohol and slightly soluble in chloroform.

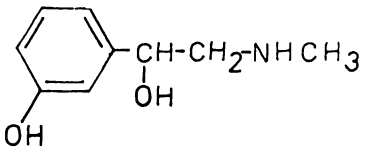


IUPAC Name : N-ß-Hydroxy-α-methyl phen ethyl-N-methyl amine.

Actions and uses : It is used as a broncho-dilators to relieve nasal and bronchial congestion in bronchial asthma. Its actions are similar to ephedrine.

PHENYLEPHRINE

Phenylephrine is available as a hydrochloride salt. The salt is an odourless, white crystalline powder with bitter taste. It is soluble in water, alcohol, and glycerol. It should be stored in air tight containers protected from light. Its aqueous solution gradually oxidises and is decolourised.



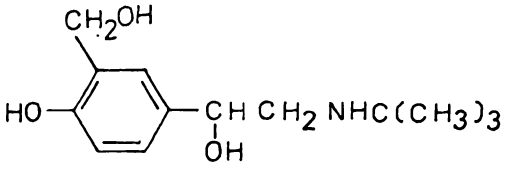
IUPAC Name : N-[3-ß-Dihydroxy phenyl ethyl] N-methyl amine.

Actions and uses : Phenylephrine has actions similar to nor-adrenaline but it has weaker pressor activity and longer duration of action than nor-adrenaline. It is used in the treatment of hypotensive state, drug induced [cyclopropane] hypotensions or in nasal decongestion as bronchodilator.

Officials : Phenylephrine Injection I.P.
Phenylephrine Hydrochloride I.P.

SALBUTAMOL

Salbutamol is an odourless, tasteless and white crystalline powder. It is slightly soluble in alcohol and very slightly soluble in ether. It should be stored in well closed containers protected from light. Salbutamol is also available as a sulphated salt that is soluble in water, alcohol, ether and chloroform.



IUPAC Name : 1-[4-Hydroxy -3-hydroxymethyl phenyl]-2-[tert-butyl amino] ethanol.

Actions and uses : Salbutamol is a direct acting sympathomimetic agent. Its actions are similar to isoprenaline. It is used in the treatment of asthma, chronic bronchitis and broncho-pulmonary disorders involving bronchospasm.

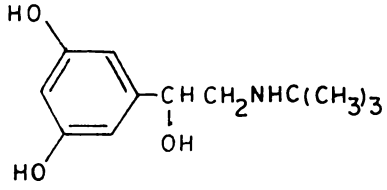
It may cause palpitations and tachycardia and is therefore contra-indicated to the patients suffering from hypertension and hyperthyroidism .

Officials : Salbutamol I.P.
Salbutamol Injection I.P.
Salbutamol Inhaler I.P.

Salbutamol Sulphate I.P.
Salbutamol Syrup I.P.
Salbutamol Tablets I.P.

TERBUTALINE

Terbutaline is available as a sulphated salt. It is an odourless, white to grayish white crystalline powder with a bitter taste. It is soluble in water, slightly soluble in alcohol, practically insoluble in ether and chloroform. It should be stored in well closed containers protected from light.



IUPAC Name : N-tert-Butyl-N-[2-(3,5-dihydroxy phenyl)-2-hydroxy ethyl] amine
Actions and uses : Terbutaline sulphate is a direct acting sympathomimetic agent. It is used in the treatment of asthma, chronic bronchitis and other bronchopulmonary disorders involving bronchospasm. Its other actions are similar to salbutamol.
Officials : Terbutaline Sulphate I.P.
Terbutaline Injection I.P.
Terbutaline Tablets I.P.

(1) **Adrenaline** : Biddle sawyer : Brovon inhalant : 10 drops at a time. Two times during the day.
FDC : Midricin inj. : 0.3 ml oralused for subconjunctival inj. only.

(2) **Noradrenaline** : Unicbery : Nodrin inj. : Contents of 1-2 ml or more 2ml. ampoules diluted in 500ml normal saline or 5% glucose soln. Infusion of drop-rate. 0.5 to 1ml/minute.

(3) **Isoprenaline** : Unichem : Isoprin inj. : infused by drip in 500ml normal saline or glucose saline solution.
Wellcome: Neo Epinine tab. : Adults : Sublingually 1 tab. t.i.d.

(4) **Phenylephrine** : Alembic : Wikoryl tab. : 1-2 tab. tid.

(5) **Salbutamol** : Cipla : Asthalin , syrup inhater : tabs. 2-4 times a day.
Franco Indian : Grinlinctus BM : 3-4 mg 3-4 times a day.

(6) **Terbutaline** : Astra IDL : Bricanyl Tab.

(7) **Ephedrine** : B-Wellcome: Actified tabs : Adults & children above 12 days : 1 tab b.i.d.
Rhone-poulenc : Zedex

(8) **Pseudo ephedrine** : Protec : Phencedyl liquid : 5-10 ml t.i.d. Children 2-3 times daily.
Adults & children above 12 yrs : 10ml t.i.d.
Plethico : Recofast plus tabs : 1 tab. 2-3 times daily.

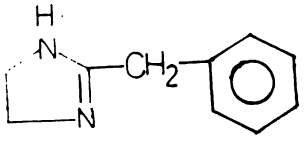
CHAPTER - 17

ADRENERGIC ANTAGONISTS

Adrenergic blocking agents are those that block the adrenergic neuro effecter receptor by competitive antagonism. They do not prevent the action of catacholamines but act as classical adrenergic blocking agents. This agent's block either α (ergot alkaloids and benzodioxaines) or ß-blockers i.e. Propanalol, Practelol, etc.

TOLAZOLINE

Tolazoline is available as its hydrochloride salt . It is an odourless, white to creamy white crystalline powder. It is soluble in water, chloroform and alcohol but practically insoluble in ether. It should be stored in air tight containers protected from light.

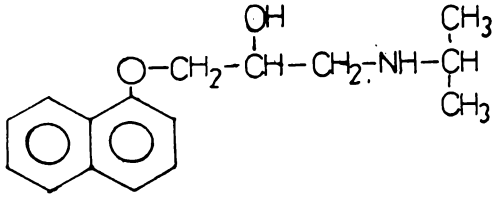


IUPAC Name : 2-Benzyl-2-Imidazoline.

Actions and uses: Tolazoline is an α receptor blocking agent and is used for the treatment of vascular disorders, Raynauds disease and in the treatment of local vascular disorders. The side effects are nausea, vomiting, diarrhoea and postural hypotension.

PROPRANOLOL

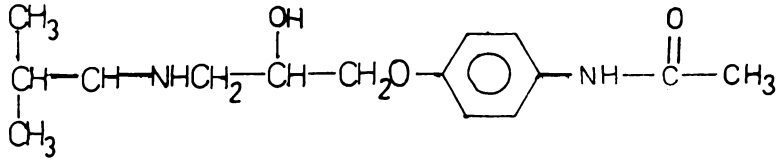
Propranolol is available as propranolol hydrochloride. It is an odourless, white powder having bitter taste. It is slightly soluble in water and alcohol and very slightly soluble in chloroform. It is a hygroscopic compound therefore it should be stored in air tight containers protected from light.



IUPAC Name : N-[2-Hydroxy-3-Naphth-1-yl oxypropyl]—N-isopropyl amine.
Actions and uses : It is a specific adrenergic ß-blocker. It inhibits sympathetic stimulation of the heart. It is used in the treatment of cardiac arrhythmia's associated with heart disease, anesthesia or digitalis intoxication and in auricular fibrillation, it is also used in hyperthyroidism.
Officials : Propranolol Tablets I.P.

PRACTOLOL

Practolol is an odourless, fine, white powder with a bitter taste. It is slightly soluble in alcohol. It is a hygroscopic compound and should be stored in air tight containers protected from light.



IUPAC Name : 4'-(2-Hydroxy-3-isopropylaminopropoxy) acetanilide.
Actions and uses : Practolol has actions and uses similar to propranolol but has more specific cardiac actions and less respiratory actions. It can be recommended for long term therapy and also in the emergency treatment of cardiac arrthymias.

(1) **Propalonol** : M.M. labs : Betazine Tab. : 1 tab. once or twice a day gradually increase upto 5 tabs.
Cipla : Clipar Tab : tab. 80-160mg daily in divided doses; inj. 1-2 mg. i.v. 1ml per minute.

CHAPTER -18

CHOLINERGIC DRUGS

The terms' cholinomimetic (cholinergic) and Parasympathomimetic are not equivalent but are popularly treated as synonyms. Acetylcholine is liberated not only at parasympathetic postganglinoic nerve endings but also at autonomic pre-ganglinoic nerve endings, at central synapses or at somatic motor nerve ending. They exert two types of effects nicotinic action and muscarinic actions.

Most of the therapeutic cholinomimetic drugs are used for their muscarinic actions. These agents stimulate gastro-intestinal smooth muscles and increase peristalsis, contract smooth muscle of urinary bladder, stimulate exocrine glands and produce miosis (pupillary constriction) of eyes.

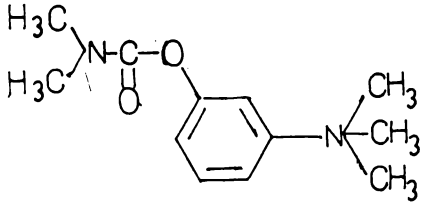
Accumulation of acetylchloline at cholinergic sites is due to inhibition of enzyme acetylcholinesterase that inactivates acetylcholine.

CLASSIFICATION

(1) **Reversible cholinergic drugs** : Neostigmine, Physostigmine, pyridostigmine.
(2) **Irreversible cholinergic drugs** : Di isopropyl fluorophosphate, Echothiophate

NEOSTIGMINE

Neostigmine is available as a bromide and methylsulphate salt. Bromide salt is an odourless, colourless to white crystalline powder, soluble in water, alcohol and ether. It should be stored in airtight containers, protected from light.



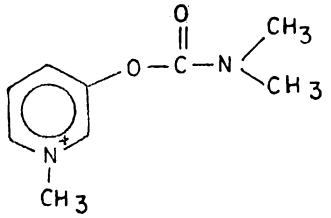
IUPAC Name : 3-(Dimethylcarbamoxyloxy)-NNN tri-methylaniline.
Actions and uses : Neostigmine inhibits the activity of enzyme cholinesterase. It is used mainly for its actions on voluntary muscles and less frequently to increase the activity of involuntary muscles. It is used in the treatment of myasthenia gravis.

It is also used to curtail the muscular relaxation produced by non depolarising neuromuscular blocking drugs like gallamine triethiodide and d-tubocurarine.

Officials : Neostigmine Bromide I.P.
Neostigmine Tablet/ Injection I.P.
Neostigmine Methylsulphate I.P.

PYRIDOSTIGMINE

Pyridostigmine is available as a bromide salt. The salt is a white, deliquescent, crystalline powder with an agreeable characteristic odour and bitter taste. It is soluble in water, alcohol, chloroform but very slightly soluble in ether and petroleum. It should be stored in air tight containers protected from light.

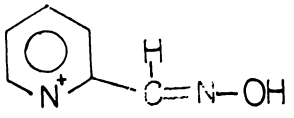


IUPAC Name : 3-Dimethyl carbamoyloxy-1-methylpyridinium.

Actions and uses : Pyridostigmine is less-active than neostigmine but its actions and uses are similar. It is used in the treatment of myasthenia gravis, but it dose not cure the disease completely.

PRALIDOXINE

Pralidoxine is available as a chloride salt. The salt is an odourless, white to pale yellow crystalline powder. It is soluble in water and slightly soluble in alcohol. It should be stored in well-closed containers.



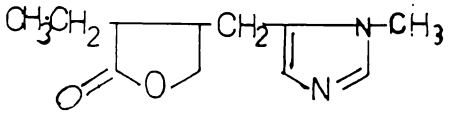
IUPAC Name : 2-Hydroxy iminomethyl-1-methyl pyridinium.

Actions and uses : It is a reactivator of cholinesterase and is used in the treatment of poisoning of organophosphorus compounds, except carbamate pesticides. It may give rise to nausea, headache, dizziness, tachycardia, muscular weakness, etc. .

PILOCARPINE

Pilocarpine is available as a hydrochloride and nitrate salt. It is an alkaloid obtained from leaves of *Pilocarpus microphyllus*. Its hydrochloride salt is an odourless colourless or white crystalline powder. It is soluble in water and alcohol and very slightly soluble in chloroform and ether. It is a hygroscopic compound and

should be stored in air tight containers protected from light. Hydrochloride salt is incompatible with chlorohexidine acetate and phenyl mercuric salt, while nitrate salt is incompatible with chlorhexidene acetate and benzylkonium chloride.



IUPAC name : Ethyl -ß-[1-methyl imidazol-5-ylmethyl] α-butyrolactone.

or

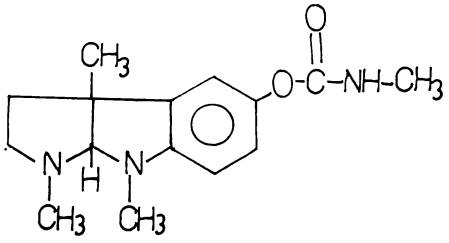
3-Ethyl Dihydro-4-[(Methyl-1H-imidazol-5-yl)]-2(3H)-Furanone.

Actions and uses : Pilocarpine act on muscarinic receptors. It has been used to decrease intra-ocular pressure in glaucoma and to constrict the pupil. The side effects are dryness of mouth, constipation and impaired vision. Pilocarpine poisoning is treated by gastric lavage.

Officials : Pilocarpine Nitrate I.P.

PHYSOSTIGMINE

Physostigmine is an alkaloid obtained from seeds of *Physostigma venenosum.* Physostigmine is available as odourless, colourless crystals. It becomes pink on exposure to air and light. It is soluble in chloroform, slightly soluble in alcohol, ether and water . It should be stored in air tight containers protected from light. It is also available as physostigmine salicylate and physostigmine sulphate. The sulphated salt is soluble in water and alcohol.



IUPAC Name : 1,2, 3,3a,8,8a-Hexahydro-1,3a,8-trimethyl-Pyrrolo [2,3-b] indol-5-yl methylcarbamate [ester].

Actions and uses : Physostigmine inhibits cholinesterase activity and prevents destruction of acetylcholine. Its effects are antagonistic to atropine. It increases salivary , bronchial and gastric secretions and slows the heart rate. It is mainly used as a mitotic or to counteract homatropine or cocaine effect on eye. It reduces intra-ocular pressure in glaucoma. Its side effects are nausea, vomiting, etc.

Official : Physostigmine salicylate I.P.

Physostigmine Injection I.P.

(1) **Neostigmine** : Roche : Prostigmin tab. : 15-30 mg. daily.
Prostigmininj. 1-5mg in with atropine or as directed by physcian.
Tablets India : Tilstigmin tab : 5-20 spread over the day.

(2) **Pralidoxime** : Shree Ganesh : PAMA-Korea inj.

(3) **Pilocarpine** : FDC : Pilocardrops : 1-2 drops or as reqd.

(4) **Physostigmine** : Bell pharma : Bi-miotic.

CHAPTER -19

CHOLINERGIC ANTAGONISTS

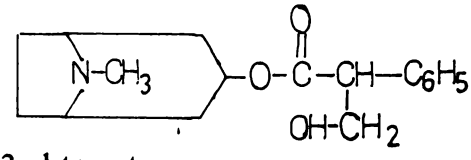
Cholinergic blocking agents block or interfere with the action of acetylcholine at the post-ganglionic parasympathetic nerve endings. These agents are also called as parasympatholytic or anticholinergics or muscarinic receptor blocking agents or antimusacarinic drugs.

Classification :

1. Natural agents : Atropine, Hyoscine (scopolamine).
2. Synthetic agents :
   - (A) Atropine like drugs : Homatropine.
   - (B) Antispasmodic - Antisecretory : Propantheline
   - (C) Antiparkinsonism drugs : Benztropine, Benzhexol

ATROPINE

Atropine is a solanaceous alkaloid (Tropane alkaloid) obtained from plant *Atropa belladona* and different species of *Hyoscyamus niger.* Atropine is an odourless, colourless to white crystalline powder. It is soluble in chloroform and alcohol, and insoluble in water. Its sulphated salt is soluble in water but insoluble in organic solvents. Atropine sulphate is unstable in aqueous solution. It is incompatible with bromides, iodides, quinine, tannic acid and salts of mercury.



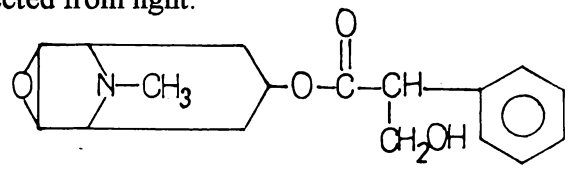
IUPAC Name : Tropane-3-yl-tropate.

Actions and uses : It antagonises the muscarinic actions of acetylcholine. It stimulates central nervous system causing excitement and restlessness but in large doses produces depression. It acts on lower motor centers and diminishes muscular rigidity. It also reduces secretions of salivary and sweat glands. It dilates the pupil and paralyses accommodation. It is given before volatile anesthesia. It is used in the treatment of biliarycolic, gastric and duodenal ulcers, etc. It is also used in the treatment of rheumatism, neuralgia and sciatica.

Officials : Atropine I.P.
Atropine Sulphate I.P
Atropine Sulphate Injection/Tablets I.P.
Atropine Eye Ointment I.P.

HYOSCINE or SCOPOLAMINE

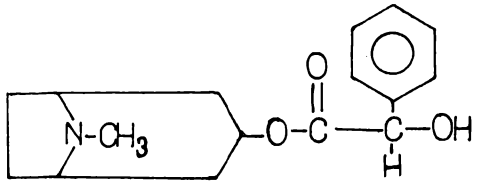
Hyoscine is an alkaloid obtained from various species of DHATURA. It is available as a hydrobromide salt. The hydrobromide salt is an odourless, slightly effervescent, colourless or white crystalline powder. It is soluble in water, slightly soluble in alcohol and very slightly soluble in choloroform. It should be stored in air tight containers protected from light.



IUPAC Name : 6,7-Epoxy-3-[Tropoyloxy] Tropanium.
Actions and uses : Hyoscine is an antagonist to acetylcholine. It produces mydriasis and other actions similar to atropine. It is effective in mania, cerebral excitement, delirium and alcoholism. It is also used for the prevention and treatment of motion sickness.
Official : Hyoscine hydrobromide I.P.
Hyoscine Injection I.P.
Scopolamine hydrobromine Tablet I.P.

HOMATROPINE

Homatropine is available as a hydrobromide salt. It is an odourless, colourless or white crystalline powder. The salt is soluble in water and slightly soluble in alcohol. It should be stored in well closed containers protected from light.

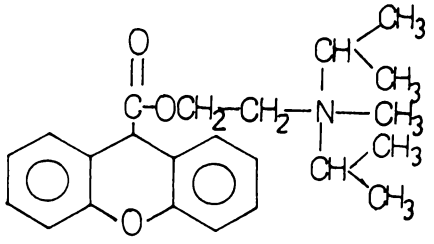


IUPAC Name : 3-[2-Hydroxy-2-phenylacetyloxy] Tropanium.
Actions and uses : Homatropine has actions and uses similar to atropine. It is a powerful mydriatic and has less tendency to increase intra-ocular pressure.

PROPANTHELINE

Propantheline is available as propantheline bromide. It is an odourless, slightly hygroscopic, white or yellowish white powder with a bitter taste. It is soluble

in water, alcohol and chloroform but practically insoluble in ether. It should be stored in air-tight containers.

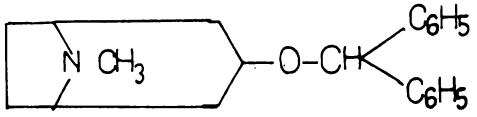


IUPAC Name N,N-Di isopropyl-N-methyl-N-2-[xanthen-9-ylcarbonyl oxy] ethylamine.

Actions and uses : Propantheline has only peripheral actions similar to atropine. It reduces gastric secretions and intestinal motility. It also diminishes biliary and ureteric spasm. It can also be used to control sweating, salivation, etc.

BENZTROPINE

Benztropine is available as a mesylate salt. The salt is an odourless, white crystalline powder with a bitter taste. It is soluble in water and alcohol, and practically insoluble in ether. It should be stored in air tight containers.

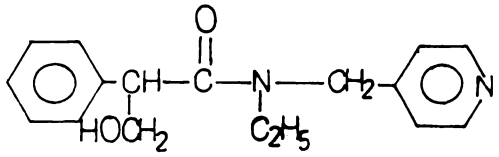


IUPAC Name : 3-Benzhydryloxytropanium

Actions and uses : Benztropine depresses motor cortex and also has antihistaminic actions. It reduces spasm and tremors of voluntary muscles and is used in the treatment of parkinsonism.

TROPICAMIDE

Tropicamide is an odourless, white crystalline powder. It is soluble in choroform and alcohol, and, slightly soluble in water. It should be stored in well closed containers protected from light.

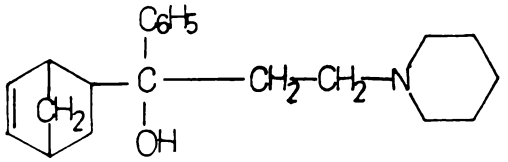


IUPAC Name : N-Ethyl-N-[Pyrid-4-yl methyl] tropamide.

Actions and uses :Tropicamide has cycloplegic and mydriatic properties similar to atropine.

BIPERIDEN

Biperiden is an odourless white crystalline powder. It is soluble in chloroform; sparingly soluble in ether, slightly soluble in alcohol and almost insoluble in water. It is stored in well-closed container protected from light.



IUPAC Name : 1-[Bicyclo(2.2.1) hept-5-en-2-yl]-1-phenyl-3-piperidino propan-1-ol.
Actions and uses : A Biperiden is used in the treatment of idiopathic, encephalitic and arteriosclerotic type of parkinsonism. It is also used in the treatment of dystonic reactions.

(1) **Atropine** : Searle : Lomafen tab. : 2 tabs every 6 hrs.
Searle : Lomotil tab. : 2 tabs every 6 hrs.

(2) **Hyoscine** : German Remedies : Buscopan Tab.

(3) **Homatropine** : Plethico : Lumingy plus cap. : 2 caps b.i.d.
Akil pharma: Methozyne liquid : 2-10 ml b.i.d. or as reqd.

(4) **Propenthaline** : Sun pharma : pepcer tab. : 1 tab tid or as reqd.
Sun pharma : spastheline tab. : According to clinical requirements.

(5) **Tropicamide** : Mepla : Tropisyn drops : As directed by the doctor.

(6)**Propentheline** : Sarle India : Probanthine Tab.

CHAPTER 20

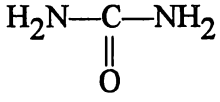
DIURETIC DRUGS

Diuretics are drugs used to increase the volume of urine excreted by the kidneys. These drugs are used for the relief of oedema or ascites that are caused by heart, kidney and liver diseases. These are also effective in the treatment of cardiac oedema and other oedema caused by pregnancy and to reduce raised intraocular pressure. They are also used in glaucoma, epilepsy, migraine hyperkalemia, anginal syndrome, etc. These agents are classified according to their mode of action.

1. **Osmotic Diuretics** :Urea and mannitol.
2. **High ceiling or Loop Diuretics** :Furesemide and ethacrynic acid..
3. **Thiazides** :Chlorthiazide,Hydrochlorthiazide, Benzthiazide.
4. **Potassium sparing or Aldosterone antagonists** : Spironolactone.

UREA

Urea is an odourless, colourless, transparent, slightly hygroscopic crystalline salt having cooling and saline taste. It is soluble in water and boiling alcohol; slightly soluble in alcohol; and practically insoluble in ether and chloroform. It should be stored in well closed containers protected from light.



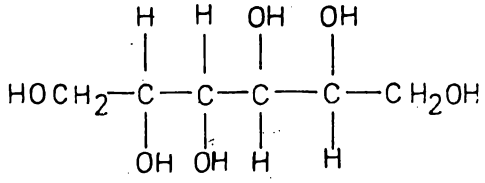
UREA

Actions and uses : When urea is given orally, it is rapidly excreted with an increasing urinary output thus acting as a diuretic. The solution is irritant and care must be taken to avoid extravasation during injection. The cream of urea is used as a keratolytic agent in hyperkeratotic skin conditions.

Officials : Urea I.P.

MANNITOL

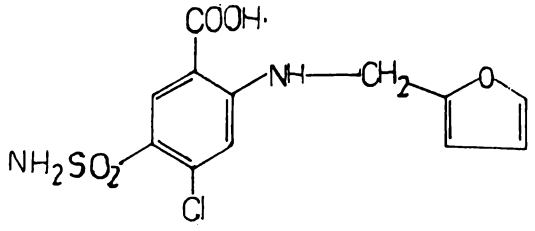
Mannitol is an odourless, white crystalline powder with a sweetish taste. It is soluble in water and slightly soluble in alcohol. It should be stored in well-closed containers protected from light.



IUPAC Name : 1,2,3,4,5,6-Hexane hexa ol. OR Mannose OR sorbitol
Actions and uses : Mannitol is an osmotic diuretic. It is given intravenously for diuretic purposes. It is used for irrigation of bladder, in cerebral injury and as a base in glyceryl trinitrate tablets.
Officials : Mannitol I.P.
Mannitol Injection I.P.

FRUSEMIDE

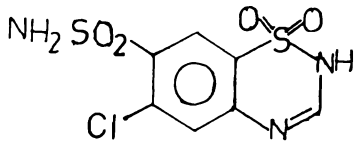
Frusemide is an odourless, tasteless and white crystalline powder. It is soluble in alkali hydroxides, slightly soluble in alcohol, and very slightly soluble in water and chloroform. It should be stored in well-closed containers.



IUPAC Name : 4-Chloro-N-furfuryl-5-sulphamoylanthranilic acid.
Actions and uses : It is a loop diuretic and reduces reabsorption of electrolytes by proximal and distal renal tubules and loop of henle. The excretion of sodium, potassium and chloride ions is increased but serum uric acid concentration will increase in blood. It is used in the treatment of acute renal failure and also in the treatment of hypertension and cerebral oedma.
Officials : Frusemide I.P.
Frusemide Injection I.P.
Frusemide Tablets I.P.

CHLORTHIAZIDE

Chlorthiazide is an odourless, white crystalline powder with a bitter taste. It is slightly soluble in acetone; very slightly soluble in water and alcohol; and practically insoluble in ether and chloroform. It should be stored in air-tight containers.

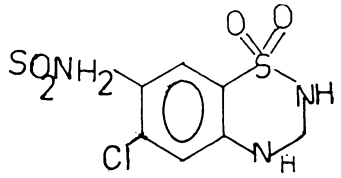


IUPAC Name : 6-Chloro-2H-benzo-1,2,4-thiadiazine-7-sulphonamide 1,1 dioxide.

Actions and uses : It's actions and uses are similar to frusemide. It also inhibits carbonic anhydrases. It is used in the treatment of oedma and toxaemia of pregnancy. It is also given with hypotensive agents in the treatment of hypertension.

HYDROCHLORTHIAZIDE

Hydrochlorthiazide is an odourless, white crystalline powder with bitter taste. It is soluble in alkali hydroxides, slightly soluble in acetone and alcohol, but insoluble in water, ether and chloroform. It should be stored in air-tight containers.



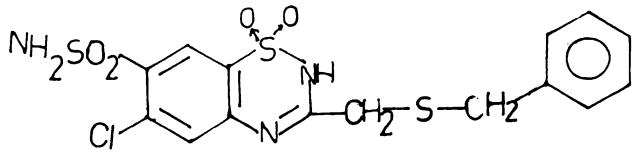
IUPAC Name : 6-Chloro-3,4-dihydro-2H-benzo-1,2,4-thiadiazine-7- sulfonamide-1,1-dioxide.

Actions and uses : Hydrochlorthiazide has a similar action and uses as of other thiazides but it is more effective even in smaller doses.

Official : Hydrochlorthiazide I.P.
Hydrochlorthiazide Tablets I.P.

BENZTHIAZIDE

Benzthiazide has a characteristic odour and taste, and is a white crystalline powder. It is slightly soluble in alcohol, and insoluble in water, chloroform and ether. It should be stored in air-tight containers.

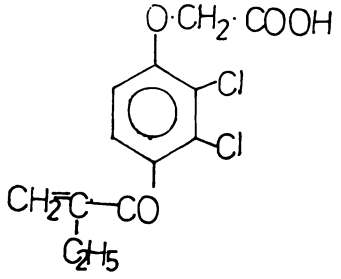


IUPAC Name : 6-Chloro-3-[{(Phenyl methyl)thio }methyl]-2H-benzo-1,2,4 - thiadiazine-7-sulfonamide-1,1-dioxide.

Actions and uses : Benzthiazide has action and uses similar to chlorthiazide. It is used as a diuretic and also as an antihypertensive.

ETHACRYNIC ACID

Ethacrynic acid is an odourless, white crystalline powder. It forms soluble salts with hydroxides and is soluble in alcohol, ether and chloroform but very slightly soluble in water. It should be stored in air-tight containers.



IUPAC Name :2,3-Dichloro-4-(2-ethylacryloyl) Phenoxyacetic acid.

Actions and uses : Ethacrynic acid is a loop diuretic and increases the excretion of sodium, potassium and chlorides. It decreases the urinary pH as well as the excretion of bicarbonates.

Officials : Ethacrynic acid I.P.
Ethacrynic acid Tablets I.P.

(1)**Urea**	: FDC Ltd.	: Cotaryl
(2)**Mannitol**	: Krishna Keshav Ltd.	: Mannitol 5%
(3)**Frusemide**	: Hoechst	: Lasix Tab.
(4)**Hydro chlorthiazide**	: Ciba - Geigy	: Esidrex Tab.

CHAPTER - 21

CARDIOVASCULAR DRUGS

Cardiovascular drugs are the drugs that effect heart or blood vessels or circulatory system directly or indirectly. Generally those drugs that effect the cardiac system directly are called cardiovascular drugs. All the adrenergic drugs, diuretics and anticoagulants are also used in the treatment of cardiac diseases. These agents can be further classified into

(1) Cardiac glycosides : Digitalis,
(2) Antihypertensive agents : Methyldopa, guanithidine
(3) Antianginal agents : Ethyl nitrite, glyceryl trinitrate
(4) Antiarrhythmic agents : Quinine, ethyl alcohol
(5) Antihypercholesterolemic (lipid lowering)agents : Clofibrate.

ETHYL NITRITE

Ethyl nitrite is a colourless to yellowish clear, volatile liquid with characteristic ethereal(Fruity) odour and sweet burning taste. It is miscible with alcohol and ether, and slightly soluble in water. Air, light, moisture and presence of acid or alkali activates decomposition of drug to form oxides of nitrogen and acids. It should be stored in well closed containers protected from light.

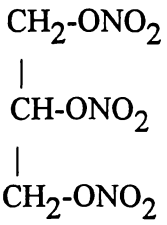
$C_2H_5\text{-}NO_2$

Ethyl nitrite

Actions and uses :Ethyl nitrite is used as a diaphoretic and cardiovascular agent. The side effects of this drug are hypotension and methaemoglobinimea and narcosis.

GLYCERYL TRINITRATE

Glyceryl trinitrate is a clear colourless oily liquid. It is explosive on rapid heating. It is miscible with Chloroform, ether and acetone. It is soluble in glycerol, light petroleum, alcohol, almond oil and very slightly soluble in water. It is a very unstable compound may deteriorate and in the presence of cotton, cork, paper, plastic, rubber, wool and elevated temperature. It should be stored in air-tight containers protected from light below 25°C.

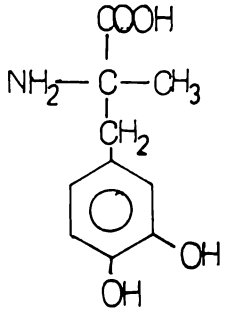


IUPAC Name : 1,2,3-propane trinitrite.

Actions and uses : Glyceryltrinitrate relaxes involuntary muscles leading to dilatation of arterioles. It is used in the prophylactic and treatment of angina and to relieve colic of renal and gall bladder.

ALPHA-METHYLDOPA

Alpha-Methyldopa is an odourless, tasteless white to yellowish white powder. It is soluble in dilute hydrochloric acid, slightly soluble in water and alcohol, and very slightly soluble in ether. It should be stored in air-tight containers protected from light.



IUPAC Name : 3-(3,4-Dihydroxy phenyl)-2-methyl-L-alanine.

Actions and uses : Alpha methyldopa inhibits conversion of dopa to dopamine by competing for the enzyme dopa-decarboxylase and reduction in the formation of noradrenaline. It is used as an antihypertensive agent and as a CNS depressant. The side effects include depression, dryness of mouth, diarrhoea, liver damage, etc.

Officials : Methyldopa I.P.
Methyldopa Tablets I.P.

ANTI-HYPERTENSIVE AGENTS

Hypertension is a disease characterised by abnormally high blood pressure. The syndrome of essential hypertension is characterised by elevation of diastolic blood pressure .Hypertension is classified into:

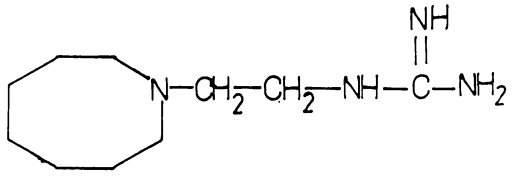
(A) Primary [Essential or Idiopathic] hypertension : For which the exact cause is not known.

(B) Secondary hypertension : This may be due to renal, endocrine or vascular lesions. Antihypertensive drugs are classified according to the site of action. It is calssified as :

(1) Drugs acting on CNS : Clonidine, Alpha methyl dopa
(2) Drugs acting on ANS
  (A) Ganglion blockers : Hexamethonium, Pentolinium, Pempidine
  (B) Adrenergic receptor blockers : Phenoxybenzamine, Phenoxy ,Propronolol
  (C) Adrenergic neurone blockers : Guenethidine, Bethenidine ,Debrisoquine
(3) Catecholamine depletors : Reserpine
(4) Vasodilators : Diazoxide
(5) Oral diuretics : Thiazides
(6) Renin angiotensin antagonists : Seralasin
(7) Drugs acting reflexly : Veratrum alkaloids
(8) Miscellaneous drugs : Pargylline

GUANETHIDINE

Guanethidine is available as its monosulphate salt. The salt is an odourless, colourless crystalline powder. It is soluble in water, very slightly soluble in alcohol, and practically insoluble in ether and chloroform. It should be stored in air tight containers proteced from light.



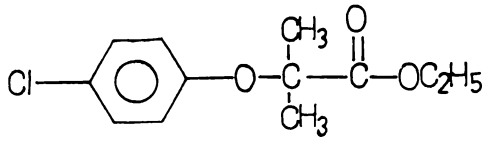
IUPAC Name : 1-[2-(perhydroazocin-1-yl)ethyl] guanidine

Actions and uses : Guanethidine is a hypotensive agent that lowers the blood pressure by blocking transmission in post ganglionic adrenergic nerve. It is also useful to reduce blood pressure in patients with phaeochromocytoma. Its eye drops were used for mydriasis and to reduce intra-ocular pressure. The side effects of this drug include diarrhoea.

Officials : Guanethidine Sulphate I.P.
Guanethidine Tablets I.P.

CLOFIBRATE

Clofibrate is a colourless liquid ,with characteristic faint acrid odour. The taste is acrid that turns sweet. It is very slightly soluble in water, and miscible with alcohol, ether and chloroform. It should be stored in well closed containers.



IUPAC Name : Ethyl-2-[4-Chlorophenoxy]-2-methyl propionate

Actions and uses : Clofibrate reduces elevated levels of triglycerides, phospholipids and plasmocholestrol concentration. It also reduces platelet sickness and fibrinogen concentration thereby causing fibrinolysis. It is used in hyper-triglyceridema, hyper-cholesterolemia. Its side effects are nausea, diarrhoea and pain in muscles.

Officials : Clofibrate I.P.
Clofibrate Capsules I.P.

CARDIAC ARRHYTHMIA'S

Disturbances in cardiac rhythm are called as cardiac arrhythmia's. Mortarlity rate in acute myocardial infarction can be decreased by the urgent treatment of various arrhythmia's. Antifibrillatory drugs are compounds which prevents the development of atrial or ventricular fibrillation.

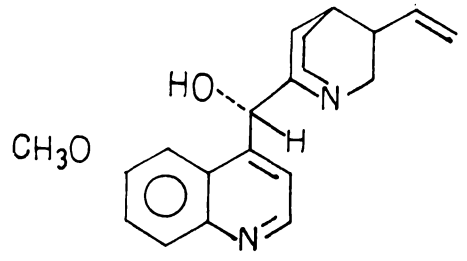
Cardiac arrhythmia's may be due to either disorders of impulse formation or disorders of impulse conduction. Tachyarrhythmias are due to disturbed impulse formation or irregular and rhythmic discharge from ectopic pace-maker. The drugs used in the treatment of cardiac arrhythmia's are :

(I) Myocardial depressants :
- (A) Electro-physiological depressants : Quinidine, procanamide.
- (B) Electro-physiologically partial depressants : Lignocain, Phenytoin

(II) Drugs acting on A.N.S.[Beta adrenergic blockers] : Propranolol.
(III) Calcium Channel blocker : Verapamil
(IV) Digitalis and analogues
(V) Drugs which prolong repolarisation.

QUINIDINE

Quinidine is an alkaloid obtained from the bark of various species of cinchona. It is an odourless, neddle like white crystalline substance possessing very bitter taste. It is insoluble in water but soluble in organic solvents. It is also available as quinine sulphate that is soluble in water and insoluble in organic solvents. It should be stored in air tight containers protected from light.



IUPAC Name : α-[6-methoxy quinolin-4-yl]- α-[5-vinyl quinuclidin-2-yl] methanol.

Actions and uses : Quinidine acts on cardiac muscles and increases the refractory period of contraction thereby decreases rate of contractions. It is used in the treatment of auricular fibrillation and paroxysmal ventricular tachycardia. The side effects of this drug include are palpitation, diminution of vision, headache, nausea, vomiting etc.

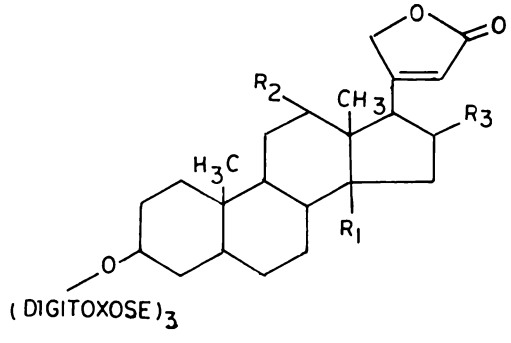
Officials : Quinidine Sulphate I.P.
Quinidine Tablets I.P.

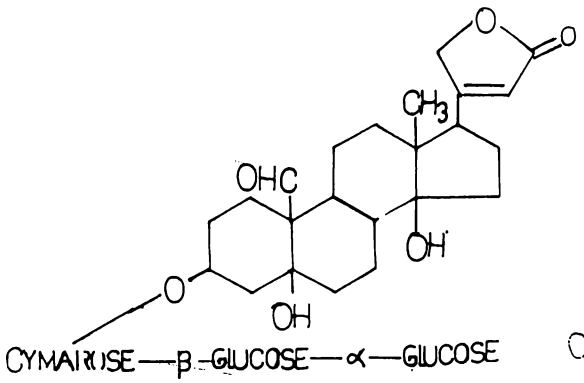
CARDIOTONICS OR CARDIAC GLYCOSIDES

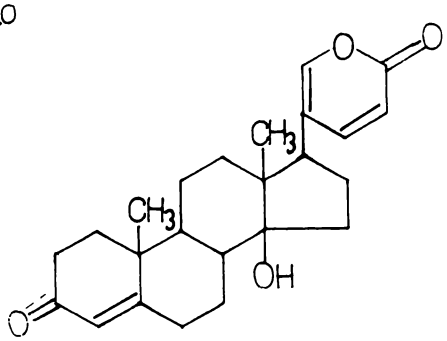
The Cardiac glycosides are sweet compounds containing sugar moiety (Glycon) and non-sugar moiety (aglycon). The aglycon is responsible for the different actions of glycosides. The cardiac glycosides contain steroidal (Cyclo pentophenanthrene) nucleus of C-23 carbon. In these aglycon ring C & D junction is in cis-Configuration. The lactone ring is attached to the C-17 position of steroidal skeleton which is important for cardiac activity. The sugar moiety is attached at C-3 by an ethereal linkage. The sugar attached is either ribose, digitoxose, glucose, cymarose, etc. These are further classified into two types.

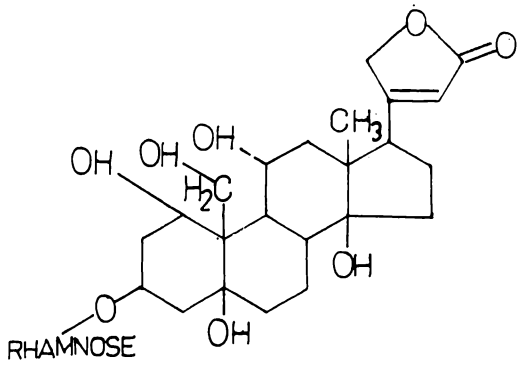
(A) Cardenolides : These glycosides contain five membered lactone ring attached to C-17 of steroidal nucleus the example of cardenolides : digitoxigenin, gitoxigenin, digoxigenin and ovabagenin

(B) Bufadienolides: These are C-24 homologues of cardenolides containing six membered lactone ring attached to C-17 of steroidal nucleus. It also possesses a double bond. It has low therapeutic index. The example of bufadienalides are scillaren A and scillaren B obtained from *Urginea maritima.* These cardenolides increase the tone of cardiac muscles and are used in the treatment of congestive heart failure and cardiac tachyarrhythmia. It is also used in cardiac failure by increased force of myocardial contraction. Scillaren is a bufadienolide. It is a white or yellowish white, odourless, granular and bitter in taste. It is soluble in alcohol and methanol, and slightly soluble in water. It contains rhamnose and glucose as glycon moiety. It has similar action and used as cardenolides but it is less potent.









(1) **Glyceryl trinitrite** : Wellcome : Angised tabs : 0.5 mg every 3 minutes till pain appears.
Cadila : Myovin oint : 1.5-3.5 cm rub thrice daily.

(2) **Alpha methyldopa** : Merind : Alphadopa : 0.5-2 gm daily in divided doses.
IDPL : Emdopa : 0.5-2 gm daily in divided doses.

(3) **Clofibrate** :Sigma Lab.: Clofert tabs : 1-3 cap 3-4 times daily.

(4) **Quinidine** : Frano india : Natcardine tab : 200-300 mg 3-4 times daily.
Wellcome : Quinidine tabs : 200-300 mg 3-4 times daily.

CHAPTER - 22

HYPOGLYCEMIC AGENTS

Pancreas consists of glandular tissue. It secretes digestive enzymes, glucagon and insulin. An isolated group of cells within pancreas is called as islets of langerhons. These cells are divided into two parts as per their secretary nature. The cells secreting glucagon are called α-cells and cells secreting insulin are called ß-cells.

Insulin plays an important role in digestion and utilisation (Catabolism) of food material. It is essential for the phosphorylation of glucose to glucose-6-phosphate. Glucose-6-phosphate is further catabolised to give energy. In certain individuals glucose level in blood increases due to lack of sufficient insulin. This condition is called hyperglycemia. The disease is called diabetes mellitus. Hypoglycemic agents can be classified as :

(1) Insulin and its preparations :
(2) Synthetic compounds :
  (A) Sulfonyl ureas : Chlorpropamide, Tolbutamide, Glibenclamide
  (B) Biguanides : Phenformin , Metformin

INSULIN

Insulin is a polypetide hormone secreted by ß-cells of islets of langerhans present in pancreas of all vertebrates. It is the first protein whose chemical structure and molecular weight was determined. It contains 51 amino acids having a molecular weight of six thousand. Insulin comprises of a polypeptide chain. The 51 amino acids are present in two chains. Chain A contains 21 amino acids and chain B contains 30 amino acids and both these chains are united by two disulfide (-s-s-) linkage. It is present as a macromolecule of molecular weight 12 to 36 thousands depending on the pH of the solution. The iso-electric point of insulin is 5.3.

Commercially insulin is obtained by the extraction from bovine or porcine pancreas or as a mixture of both these pancreas purified by recrystallisation. Human insulin is produced by enzymatic modification of insulin obtained from porcine pancreas. Human insulin is also produced by the chemical combination of A & B

chains obtained by genetically modified technology of DNA recombination in bacteria. Insulin obtained by this technology is called biosynthetic human insulin.

Crystalline insulin preparation contains small amounts of heavy metals such as cadmium ,cobalt, nickel and zinc. Insulin is available as amorphous as well as crystalline powder in combination with heavy metal salts.

Insulin plays an important role in transport of glucose through cell membrane; protein synthesis in muscles, fatty acid synthesis and increase in deposition of fats in liver and adipose tissue.

Insulin also helps in oxidative phosphorylation, oxidation in T.C.A. (Tricarboxylic acid) cycle and conversion of glucose to glucose-6-phosphate with utilisation of energy (ATP). This conversion is followed by reversible transport of glucose through cell membrane. Pure insulin has a rapid onset and short duration of action. Amorphous form of insulin is having more rapid action and less duration of action as compared to crystalline form. The duration of action can be increased by esterification of insulin with metal or with protein (globin or protamine). These esterified products have a longer duration of action and onset of action is also fast.

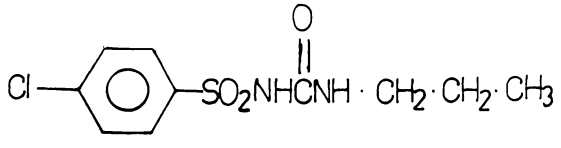
Insulin therapy is given by admixturing various amorphous and crystalline forms as per the dose requirement of individual patient. It is a protein and is destroyed by G.I.T.secretions, therefore it should not be given orally. It should be given subcutaneously or intramuscularly. The market preparation has a potency not less than 95%. The potency is 40, 80, 100 or 500 insulin units in each ml.

Insulin is used in the treatment of Diabetes Mellitus. Side effects of insulin therapy are sweating, palpitation, anxiety and hunger.

Officials : Globin Zinc Insulin Injection I.P.
Insulin Zinc Suspension I.P.
Protamine Zinc Insulin Injection I.P.
Insulin Injection I.P.
Isophane Insulin Injection I.P.

CHLORPROPAMIDE

Chlorpropamide is an odourless, tasteless and white crystalline powder. It is soluble in alkali hydroxides, acetone and chloroform, slightly soluble in ether, and insoluble in water. It should be stored in well closed containers protected from light.



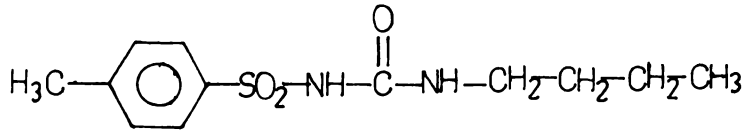
IUPAC Name : 1-[4-Chloro benzene sulfony]-3-propyl urea

Actions and uses : Chlorpropamide is an oral hypoglycemic agent. It acts by stimulating beta-cells of islets of langerhans, which stimulates release of insulin. It is only effective when islets tissue is functional. It is used in non Insulin dependent Diabetes. It is unsuitable for the patients with Diabetic ketosis. The side effects include gastro-intestinal disturbances, intolerance to alcohol, skin sensitization etc.

Officials : Chlorpropamide I.P.
Chlorpropamide Tablets I.P.

TOLBUTAMIDE

Tolbutamide is an odourless white crystalline powder. It is soluble in alkali, mineral acids, acetone and alcohol but insoluble in water. It should be stored in well closed containers protected from light.



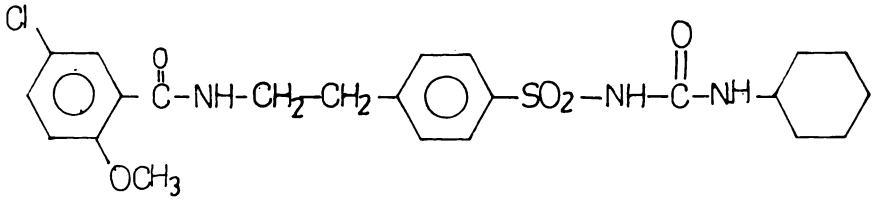
IUPAC Name : 1-Butyl-3-tosylurea.

Actions and uses : Tolbutamide has actions and uses similar to chlorpropamide but has shorter duration of action.

Officials : Tolbutamide I.P.
Tolbutamide Tablets I.P.

GLIBENCLAMIDE

Glibenclamide is an odourless, white crystalline powder. It is slightly soluble in chloroform, methanol and alcohol but very slightly soluble in water and ether. It should be stored in well closed containers protected from light.



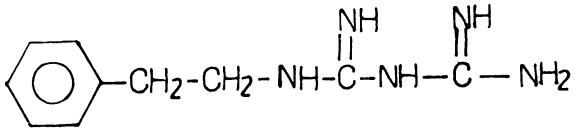
IUPAC Name : 1-[4-{ 2-(5-Chloro-2-methoxy benzamido) ethyl }benzene sulphonyl]-3- cyclohexyl urea.

Actions and uses : Glibenclamide is an oral hypoglycemic agent. It has actions and uses similar to chorpropamide. Patients who fail to respond to other hypoglycemic agents may sometimes respond to it or in combination with biguanides.

Officials : Glibenclamide I.P.
Glibenclamide Tablets I.P.

PHENFORMIN

Phenformin is available as a hydrochloride salt. It is an odourless, white crystalline powder with a bitter taste. It is soluble in water and alcohol but insoluble in ether and chloroform. It should be stored in air tight containers.



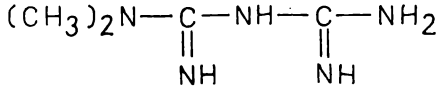
IUPAC Name : 1-Phen ethyl biguanide.

Actions and uses : Phenformin is a biguanide derivative. It acts by increasing the peripheral utilisation of glucose and inhibits gluco-neogenesis in Diabetes. These agents usually give rise to gain in weight and does not encourage lipogenesis. It reduces insulin requirements of young Diabetics The side effects include nausea, vomiting, diarrhoea and anorexia.

Officials : Phenformin Hydrochloride I.P.
Phenformin Tablets I.P.

METFORMIN

Metformin is available as a hydrochloride salt. It is an odourless, white crystalline powder with bitter taste. The salt is soluble in water, sparingly soluble in alcohol, and insoluble in ether and chloroform. It is a hygroscopic compound. It should be stored in air tight containers.



IUPAC Name: 1,1-dimethyl biguanide.

Actions and uses : Metformin is an oral hypoglycemic agent having actions and uses similar to phenformin. It is unsuitable for the treatment of young diabetics. It should not be given to patients suffering from diabeties with severe acidosis, hepatic and renal diseases, etc.

Officials : Metformin Hydrochloride I.P.
Metformin Tablets I.P.

(1) **Insulin**: Torrent : Human Actrapid

(2) **Chlorpropamide** : Deys : Copamide tab : Dose Adults initially 100-250 mg once .
Pfizer : Diabinese tab : daily after breakfast.

(3) **Tolbutamide** : Hoechst : Rastinon tab: Daily 0.5-200 gm.

(4) **Glibenclamide** : Heochst : Daonil tabs : Dose: initially 2.5mg daily at breakfast.
Medopharm: Gluhic tabs.

(5) **Phenformin** : USV : DBI: Adults : 25 mg 1-4 times daily.

(6) **Metformin** : Franco India : Glyciphage tab : Adults : 250 mg 2-3 times daily.
Wallace : Walaphage tab

CHAPTER - 23

COAGULANTS AND ANTICOAGULANTS

Coagulation is a complex phenomenon. In this process prothrombin is converted to thrombin and fibrinogen is converted to fibrin. Fibrin forms a net in which blood cells get entangled to block the bleeding. The conversion of prothrombin to thrombin is achieved by factor X in the presence of calcium, phospholipids and factor V. Activated factor X may initiate coagulation place either by intrinsic system or by extrinsic system. Formation of factor X by intrinsic system takes more time as compared to extrinsic factor (Twenty-four seconds). This formation of thrombin splits fibrinogen molecules into small fibres. These fibres unite end to end and side to side to form an insoluble net of fibrin. The clot or fibrin can be destroyed with the help of plasma components called antithrombin. If clots are formed in the vascular system, it can be removed by proteolytic enzyme fibrinolysin or plasmin.

ANTICOAGULANTS

These agents are used in the treatment of cardiovascular disease such as myocardial infarction, venous thrombosis and to prevent thrombosis after operation. These agents prolong the duration of coagulation of blood.

HEPARIN

Heparin is available as calcium and sodium salt. Heparin sodium is a white crystalline and hygroscopic powder. It is soluble in water. It should be stored in sealed containers protected from micro-organisms.

Actions and uses : Heparin sodium inhibits blood clotting in vivo and in vitro by combining with certain fractions of plasma protein. It inhibits conversion of prothrombin to thrombin, antagonises thromboplastin and prevents formation of thrombin. Heparin is ineffective when taken orally but very well effective by intravenous injection. It is used as an anticoagulant in vascular surgery and in blood transfusions. It is also used in the treatment of arterial and venous thrombosis. It prevents coagulation during dialysis and as an adjunct to thrombolytic therapy. The side effects include haemorrhage, thrombocytopenia and allergic reactions.

Officials : Heparin sodium I.P.
Heparin sodium Injection I.P.

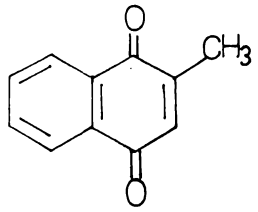
THROMBIN

Thrombin is cream coloured and is readily soluble in saline and forms a cloudy pale yellow solution. It should be stored in nitrogen atmosphere, in a sterile sealed container below 25°C and protected from light.

Thrombin solution in sodium chloride is used in conjuction with fibrinogen and human fibrin. A care should be taken when dried human thrombin is used which may transmit viral hepatitis.

MENADIONE [Vit.K]

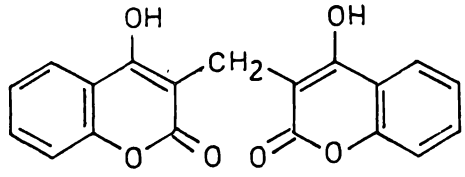
Menadione is a bright yellow, crystalline and odourless powder. It is soluble in vegetable oils, benzene, sparingly soluble in chloroform and practically insoluble in water. It should be stored in well closed containers protected from light.



IUPAC Name : 2-Methyl naphthalene-1,4-dione.
Actions and uses : Menadione has an antihaemorrhagic action and also inhibits glucose metabolism. The side effects are irritation to skin and respiratory tract.
Officials : Menadione I.P.

BISHYDROXYCOUMARIN

Bishydroxycoumarin is also called Di-CUMAROL. It is a white crystalline powder, faint pleasant odour and slightly bitter in taste. It is soluble in alkali hydroxides; slightly soluble in chloroform ; and insoluble in water, alcohol and ether. It should be stored in well closed containers.

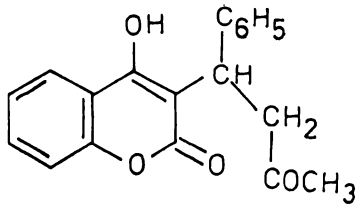


IUPAC Name : 3,3'-methylenebis [4-hydroxy coumarin]
Actions and uses : Bishydroxycoumarin is a prothrombopenic anticoagulant depresses hepatic production of prothrombin. It competes with vitamin K, therefore lowers the blood level of prothrombin and less blood is coagulable. It can be used for long term anticoagulant therapy and is effective orally .

It is used in the treatment of pulmonary embolism, post operative thrombo phlebitics, prophylaxis of post operative venous thrombosis, etc.

WARFARIN

Warfarin is available as warfarin sodium. It is an odourless, white crystalline powder having slightly bitter taste. It is soluble in water, alcohol and very slightly soluble in ether and chloroform. It should be stored in air tight containers protected from light.



IUPAC Name : 4-Hydroxy-3-[3-oxo-1-phenylbutyl] coumarin.

Actions and uses : Warfarin is a prolong prothrombin time inhibiting anticoagulant. It acts by inhibiting the formation of factor VII. An intra-venous heparin is given for immediate blood coagulation effect. It is used in the treatment of thrombosis in veins or arteries. It reduces the risk of embolism and given in the treatment of post operative thrombosis. It should not be used in the treatment of cerebral thrombosis. It is also used as rodenticides.

(1) **Heparin** : Biological C : Beparine inj : Adults : IV 10,000-12500 i.v. state.
Pecon : Delcot inj.

(2) **Menadeone** : Sterling tabs : Gynae c.v.p. : 1-3 caps daily in divided doses.
Indon : Styptindon tab : 1-2 tab 3 times daily.

(3) **Warfarin sodium** : Unichem : Uniwarfin tab : 10-15 mg daily.

CHAPTER - 24

HISTAMINE AND ANTIHISTAMINIC AGENTS

Histamine is a potent biogenic amine, formed by decarboxylation of amino acids [Histidine] by the presence of enzyme histidine decarboxylase. Histidine is present in platelets, leucocytes, basophills, mast cells, biological fluid, lungs and gastrointestinal mucosa. Histamine acts on three type of receptors, H_1, H_2 and H_3.

Stimulation of H_1, receptors is associated with increased intra cellular cyclic guanosine 3,5 monophosphate [CGMP]. It stimulates smooth muscle contraction, vascular permeability and mucous secretion.

Activation of H_2 receptors is associated with decreasing CGMP. It increases gastric acid secretion. Both H_1 and H_2 receptors are involved in the vascular dilatation and in edema formation.

Antihistaminic are the drugs which antagonise the actions of histamine. These drugs are classified as.

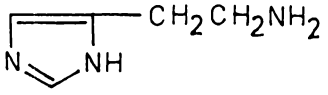
(1) H_1 receptor antagonists :

(A) Ethanolamine derivative	: Diphenhydramine.
(B) Ethelene Di amine derivative	: Mepyramine.
(C) Alkylamine derivative	: Chlorpheniramine.
(D) Piperazine derivative	: Chlorcyclizine, Meclizine,Buclizine, Cyclizine, Cyproheptadine.
(E) Phenothiazines	: Promethazine.
(F) Newer non sedating H_1 Antihistaminics	: Cetrizine,Loratidine, Astemizole

(2) H_2 receptor antagonists : Cimetidine, Ranitidine, Famotidine, Oxmetidine.

HISTAMINE

Histamine is a crystalline compound. It is soluble in water, alcohol and chloroform but sparingly soluble in ether. It is available as histamine dihydrochloride salt. The salt is hygroscopic in nature. It should be stored in well closed containers protected from light.



IUPAC Name : Imidazole-4-ethylamine.

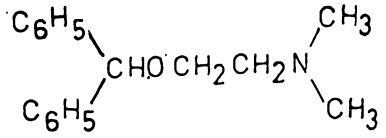
Actions and uses : Histamine is present in abundance and is formed in the tissues. The various actions of H_1 receptors and H_2 receptors have already been discussed above. It is used to diagnose impairment of the acid producing cells of the stomach and in hyposensitization.

The side effects of histamin therapy are headache fall in blood pressure tachycardia, visual disturbances, vomiting, diarrhoea, flushing of skin, etc.

Officials : Histamine Acid Phosphate I.P.
Histamine Acid Phosphate Injection I.P.

DIPHENHYDRAMINE

Diphenhydramine is available as diphenhydramine hydrochloride. The salt is an odourless, white crystalline powder with a bitter taste followed by sensation of numbness. It is soluble in water and alcohol, slightly in acetone and ether. It should be stored in air tight containers protected from light.



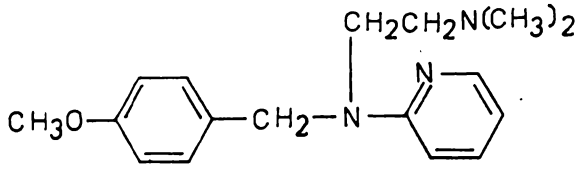
IUPAC Name : 2-Benzhydroxy ethyl-N N-dimethyl amine.

Actions and uses : Diphenhydramine is an H_1 antagonist. It causes sedation and possesses antiemetic and antimuscarinic effects. It is used in the treatment of nausea, vomiting, motion sickness and parkinsonian symptoms. It is also added in cough and cold preparations.

Officials : Diphenhydramine Hydrochloride I.P.
Diphenhydramine Capsules I.P.

MEPYRAMINE

Mepyramine is available as mepyramine maleate. The salt is an odourless, white or creamy powder and is bitter in taste. It is freely soluble in water, alcohol and chloroform. It should be stored in well closed containers protected from light.



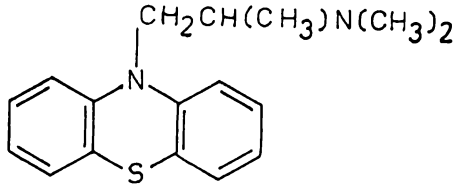
IUPAC Name: 2-[N-p-Anisyl-N-2-pyridyl amino]ethyl di methylamine.

Actions and uses : Mepyramine is mainly used in the treatment of allergy, anaphylactic condition, hay fever, urticaria, etc.

Officials : Mepyramine Maleate I.P.
Mepyramine Tablets I.P.

PROMETHAZINE

Promethazine is available as hydrochloride salt. The salt is an odourless white or faintly yellowish crystalline powder with a bitter taste. It is soluble in water, chloroform and alcohol. The compound is unstable in aqueous solutions when exposed to heat, light, air or oxygen. It should therefore be stored in well closed containers protected from light.



IUPAC Name : 10-[2-Dimethyl aminopropyl] phenothiazine.

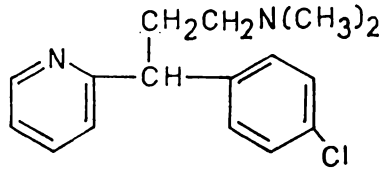
Actions and uses : Promethazine is a powerful long acting H_1 antagonist. It has effects on involuntary muscles of intestine, bladder, uterus and bronchioles. It also antagonises vasodilatory and vasoconstrictor action of histamine. The duration of action is long (20 hours) therefore its use is restricted.

It is used in the treatment of allergic reactions of skin and mucous membrane. It is also used for prevention and treatment of vomiting, motion-sickness, nausea and radiation sickness.

Officials : Promethazine Hydrochloride I.P.
Promethazine Injection I.P.
Promethazine Syrup I.P.
Promethazine Tablets I.P.
Promethazin Theoclate I.P.

CHLORPHENIRAMINE

Chlorpheniramine is available as maleate salt. The salt is an odourless, white crystalline powder with a bitter taste. It is soluble in water, alcohol and chloroform but very slightly soluble in ether. It should be stored in well closed containers protected from light.



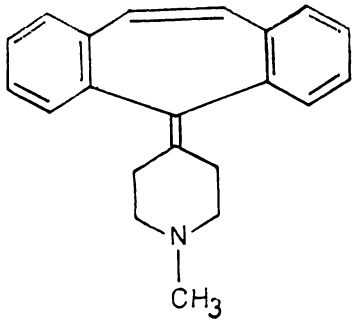
IUPAC Name : 3-[4-Chlorophenyl]-3-[pyrid-2-yl]-N,N-dimethyl propyl amine.

Actions and uses : Chlorpheniramine has actions and uses similar to promethazine hydrochloride but it is effective in smaller doses and does not produce antiemetic effect.

Officials : Chlorpheniramine Maleate I.P.
Chlorpheniramine Elixir/Tablets I.P.

CYPROHEPTADINE

Cyproheptadine is available as a hydrochloride salt. The salt is an odourless, white yellow crystalline powder with a bitter taste. It should be stored in air tight containers.



IUPAC Name: 4-[5H-Dibenzo (a,d) cyclohepten-5-ylidene] -1-methyl piperidine.

Actions and uses : Cyproheptidine has actions and uses similar to promethazine. It is also used to stimulate appetite and in treatment of migraine, headache, cushing's disease and allergic reactions.

Officials : Cyproheptadine Hydrochloride I.P.
Cyproheptadine Hydrochloride Syrup I.P.
Cyproheptadine Tablet I.P.

(1) **Histamine** : John wyeth : Algipan : Apply cream in affected areas.

(2) **Diphehydramine** : Parke davis : Benadryl syp. : Adults : 10-25ml 3-4 times daily.
Astra\Idl : Mucosol syp. 5-10ml 2-3 times daily.

(3) **Promethazine** : Rhone poulenc: Phenergan tab./ Ellixir/ syp. : 25mg at night 6-10ml during day.
Rhone poulnec: Phenseryl syp. : 5-10ml b.i.d.

(4) **Cyproheptadine** : Merind : Practin Tab.

(5) **Chlorpheniramine** : Glaxo : Piriton expectorant.

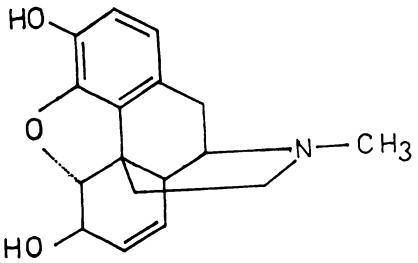
CHAPTER - 25

ANALGESICS AND ANTIPYRETICS

Analgesics are agents which relieve pain without loss of consciousness. Pain is an unpleasant sensation and cannot be defined objectively. Clinically pain can be of superficial pain, deep non-visceral pain from muscles, joints, ligaments and bones; visceral pain, and functional pain. Important analgesics include morphine and related compounds. Some synthetic compounds are also active as analgesics e.g. butorphanol, methadone, buprenorphine.

MORPHINE

Morphine is an alkaloid obtained from unripe fruit of *Papaver somniferum*. It is available as morphine hydrochloride and morphine sulphate. Its hydrochloride salt is an odourless, colourless, silky crystalline powder having bitter taste. It is soluble in glycerol and water, slightly soluble in alcohol and insoluble in chloroform. It is incompatible with ammonia. It should be stored in air tight containers, protected from light.



IUPAC Name : 4a,5,7a,8,9,9c Hexahydro-12-methyl-8, 9c-imino ethophenanthrol(4,5 b cd) furan-3,5-diol.

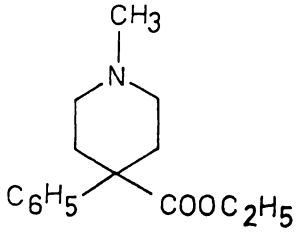
Actions and uses : Morphine is a powerful analgesic and narcotic. It is a central nervous system stimulant. It depresses thalamus, sensory cortex, respiratory and cough centres. It stimulates spinal cord, vagous and vomiting centre. Morphine increases tone of involuntary muscles like sphincters of gastro-intestinal track. It reduces secretions and dilates skin vessels. It is used to relieve pain, anxiety and sleeplessness due to pain.

The major drawback of morphine is to make person dependent on the drug and produces marked euphoria. In morphine poisoning cases saline purgatives are given to reduce rate of absorption of drug and 0.2% potassium permanganate solution is used for gastric lavage.

Officials : Morphine Hydrochloride I.P.
Morphine Hydrochloride Solution I.P.
Morphine Sulphate I.P.
Morphine and Atropine Injection I.P.
Ethyl Morphine Hydrochloride I.P.

PETHIDINE

Pethidine is available as pethidine hydrochloride. The salt is an odourless, white crystalline powder with a slightly acidic bitter taste. It is soluble in water, alcohol and chloroform but very slightly soluble in acetone. It should be stored in well closed containers protected from light.



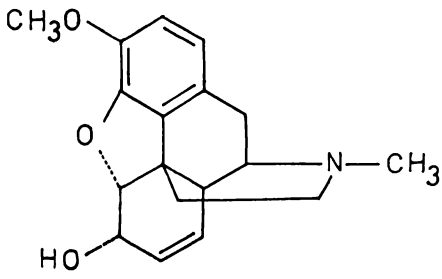
IUPAC Name : 4-Ethoxycarbonyl-1-methyl-4-phenyl piperidin.

Actions and uses : It has local effect on nerve fibres and nerve endings. It is used to relieve more severe types of pain. Its spasmolytic action is less important. It is used to relieve pain in most medical or surgical conditions post operative conditions. It is a useful alternate to morphine for control of pain. Barbiturates or hyoscine may be given concurrently to enhance sedation and to depress memory. Diphenoxylate and Fentanyl are pethidine analogeses having similar actions to pethidine.

Officials : Pethidine Hydrochloride I.P.
Pethidine Injection I.P.
Pethidine Tablets I.P.

CODEINE

Codeine is an alkaloid obtained from latex of unripe fruit of *Papaverum somniferum.* It is available as codeine phosphate. The salt is an odourless, colourless or white crystalline powder with a bitter taste. It should be stored in air tight containers protected from light.



IUPAC Name : 3-O-Methyal morphine

or

4a,5,7a,8,9,9c -Hexahydro- 12-methyl-8, 9c-imino ethanophenanthrol (4,5bcd) furan-3-methoxy-5-ol.

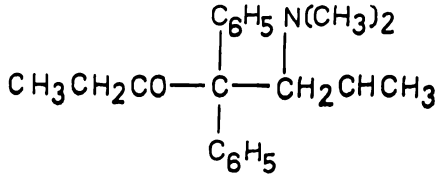
Actions and uses : Codeine is a modrate analgesic and has cough suppressant effect. It is less depressant to respiratory centre.

Officials : Codeine Phosphate I.P

Codeine Phosphate Syrup I.P.

METHADONE

Methadone is available as methadone hydrochloride. The salt is an odourless, colourless to white crystalline powder with bitter taste. It is soluble in chloroform, alcohol and water but practically insoluble in ether. It is incompatible with certain dyes. It should be stored in well closed containers.



IUPAC Name : N,N-Dimethyl-N-[5-oxo-4,4-diphenyl heptane-2-yl] amine.

Actions and uses : Methadone has similar actions and uses as morphine hydrochloride. It is a less potent analgesic but has a delayed onset of action. It is not used as a pre-anaesthetic agent because of less sedative action. It depresses cough centre and respiratory centre therefore it is undesirable for as an obstetric analgesic. It is used to treat morphine addicts as thereputic substitutent.

Officials : Methadone Injection I.P.

Methadone Tablets I.P.

Methadone Hydrochloride I.P.

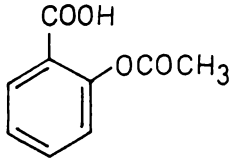
ANTIPYRETICS

Fever is defined as an increase in body temperature because of abnormal hypothalamic thermostat. Hypothalamus plays an important role in regulating body temperature and also to increase or decrease secretion of sweat glands.

Antipyretics are the agents which reduce increased body temperature to normal. Common examples are aspirin, paracetamol, analgin, etc.

ASPIRIN

Aspirin is an odourless, colourless or white crystalline powder with a slightly acidic taste. It is soluble in solutions of acetate and citrates, slightly soluble in alcohol, ether and chloroform and practically insoluble in water. In presence of moisture, aspirin hydrolyses salicylic acid and acetic acid. It should be stored in air tight containers.



IUPAC Name : 2-Acetoxy benzoic acid.

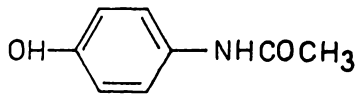
Actions and uses : Aspirin has analgesic, anti inflammatory and anti pyretic action by inhibiting prostaglandin synthatase. It is rapidly absorbed from the upper gastro intestinal tract. It is used in the treatment of chronic rheumatic state. Its use in the children should be avoided.

Side effects of aspirin therapy are gastrointestinal disorders like nausea, vomiting, irritation of gastric mucosa, etc. It also increases bleeding time.

Officials : Acetylsalicylic Acid, Tablets I.P.
Compound Acetylsalicylic Acid, Tablets I.P.
Methyl Salicylate I.P.
Sodium Salicylate I.P.
Aspirin Tablets I.P.
Soluble Aspirin Tablets I.P.

PARACETAMOL

Paracetamol is an odourless, white crystalline powder with a bitter taste. It is soluble in alkali hydroxides, alcohol and acetone, slightly soluble in glycerol and water. It should be stored in air tight containers.



IUPAC Name : 4-Hydroxyacetanilide. or
N-para aceto amino phenol.

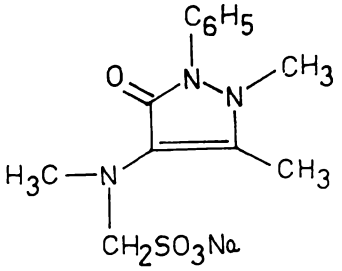
Actions and uses : Paracetamol has similar antipyretic action as that of aspirin but it is weaker than aspirin. It has also anti-inflammatory activity. It is used in the treatment of

pain such as headache, toothache, rheumatism and neuralgia. Long term use may lead to renal and hepatic damage.

Officials : Paracetamol I.P.
Paracetamol Tablets I.P.
Paracetamol Syrup I.P.

ANALGIN

Analgin is an odourless, white to yellowish crystalline powder with a bitter taste. It is freely soluble in water, slightly soluble in alcohol, practically insoluble in chloroform and solvent ether. It should be stored in air tight containers.



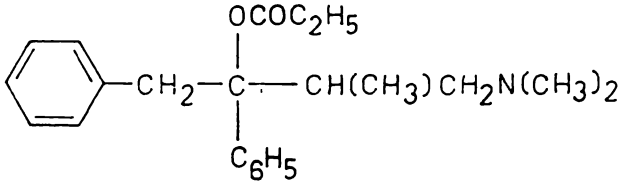
IUPAC Name : 1,5-Dimethyl, 2-phenyl, 4-[N-methyl, N-sodium methyl sulphonate] amine, 3-oxo, 4-pyrazoline.

Actions and uses : Analgin is used to relieve headache, muscle pain, and post-operative pain etc. It is also used as an antipyretic. Nausea, vomiting, rashes, aganulocytosis, etc. are side effects of analgin.

Officials : Analgin I.P.
Analgin Tablets I.P.

DEXTROPROPOXYPHENE

Dextropropoxyphene is available as dextropropoxyphene hydrochloride. The salt is an odourless, white yellowish powder with a bitter taste. It is soluble in water, alcohol and chloroform but insoluble ether. It should be stored in air tight containers.



IUPAC Name : 4-Dimethyl amino-3- methyl-1,2-diphenyl but-2-yl propionate hydrochloride

or

Dimethyl [(2R,3S)2-methyl-3,4-diphenyl-3-propionyloxybutyl] amine.

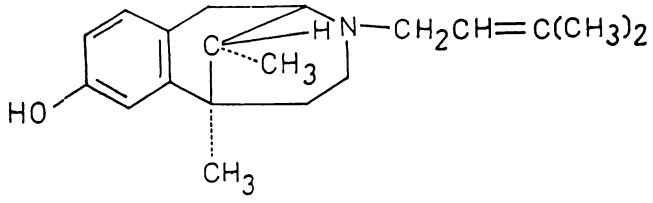
Actions and uses : Dextropropoxyphene is a potent analgesic similar to codeine but produces less constipation. It develops rapid analgesia. It may cause nausea, vomiting, drowsiness and irritation to mucous membrane

Dextropropoxyphene napsylate is less bitter and irritant to mucous membrane as compared to its hydrochloride salt. The other properties are similar to Dextropropoxyphene hydrochloride.

Officials : Dextropropoxyphene Hydrochloride I.P.
Dextropropoxyphene Napsylate I.P.

PENTAZOCINE

Pentazocine is an odourless, white or creamy white powder. It is soluble in chloroform, slightly soluble in alcohol and ether and very slightly soluble in water. Pentazocine salt is slightly soluble in water. It should be stored in air tight containers protected from light.



IUPAC Name : 1,2,3,4,5,6-Hexahydro-6,11-dimethyl-3-(3-methyl-but-2 enyl]-2,6-methano-3-benzazocin

Actions and uses : Pentazocine hydrochloride is a narcotic antagonist having sedation and analgesia. It depresses respiratory centre and fall in blood pressure.

Officials :

(1) **Morphine** : Modi Mundi Pharma : Morticontin (C.R.) continus Tab.
morphine sulphate C.R Tab.10,30,60,100mg.

(2) **Codein** : Indon : Codeine sulphate Tab 25 mg. : Pfizer : Corex Sy. -10mg/5ml.

(3) **Aspirin** : Reckitt columan : Disprin Tab. 350mg. 300 to 600mg./day.
: US vitamins : Ecospirin Tab. 150 to 325mg.

(4) **Paracetamol** : B. Wellcome : Calpol Tab./Sy. :
Themis : Metacin Tab./Sy./Drops.

(5) **Analgin** : IDPL : Analgin Tab. I.P. 30-60mg/kg./day.
: Hoechst : Novalgin Tab./Inj. 500mg. 0.8ml/day.

(6) **Dextropropoxyphene** : Roussel : Corbutyl Tab. 60 to 120mg. daily.
Whokhardt : Ibu-Proxyvon 65mg. Capsules.

(7) **Pentazocine** : Ranbaxy : Fortwin 25mg Tab. as HCl.
: Ranbaxy : Fortwin 30mg/mlInj. as Lactate.
: Indoco : Susewin inj. 30mg/ml Inj. as lactate.

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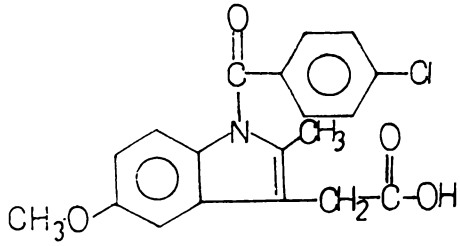
NON STEROIDAL ANTIINFLAMMATORY AGENTS

Antiinflamnatory agents are the drugs which reduce inflammation and pain arising from it. Glucocorticoids (hydrocortisone and cortisone) are steroidal antiinflammatory agents but are not recommended for their various undesirable effects. The non-steroidal anti inflammatory agents also have analgesic and antipyretic properties. These drugs are used in the treatment of arthritis, rheumatism and ankylosing, spondylitis. They have weaker analgesic actions as compared to opoid derivatives. They are classified as :

(i)	Salicyclic acid derivatives	:	Aspirin
(ii)	N-arylanthranilic acid derivatives	:	Mefenamic acid.
(iii)	Indolyl or aryl acetic acid derivatives	:	Indomethacin.
(iv)	Pyrazole derivatives	:	Phenyl butazone, oxyphen butazone.

INDOMETHACIN

Indomethacin is an odourless, tasteless, pale yellow, crystalline powder. It is slightly soluble in chloroform and ether. It should be stored in air tight containers protected from light.

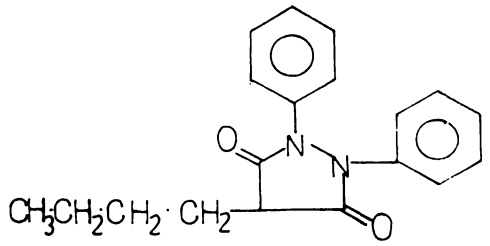


IUPAC Name : 1-(4-Chlorobenzoyl)-5-methoxy-2-methyl indol -3-yl-acetic acid.

Action and uses : Indomethacin is an anti-inflammatory, antipyretic and analgesic. It is effective in reducing swelling in cases of gout and rheumatoid arthritis, osteoarthritis and ankylosing spondylitis. The side effects are dizziness, dyspepsia and peptic ulceration.

PHENYLBUTAZONE

Phenyl butazone is an odourless white crystalline powder having bitter taste. It is soluble in alkali hydroxides, and chloroform; slightly soluble in alcohol and ether and insoluble in water. It should be stored in air tight containers protected from light.



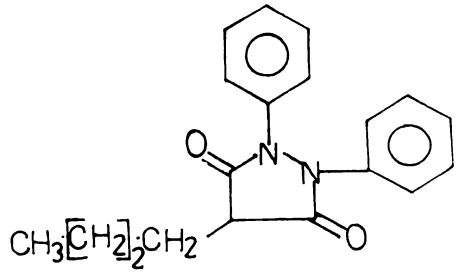
IUPAC Name : 4-Butyl-1,2-diphenylpyrazolidine -3,5-dione.

Action and uses : Phenylbutazone is an antiinflammatory agent similar to aspirin. It exhibits uricosuric and sodium retention properties and blocks the iodine uptake by thyroid gland. It is a long acting anti inflammatory agent used in rheumatic disorders. The important side effects are gastric upset, rashes, mucosal ulceration of mouth and other parts of G.I.T.

Officials : Phenylbutazone I.P.
Phenylbutazone Tablets I.P.

OXYPHENBUTAZONE

Oxyphenbutazone is an odourless white crystalline powder with a bitter taste. It is soluble in alkali hydroxides, acetone and alcohol, slightly soluble in chloroform and ether, and very slightly soluble in water. It should be stored in air tight containers.



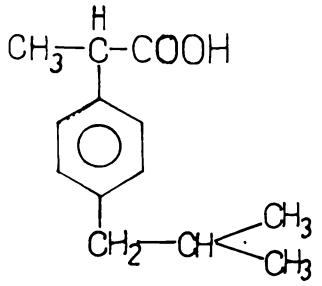
IUPAC Name : 4-Butyl-2-(4-hydroxyphenyl)-1-phenyl pyrazolidine-3,5 dione.

Action and uses : Oxyphenbutazone has actions, uses and side effects similar to phenylbutazone. It is used in the treatment of acute gout, active rheumatoid arthritis and other disorders. Its ophthalmic preparation is used in inflammatory conditions of eye.

Officials : Oxyphenbutazone I.P.
Oxyphenbutazone Tablets I.P.

IBUPROFEN

Ibuprofen is a white crystalline powder with a characteristic odour. It is soluble in alcohol, ether, chloroform, and acetone but slightly soluble in water. It should be stored in air tight containers protected from light.



IUPAC Name : 2-(4-Isobutylphenyl) propionic acid.

Action and uses : Ibuprofen is an analgesic with a lesser anti inflammatory property as compared to aspirin. It is used to relieve pain or inflammation in rheumatic diseases. It may cause bronchospasm in patients of bronchial asthma or allergic persons.

Officials : Ibuprofen I.P
Ibuprofen Tablets I.P.

(1) **Indomethacin** : Jagsonpal : Indocap Cap. 25 mg.
: Jagsonpal : Indocap SR Cap. 75 mg. Sustained Release.

(2) **Phenyl Butazone** : SG pharma : Zolandin Tab. 100 to 200 mg TID.
: Pharmed : Actimol Tab. 50mg.

(3) **Oxyphenbutazone** : IDPL : Phenabid Tab. 100mg. - 100 to 200mg. 2 to 3 times daily.
: Albert David : Siorll Tab. 100mg.

(4) **Ibuprofen** : Knoll : Brofen 200/400/600mg. Tab. 200 to 600 mg twice daily.
: Knoll : Febrilix Sy 100mg/5ml.
: Cipla : Ibugesic Tab. 200/400/600mg.
: Ibugesic Susp. 100mg/5ml.

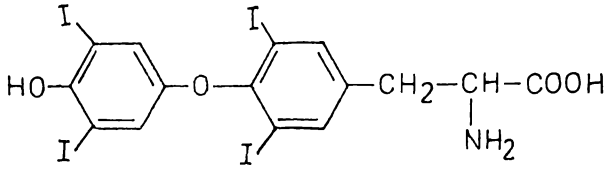
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THYROXINE AND ANTITHYROIDS

Thyroid gland is an endocrine gland which utilises inorganic iodides present in blood plasma to synthesise and secrete, thyroxine and tri-iodo thyronine. These hormones are stored as bound to thyroglobulin. These hormones are responsible for basal metabolic rate (BMR). In absence of these glands BMR can reduce to 50%, while in excessive secretion (hyperthyroidism) it may increase to 160%. The deficiency of thyroid hormones leads to myxedema (hypothyroidism) and, affects growth and development of brain. Excessive secretion of thyroid hormones is called hyperthyroidism (thyrotoxicosis). In this condition metabolic rate, heart rate, anxiety and restlessness are increased.

THYROXINE

Thyroxine is official as thyroxine sodium. It is an odourless white to pale brownish yellow powder. It is soluble in alkali hydroxides, slightly soluble in alcohol and water, and very slightly soluble in ether and chloroform. It should be stored in air tight containers, protected from light.



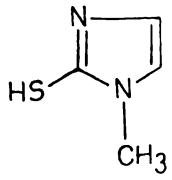
IUPAC Name : 3-[4-(4-hydroxy-3,5-di-iodophenoxy)-3,5-di iodo phenyl]-L-alanine.

Actions and uses : Thyroxine sodium is used in the treatment of thyroid deficiency states and cretinism. It should not be given to the patients with normal functioning of the gland, because intrinsic secretion of the hormone is destroyed by the drug. It increases oxygen consumption and stimulates general metabolism associated with increased excretion of nitrogen, calcium, water and urine. Side effects of thyroxine include sweating, tachycardia, diarrhoea, restlessness and excitability.

Officials : Thyroid I.P.
Thyroid Tablets I.P.
Thyroxine Sodium I.P.
Thyroxin Tablets I.P.

METHIMAZOLE

Methimazole is a white to pale buff coloured crystalline powder, with a faint characteristic odour. It is solubie in chloroform, water and alcohol; and sparingly soluble in ether.



IUPAC Name : 1-methyl, 2-thione, 1,3-dihydro-2-imidazole

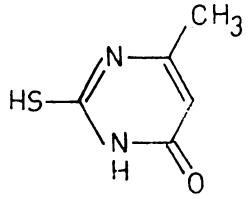
or

1-Methylimidazol-2-thiol

Actions and uses : Methimazole is an antithyroid drug and is used in the treatment of hyperthyroidism. It is a potent, prolonged acting antithyroidal drug. It lowers metabolic rate.

METHYLTHIOURACIL

Methylthiouracil is an odourless white crystalline powder. It is soluble in boiling water, sparingly soluble in alcohol, chloroform and ether; and freely soluble in alkali hydroxides. It is stored in well closed containers protected from light.

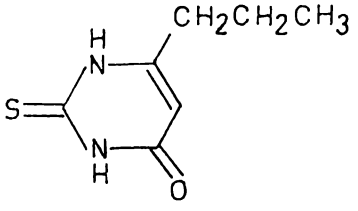


IUPAC Name : 2,3-Dihydro-6-methyl-2-thioxo-4-{1H}-pyrimidinone

Actions and uses : Methylthiouracil is a homologue of thiouracil. It is an antithyroidal agent used in the treatment of hyperthyroidism. Common side effects are headache, vomiting, nausea and skin-rashes.

PROPYLTHIOURACIL

Propylthiouracil is a white crystalline powder and bitter in taste. It is soluble in alkali hydroxides; sparingly soluble in alcohol; and slightly soluble in water, chloroform and ether.



IUPAC Name : 2,3-Dihydro-6-propyl-2-thioxo-4[1H] pyrimididione.
Actions and uses : Propylthiouracil is used in the management of hyperthyroidism. It blocks extrathyroidal conversion of thyroxin to liothyronine [Triiodothyroxine]. It decreases hypermetabolic conditions. Side effects are granulocytopenia, leucopenia, dermatitis etc. It may cause pro-sensitivity to other thiouracils.

Officials : Propylthiouracil I.P.
Propylthiouracil Tablets I.P.

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DIAGNOSTIC AGENTS

There are certain agents which do not play any role in the treatment and prevention of diseases, but they are essential for the identification or diagnosis of certain diseases. These agents are called diagnostic agents. Certain radio-pharmaceuticals and inorganic ions are also helpful in the diagnosis of diseases Inorganic diagnostic agents have already been in the pharmaceutical chemistry -I. Organic diagnostic agents are classified into four major groups.

I **Drugs used as X-ray contrast media** : Iopanoic acid, Propylidone.
II **Drugs used for organ function test** : Sulphobromophthalein sodium, Indiogatin disulphonate sodium.
III **Drugs used to determine blood volume** : Evans blue
IV **Miscellaneous compounds** : Congo red, fluorescein sodium

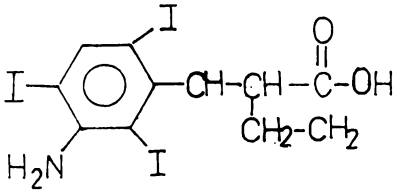
Drugs used as X-ray contrast media
OR
Radio opaque contrast media

These agents have the ability to absorb x - rays. These agents are used for the evaluation of gastro-intestinal tract, gall bladder, ureter, fallopian tubes, bile duct and renal system. These drugs are administered in various ways to visualize with the help of fluoroscopy or x-ray.

These drugs are usually radioopaque and therefore provide a shadow of positive x-ray contrast.

IOPANOIC ACID

Iopanoic acid is a cream coloured, tasteless powder containing characteristic odour. It is soluble in alcohol, chloroform, ether and solution of alkali hydroxides and carbonates. It should be stored in well closed containers protected from light.

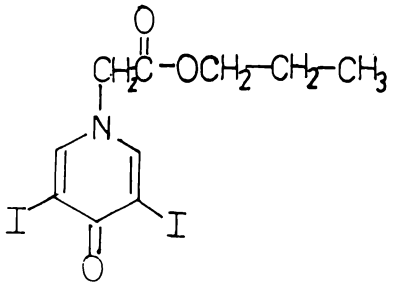


IUPAC Name : 3-Amino- α-ethyl-2,4,6-tri iodo benzene propanoic acid
Actions and uses : Iopanoic acid is used for roentgenography. It is given to the patients with a fat free evening meal. It is promptly absorbed from the gastro-intestinal tract and concentrated in gall-bladder. It visualizes the gall bladder and extra-hepatic ducts.

It is relatively free from toxicity but may cause . The hypersensitivity reactions involving skin, mucous membranes and systemic serum sickness. It should not be used in patients with acute nephritis and uremia. After roentgenography patients are given a high fat meal to excrete the drug.
Dose : 3-6 gm.

PROPYLIODONE

Propyliodone is a white crystalline and odourless powder. It is slightly soluble in alcohol and chloroform, very slightly soluble in ether; and practically insoluble in water. It should be stored in air tight containers protected from light.



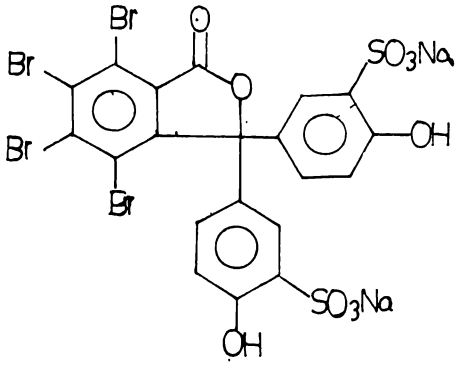
IUPAC Name: Propyl-(1,4-dihydro-3,5-di-iodo-4-oxopyrid-1-yl) acetate.
Actions and uses : Propyliodone is used as a radio-opaque contrast media for the examination of bronchial tract. It's aseptic aqueous or 60% oily suspension is used for diagnostic purposes.

Drugs used for organ function test

In the year 1909 Abed and Rowntree worked on liver excretory functions using phenolitetra chlorophthalein and other similar compounds. These compounds are excreted from certain organs e.g. 8 phenol sulfophthalin is excreted in urine by the kidney. These findings help in determining the function of a particular organ. Such drugs are used to test liver, kidney and gastric functions.

SULPHOBROMOPHTHALEIN SODIUM

Sulphobromophthalein is an odourless, white, crystalline powder which is bitter in taste. It is soluble in water but insoluble in alcohol and acetone. It is a hygroscopic compound and should be stored in air tight containers.



IUPAC Name : 3,3'- [4,5,6,7-tetrabromo-3-oxy-1-(3H)-isobenzo-furanylidene] bis [6-hydroxybenzene sulfonic acid] disodium salt.

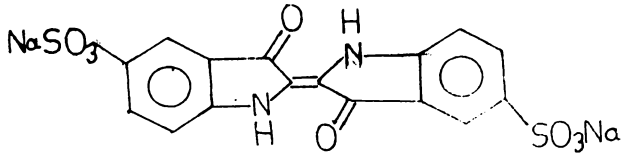
Actions and uses : Sulphobromophthalein is used for testing liver functions. A fat free break fast is provided to the patients in the morning before performing this test. If there is a normal liver excretion most of the dye is excreted in a period of 30 minutes. Precautions should be taken in the asthmatic patients and in patient with a history of urticaria or allergy.

Dose : 5 mg/kg not more than 500 mg. body wt.

Official : Sulphobromophthalein sodium I.P.
Sulphobromophthalein sodium Injection I.P.

INDIGOTIN DISULPHONATE SODIUM or INDIGO CARMINE or INDIGO BLUE

Indigotin disulphonate sodium is available as purple blue coppery lusturous granules. It is slightly soiuble in water and alcohol, and practically insoluble in organic solvents. It is sensitive to light. It should be stored in air tight containers protected from light.



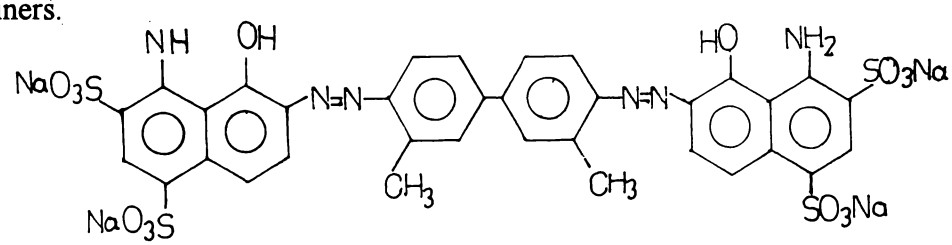
IUPAC Name : Disodium 5,5'-indigotin disulphonate
Actions and uses : Indigo caramine is a dye used for renal functions to locate urethral orifices. The dye is entirely excreted within three hours after an intravenous injection. The rate of excretion is determined colorimetrically. Indigo caramine is also useful in colouring nylon, surgical sutures, testing of milk and as a food colour. The patient should be tested for sensitivity before the drug is given.
Officials : Indigocarmine I.P.

Drugs used to determine blood volume

Estimation of blood volume is an important test to guide physician for the treatment of shock. This test provides amount of plasma and other fluids. The drugs used for determination of blood volume are Evans blue, Indocyanine green and fluorescien sodium.

EVANS BLUE

Evans blue is an odourless, green or blue green powder. It is very soluble in water, very slightly soluble in alcohol, and practically insoluble in benzene, chloroform and ether. It is a hygroscopic compound and should be stored in air tight containers.



IUPAC Name : 6,6'- [(3,3'-Dimethyl{1,1'-biphenyl}-4-4'-diyl) bis{ azo}] bis(4-amino-5- hydroxy-1,3-naphthalenedisulphonic acid] tetrasodium salt.
Actions and uses : Evans blue is used as a diagnostic agent for blood volume estimation. A known quantity of the dye is injected into blood. After sometime when the dye is thoroughly mixed in blood, a sample of blood is withdrawn. The concentration of this dye in blood determines the volume of blood. The dye is not excreted via kindney and does not escape into extracellular fluid.
Dose : 4.52 mg/ml of 5 ml. injection.
Officials : Evans Blue I.P.

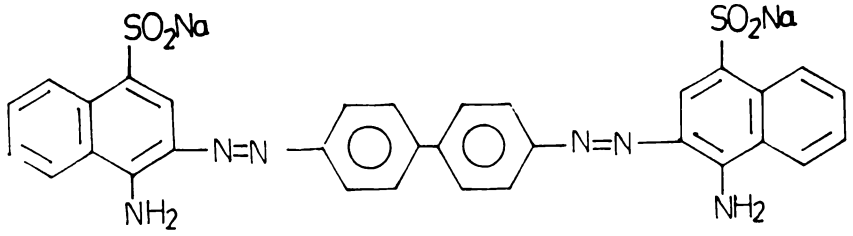
MISCELLANEOUS COMPOUNDS

A number of other drugs are useful for diagnostic purposes. Fluorescein sodium is useful to detect foreign bodies or corneal ulcers and amyloidosis is detected with the help of congo red These are certain reagents when come in

contact with urine provide diagnostic clues e.g. Gravindex and pregnosis for pregnancy, sodium nitroprusside for ketone bodies, etc.

CONGO RED

Congo red is an odourless, reddish brown powder. It is soluble in water and slightly soluble in alcohol. The compound decomposes to acid fumes. It should be stored in well closed containers.

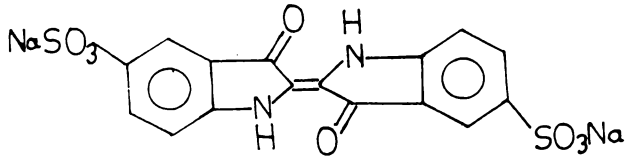


IUPAC Name: 1-Napthalenesulfonic acid, 3,3'-[(1,1'-biphenyl)-4,4'-diyl bis (azo) bis 4-amino

Actions and uses : It is used in the detection of amyloidosis. Amyloid collections in liver are stained by this dye. If amyloid growth is in kindney, a small amount appears in the urine.

FLUORESCEIN SODIUM

Fluorescein sodium is an odourless, orange-red powder. It is freely soluble in water and sparingly soluble in alcohol. It is hygroscopic in nature and should be stored in air tight containers.



IUPAC Name : Spiro [isobenzofuran -1 (3H), 9'-(9H) xanthene] -3-one,3,6' dihydroxy, disodium salt.

OR

2-(6-hydroxy-3-oxo-xanthen-9-yl) benzoic acid

Actions and uses : Fluorescein sodium is used for detection of corneal lesions and foreign bodies in eyes. An intravenous injection may produce nausea , vomiting and other allergic reactions. Skin and urine may become transiently yellow.

Official : Fluorescein sodium I.P.

Dose : 0.1 to 0.3 ml of 2% solution.

CHAPTER - 29

ANTICONVULSANT AGENTS

Epilepsy is a collective term for chronic convulsive disorders characterised by sudden episodes of seizures with or without loss of consciousness. The seizure always correlates with an abnormal electro encephalo gram (E.E.G.).

Convulsions may occur at any time with or without warming signal (aura). Common features include increase in muscle tone, locked jaw, frothing of mouth and upward movement of eye-ball.

Convulsions can be prevented by the depression of motor cortex. Sleep may also be induced by these drugs. Epileptic seizures can be classified into :

(I) **Grand mal epilepsy (major epilepsy)** : This type of epilepsy is characterised by sudden loss of consciousness and comprises of chronic spasms of whole body. These are followed by depression of central nervous system.This epilepsy may be either idiopathic or secondary to progressive (Non-progressive) organic brain disease. It may be associated with petitmal epilepsy.

(II) **Petitmal epilepsy** : This type of epilepsy is associated with bilateral motor activity such as blinking of eyelid . Petitmal is always idiopathic and may either disappeared completely or may be converted to grandmal epilepsy.

(III)**Temporal lobe epilepsy** : It is also called as psychomotor epilepsy. In these type convulsions are absent but their is change in behavior of the patients.

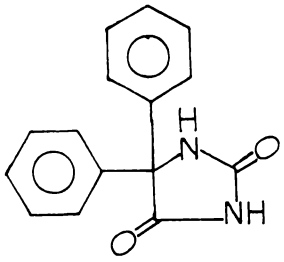
(IV) **Minor epilepsy** : This type of epilepsy leads to sudden loss of consciousness with or without fall. They may resemble petitmal epilepsy.

CLASSIFICATION : Different types of epilepsy's can be treated with following drugs :

(I) Hydantoin derivative	:	Phenytoin, Methoin.
(II) Barbiturate derivatives	:	Phenobarbitone, Mephobarbitone.
(III) Acetyl urea derivatives	:	Phenecemide.
(IV) Oxazolinedione derivatives	:	Trimethadione, Paramethadione
(V) Succimides derivatives	:	Phenosuximides, Ethosuximide.
(VI) Miscellaneous		Carbamezapin, Sodium valproate, Diazepam

PHENYTOIN
OR
DIPHENYL HYDANTOIN

Phenytoin is available as phenytoin sodium. Phenytoin is an odourless, white crystalline powder. It is soluble in alkali hydroxides, slightly soluble in alcohol and very slightly soluble in ether, chloroform and water. Its sodium salt is soluble in water and alcohol but insoluble in ether and chloroform. It should be stored in air tight containers.



IUPAC Name : 5,5-Diphenyl imidazolidine-2,4 dione.

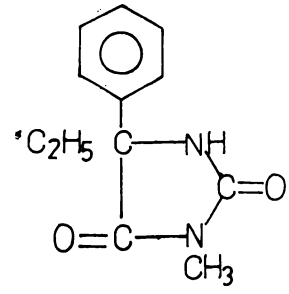
Actions and uses : Phenytoin has an anticonvulsant action but relatively a lesser hypnotic effect. It is effective in controling grand mal epilepsy and prophylactic control of seizures, developed after neurosugery but ineffective in petit mal epilepsy.

The side effects of this drug include nausea, rashes and dizziness. It may cause hallucinations, muscular tremors and mental confusion.

Officials : Phenytoin Sodium, I.P.
Phenytoin Tablets, I.P.
Phenytoin Capsule, I.P.
Phenytoin Injection, I.P.
Phenytoin Sodium Tablets, I.P.

METHOIN

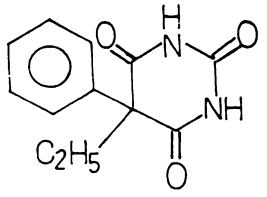
Methoin is an odourless, tasteless, colourless and lustrous compound. It is soluble in chloroform and alkali hydroxides, sparingly soluble in alcohol, slightly soluble in ether, and very slightly soluble in water. It should be stored in air-tight containers.



IUPAC Name : 5-Ethyl-3-methyl-5-phenyl imidazolidine 2,4,-dione.
Actions and uses : Methoin has similar action as that of phenytoin sodium . It is used in the treatment of grand mal, psychomotor and jacksonian epilepsy and behavioral disorders.

PHENOBARBITONE

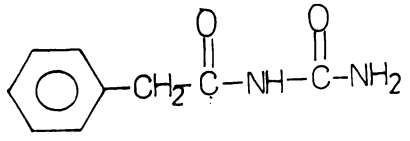
Phenobarbitone is an odourless, colourless white crystalline powder with a slightly bitter taste. It is soluble in ether, chloroform and solutions of alkali hydroxides, slightly soluble in alcohol and insoluble in water. It is also available as phenobarbitone sodium which is soluble in water and practically insoluble in organic solvents. It should be stored in air-tight containers protected from light.



IUPAC Name : 5- Ethyl-5-phenyl barbituric acid.
Actions and uses : Phenobarbitone is a long acting sedative and hypnotic. It has been used as a sedative in anxiety disorders, neurasthenia, dysmenorrhoea and thyrotoxicosis.
Officials : Phenobarbitone Sodium I.P.

PHENECEMIDE

Phenecemide is an odourless white, crystalline powder. It is soluble in acetone and methanol; and slightly soluble in water, alcohol and ether. It should be stored in air-tight containers.

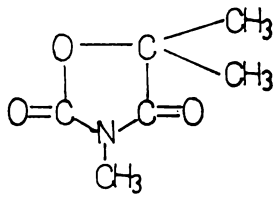


IUPAC Name : N-[Aminocarbonyl] benzene ethanamide.
Actions and uses : Phenecemide is used in psychomotor epilepsy. Its toxic effects are aplastic anemia, change in personality and damage to kidney and liver, therefore its use is restricted.

TRIMETHADIONE [TROXIDONE]

Trimethadione is available as colourless, granular crystals with a slightly camphoraceous odour. It is soluble in ether, chloroform and alcohol and slightly

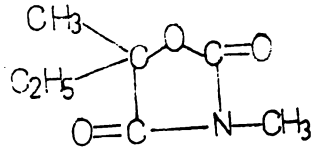
soluble in water. It should be stored in air tight containers in a cool place.



IUPAC Name : 3,5,5-Trimethyl-2,4,-oxazolidinedione.
Actions and uses : Trimethadione is used in the treatment of true petit mal epilepsy. In animals it prevents convulsions induced by leptazol without causing depression of C.N.S. The side effects include photophobia,glare effect, nausea, headache, fatigue and muscular weakness.
Officials : Troxidone I.P.
Troxidone Capsules, I.P.

PARAMETHADIONE

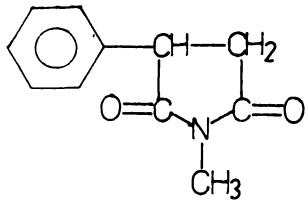
Paramethadione is a colourless liquid with a characteristic odour. It is soluble in water, alcohol ether and chloroform. It should be stored in air tight containers.



IUPAC Name : 5-Ethyl-3,5-dimethyl-2,4-oxazolidine dione.
Actions and uses : Paramethadione has anticonvulsant actions similar to troxidone but less potent to control attack of petit mal epilepsy.
Officials : Paramethadione I.P.

PHENSUXIMIDE

Phensuximide is an odourless, white crystalline powder. It is soluble in water, alcohol, chloroform and ether. It should be stored in air tight containers.



IUPAC Name : N-methyl-2-phenyl succinimide.

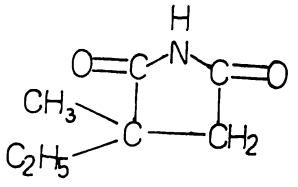
or

3- phenyl-1-methyl pyralidine 2,5-dione.

Actions and uses : Phensoximide is an anticonvulsant used in the treatment of pure petitmal epilepsy. It is given with other agents to treat petit mal with grand mal epilepsy. The side effects of this drug include gastric-upsets, drowsiness, headache and skin rashes.

ETHOSUXIMIDE

Ethosuximide is an odourless, white waxy solid with slightly bitter taste. It is soluble in alcohol, ether, chloroform and water. It should be stored in air tight containers.



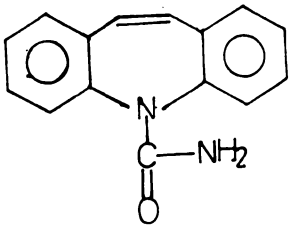
IUPAC Name: 3-Ethyl-3-methyl-2,5-pyrolidinedione.

Actions and uses : Ethosuximide has similar actions and uses as that of phensuximide but it is a more potent anticonvulsant.

Officials : Ethosuximide I.P.
Ethosuximide Capsules/Syrup I.P.

CARBAMAZEPINE

Carbamazepine is an odourless, white to yellowish crystalline, tasteless or slightly bitter powder. It is soluble in alcohol and chloroform but very slightly soluble in water and ether. It should be stored in air-tight containers.



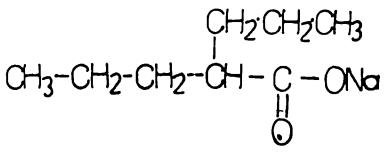
IUPAC Name : 5H-Dibenz [b,f] azepine-5-carboxamide.

Actions and uses : Carbamazepine is used in the treatment of grand mal and temporal lobe epilepsy. Side effects of this drug include dizziness, diarrhoea, dryness of mouth, nausea, aplastic anemia and jaundice.

Officials : Carbazepine I.P.
Carbazepine Tablets I.P.

SODIUM VALPROATE

Sodium valproate is an odourless, white or crystalline powder having a saline taste. It is soluble in water and alcohol. It should be stored in air-tight containers.



IUPAC Name : Sodium -2-propylpentanoate.

Actions and uses : Sodium valproate is used in the treatment of petit mal and grand mal epilepsy and may also used in the treatment of temporal lobe epilepsy. It increases the concentration of gamma-aminobutyric acid in the brain. Its action is potentiated the presence of MAO inhibitors. The side effects of this drug are gastro intestinal disturbances, nausea and alopecia.

(1)**Phenobarbitone** : Bayer : Luminal 300 mg
R. Poulenc : Gardenal 30 mg
R. Poulenc : Gardenal 30/60 mg Tab.

(2) **Phenytoin** : Parke Davis : Dilanti Cap. 100 mg/4 ml.

(3) **Carbemezepine** : Ciba Gegy : Tagretol 100/200/400 mg. dose 100 mg/day daily.
SG pharma : Mazetol 10/200/ Sy. 20 mg/5 ml.

(4) **Sodium valproate** : Torrent : Valparin Alkalets 200 mg. Valparin inj. 200 mg/5 ml.

CHAPTER - 30

VITAMINS

The terms Vitamin means **vita**, i.e., vital for life, these compounds are **amine**-compounds containing-NH_2 group, i.e., vital amines required for life. Later it was discovered that some non amino compounds are also essential for life. The term vitamin is used for such compounds. These compounds are required by the body in a very small amount for the normal growth of the body. They regulate some of the metabolic activities or act as enzyme or co-enzymes [enzyme activators].

Vitamin deficiency may give rise to various diseases. Most of the vitamins are present in normal diet. Excessive fat soluble vitamins are accumulated in the body and are potentially dangerous while excessive in water soluble vitamins are excreted in urine.

Classification of vitamins :

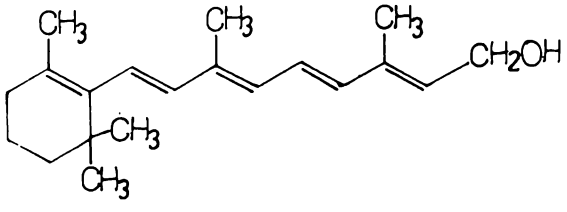
(I) **Fat soluble vitamins** : Vit-A, Vit-D, Vit-E, Vit-K.

(II) **Water soluble vitamins** : Vit. C and Vitamin B complex.

Vitamin B complex is a group of vitamins which includes [thiamine (B_1) riboflavin (B_2), nicotinic acid (B_3), Biotin (B_4 or vit H), Pantothenic acid (B_5), pyridoxin (B_6), folic acid, inositol, para-amino benzoic acid and cyanocobalamin (B_{12}).

VITAMIN A

The richest source of vitamin A is liver oils of fish ,cod-liver oil, halibut liver oil and shark liver oil. It is also available in green leafy vegetables, carrots, apricots, milk and egg yolk. It may present as esters or as provitamin.



Vitamin A is a yellow oil which may solidify on cooling; it has a slight odour. Vitamin A is stable to heat [necessary for cooking]. It is freely soluble in alcohol and fixed oils but insoluble in water. It should be stored in air-tight nitrogenous atmosphere, light resistant containers in a cool place. The different forms of naturally occurring vitamin A are isomer of retinol [vit. A1].

Vitamin A is essential for dark adaptation. Deficiency of vitamin A leads to night-blindness which may lead to xeropthalmia. It helps in epithelial regeneration and keratinisation.

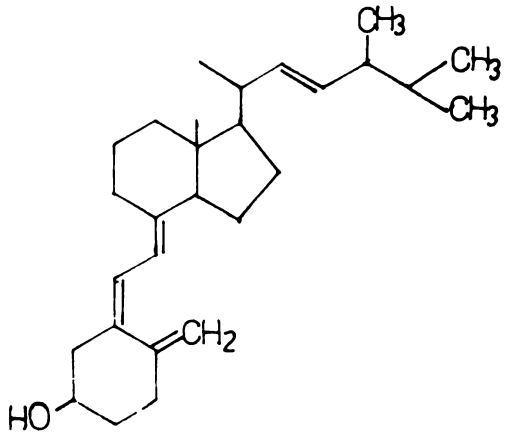
Officials : Concentrated vitamin A solution I.P.
Concentrated vitamin A and D solution I.P.
Shark liver oil I.P.
Vitamin A, I.P.
Shark -liver oil with vitamin D, I.P.

Dose : 5000 units prophylactic and 10,000 to 2,00,000 units therapeutic.

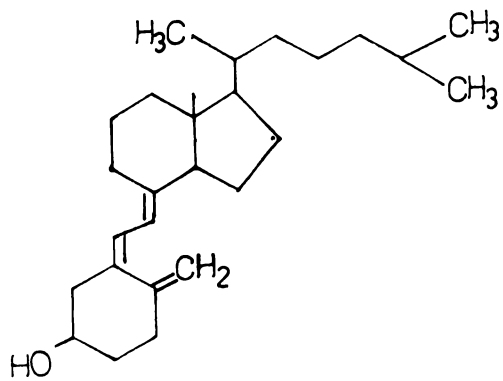
VITAMIN D

Vitamin D is a sterol derivative. It exists as calciferol, cholecalciferol and dihydrotachysterol.

Ergosterol is a yeast sterol that gives vitamin D_2 (ergocalciferol) on exposure to sun light. The naturally occurring vitamin D is cholecalciferol (D_3) present in fresh liver oils.



ERGOCALCIFEROL



CHOLECALCIFEROL

Ergocalciferol is a colourless to white crystalline powder. It is soluble in fixed oils and insoluble in water. It is stored in thermally sealed containers, protected from light, below 15°C.

Cholecalciferol is a white crystalline substance. It is also soluble in fixed oil but insoluble in water. It is also stored in hermeticlly sealed containers in nitrogen atmosphere, protected from light in a cool place.

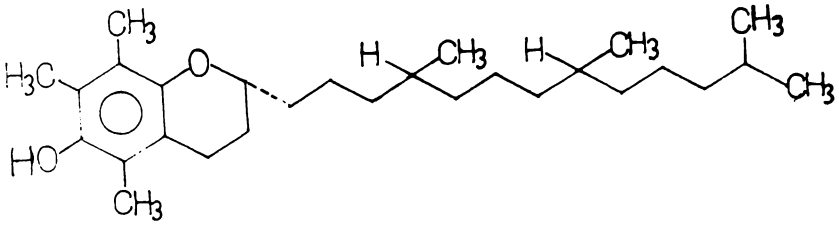
Major source of vitamin D include shark, cod and Halibut liver oils. Vitamin D is essential for the absorption and transport of calcium and phosphorous. Deficiency of vitamin D causes rickets in children and oestomalacia in adults that may lead to tetany.

Officials : Cholecalciferol I.P.
Concentrated vitamin D solution I.P.
Concentrated vitamin A & D solution I.P.
Dilute shark liver oil I.P.
Shark liver oil with vitamin D I.P.
Vitamin A and D capsules I.P.

VITAMIN E

Vitamin E is available as α-tocopheryl acetate salt. It is present in sunflower seed, rapseed, soybean oil, wheat germ, etc.

Alpha tocopheryl is an odourless, yellowish green viscous liquid. It is soluble in alcohol, chloroform and solvent ether but insoluble in water. It should be stored in air tight containers protected from light.

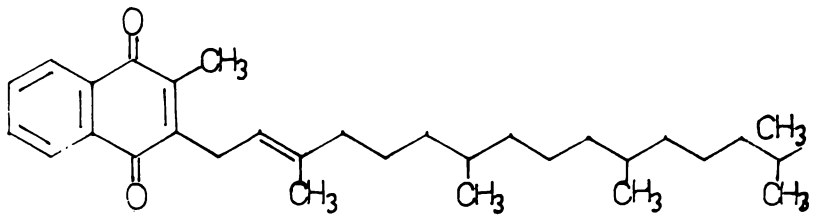


Vitamin E is involved in metabolic reactions and its deficiency leads to neurological syndrome. An excessive dose of vitamin E may cause diarrhoea, abdominal pain, weakness and fatigue.

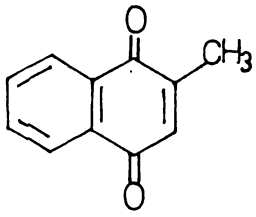
Officials : Tocopheryl acetate I.P.

VITAMIN K

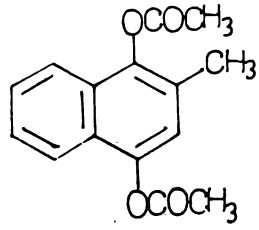
Vitamin K is a group of naphthoquinone compounds. These are phytomenadione, menadione, actomenaphthone and menatetrenone.This vitamin is responsible for clotting of blood.



PHYTOMENADIONE



MENADIONE



ACTOMENAPHTHONE

Phytomenadione is an odourless, clear to deep yellow oil. It is soluble in ether, chloroform and insoluble in water. It should be stored in airtight containers, protected from light.

IUPAC Name : 2methyl-3-phytyl-1,4-naphthoquinone.

OR

2 methyl-1,4 naphthoquinone

OR

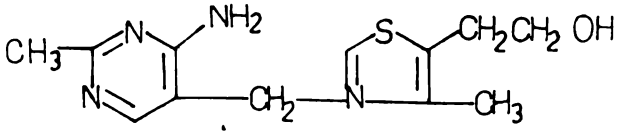
2 methyl-1,4 bis (aceto) naphthanate

Actions and uses: It is a naturally occurring vitamin K. The production of coagulation factors prothrombin and factors VII, IX and X is controlled by vitamin K. A deficiency of vitamin K reduces prothrombin level and ability to clot.

Officials : Acetomenadione I.P.
Acetomenadione Tablet I.P.
Menadione I.P.
Menadione Sodium Bisulphite I.P.

THIAMINE HYDROCHLORIDE (B_1)

Thiamine hydrochloride is a member of B complex. Rich sources of thiamine include yeast, milk, rice-polishing and liver. It is a colourless or white crystalline powder with a characteristic odour. It is soluble in water, slightly soluble in glycerol and alcohol and very slightly soluble in ether and acetone. It should be stored in airtight containers, protected from light and contact with metal should be avoided.



IUPAC Name : 3-(4-Amino-2-methylpyrimidin-5-ylmethyl)-5-(2-hydroxyethyl)-4-methylthiazolium.

Actions and uses : Thiamine is present as thamine pyrophosphate (TPP) in the body. TPP is a prosthetic group for the enzymes involved in the decarboxylation of pyruvic acid and α- keto-glutaric acid in the carbohydrate (glucose) metabolism.

Thiamine deficiency gives rise to beriberi. It is also given for the treatment of neuritis. The daily requirement of thiamine is increased during pregnancy, lactation, hyperthyroidism, pyrexia and diuresis.

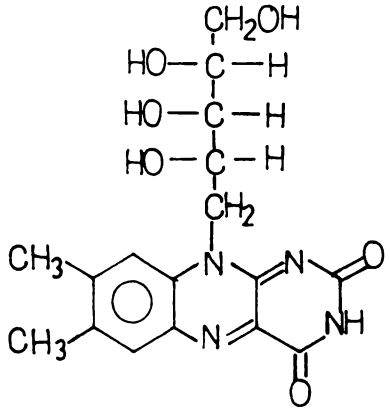
Dose : Prophylactic dose : 2 to 5 mg.
Therapeutic dose : 25 to 100 mg.

Officials : Thiamin Hydrochloride I.P.
Thiamin Hydrochloride Injection I.P.
Thiamine Hydrochloride Tablet I.P.
Thiamine Hydrochloride Mononitrate I.P.

RIBOFLAVINE (B_2)

Liver, kidney, egg, yeast, green vegetables and milk are rich sources of dietary vitamin B_2 (riboflavine). A small amount of vitamin is lost during cooking. Deficiency of riboflavin gives rise to ariboflavinosis.

Riboflavin is a yellow to orange coloured crystalline powder, with slight odour and persistently bitter taste. It is soluble in saline water and 10% urea solution, very slightly soluble in water and alcohol and practically insoluble in chloroform.



IUPAC Name : 3,10-Dihydro-7,8-dimethyl-10-[2,3,4,5, tetrahydroxy pentyl] benzopteridine -2,4,dione.

or

7,8 dimethyl-10-(D-ribit-1-yl) isoalloxazine.

Actions and uses : Riboflavin is a component of flavin mono nucleotide (FMN) and flavin adenin dinucleotide (FAD). These are useful in carbohydrate & protein metabolism. Deficiency of vitamin B_2 is characterised by stomatitis, glossitis, reddened, shiny and denuded lips, etc.

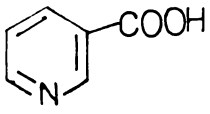
Dose : Prophylactic : 1.5 to 3 mg
Therapeutic : 2 to 10 mg

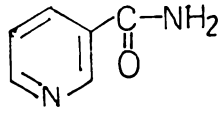
Officials : Riboflavin injection I.P.

NIACIN AND NIACINAMIDE

Dietary sources of niacin include liver, adrenal glands, white meat, yeast, milk, legumes, corn and whole cereals. It is an odourless, white crystalline powder. It is freely soluble in water, hot alcohol and dilute alkali hydroxides; very slightly soluble in chloroform and practically insoluble in ether. It is stored in well closed containers, protected from light.

Nicotinamide is a colourless to white crystalline powder with a faint characteristic odour and bitter taste. It is soluble in water, alcohol and glycerol but very slightly soluble in ether. It should be stored in well closed containers.





Niacin and nicotinamide have similar actions and uses. Deficiency of nicotinic acid leads to pellagra, characterised by dermatitis, red swollen tongue and enteritis.

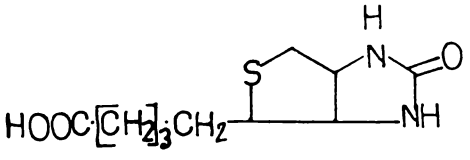
Niacin is a constituent of coenzyme diphospho-pyridine nucleotide (DPN) and triphosphopyridine nucleotide (TPN). These co-enzymes are associated with hydrogen transport in biological oxidation reduction process.

Dose : Prophylactic dose : 50 mg.
Therapeutic dose : 500 mg.

Officials : Nicotinamide I.P.
Nicotinamide Tablet I.P.
Nicotinamide Injection I.P.
Nicotinic Acid I.P.
Nicotinic Acid Tablet I.P.

BIOTIN

Dietary sources of biotin are liver, kidney, yeast and milk. This is also called as anti-egg white injury factor because it forms a complex with avidin present in egg white and makes it inactive. It is a white crystalline powder, soluble in hot water, very slightly soluble in water and alcohol and insoluble in other organic solvents. It should be stored in air tight containers.

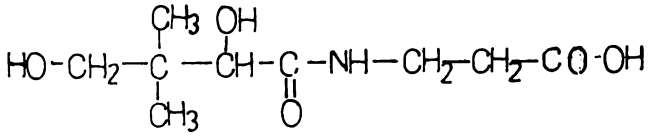


IUPAC Name : Hexahydro-2-oxo-1H thieno (3,4-d) imidazole-4-pentanoic acid.

Actions and uses : Biotin is a cofactor in the carboxylation reactions taking place in the body. It is also responsible for baldness in persons due to seborrheic conditions.

PANTOTHENIC ACID

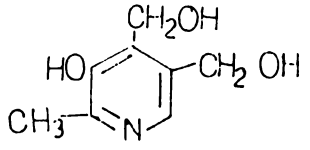
Dietary sources of pantothenic acid include meat, egg, yeast, milk and fresh vegetables. It is available as calcium pantothenate. Calcium pantothenate is an odourless, white crystalline powder. It is freely soluble in water. It should be stored in well closed containers protected from light.



IUPAC Name : 3-[2,4-dihydroxy-3,3-dimethyl butyroamido] propinic acid.
Actions and uses : It is a component of vitamin B complex. It is essential for the metabolism of carbohydrate, protein and fat.
Officials : Calcium Pantothenate I.P.

PYRIDOXINE

Pyridoxine, pyridoxal and pyridoxamine are the forms of vitamin B_6. Rich dietary sources include liver, meat, yeast and cereals. Pyridoxine hydrochloride is an odourless, white crystalline powder with a saline bitter taste. It is soluble in water, slightly soluble in alcohol, and very slightly soluble in ether. It should be stored in airtight containers.

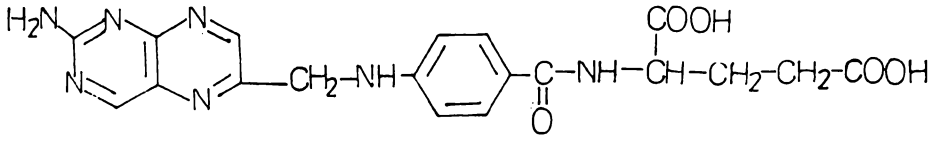


IUPAC Name : 4,5 Bis (hyroxy methyl)-3 hydroxy-2-methyl pyridinium chloride.
Actions and uses : Pyridoxal phosphate is a coenzyme for various metabolic reactions like transamination, racemization and decarboxylation. It is used in the treatment of convulsions and hypochromic anemia.
Officials : Pyridoxine Hydrochloride I.P.
Pyridoxine Tablets I.P.

FOLIC ACID

Dietary sources of folic acid are liver, yeast and leafy vegetables. It is an odourless, tasteless, orange to yellowish crystalline powder. It is soluble in sodium

hydroxide and practically insoluble in water and alcohol. It should be stored in airtight containers, protected from light.



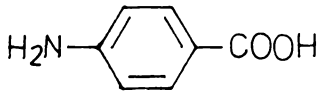
IUPAC Name : N-4-[2-Amino-4-hydroxypterid-6-ylmethylamino] benzoyl -L-glutamic acid.

Actions and uses: Folic acid is converted into tetrahydrofolic acid, which acts as a coenzyme in the synthesis of purine and pyrimidine nucleotide. Cell division arrest at metaphase stage in absence of folic acid. It is necessary for the production of red-blood cells. Deficiency of folic acid may cause megaloblastic anemia.

Officials : Folic acid I.P.
Folic Acid Tablet I.P.

PARA AMINO BENZOIC ACID

Para amino benzoic acid is an odourless, white to yellowish crystalline powder. It is soluble in alcohol and solution of alkali hydroxides but slightly soluble in water. It should be stored in airtight containers, protected from light.



IUPAC Name : 4- Aminobenzoic acid.

Actions and uses: Para aminobenzoic acid (PABA) is essential for the synthesis of purine and pyrimidine bases. It is also useful as a sunscreen.

CYANOCOBALAMIN (B_{12})

Liver, kidney, egg, muscle tissue and milk are the dietary sources of cyanocobalamin. It is a freeze dried solid available as odourless, dark red crystalline powder. It is slightly soluble in water. It should be stored in air tight containers, protected from light, below 10°C.

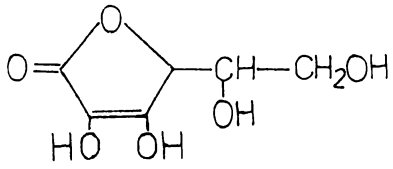
Cyanocobalamin is useful in pernicious anemia and its neurological complications. Radio labeled cyanocobalamin is used to identify megaloblastic anemia and pernicious anemia.

Officials : Cyanocobalamin I.P.
Cyanocobalamin Injection I.P.

Hydroxocobalamin I.P.
Hydroxocobalamin Injection I.P.

ASCORBIC ACID [VITAMIN C]

Ascorbic acid is present in fresh citrus fruits and vegetables. It can be extracted from juice of citrus fruits and ripe fruit of *Capsicum annum*. It is an almost odourless, colourless to pale yellow crystalline powder with acidic taste. It is soluble in water and alcohol; slightly soluble in methanol and practically insoluble in ether. It should be stored in airtight containers free from contact with metal and protected from light.



IUPAC Name : 3-oxo-L-gulofuranolactone.

Actions and uses : Ascorbic acid is essential for the formation of folinic acid, maturation of erythrocytes and absorption of iron from gut. Ascorbic acid is essential for the formation of intercellular material like collagen, cartilage, bone, teeth and healing of wounds.

Officials: Ascorbic acid I.P.
Ascorbic acid Injection I.P.
Ascorbic acid Tablets I.P.

(1) **Vitamin A** : US vitamins : Aquasol-A. Cap. 50,000 I.U.
US vittamins: Inj. Aquasol-A. 2/ml-50,000 I.V/ml.
Roche : Arovit Drops 150,000 I.V./ml.

(2) **Vitamin D** : Cadila : Calcirol Grannules (Vit.D_3 cholcalciferd)
Duphar : Arachitol inj. 300,000 & 600,000 I.V/ml

(3) **Vitamin K** : Merck : Evion Cap. 100/200/400/600 mg.
Merck : Evion Drops (paed) 50 mg/ml.

(4) **Thiamine HCl (B_1)** : Franco Indian : Benalgis Tab. 75mg.
: Franco Indian : Beneuron Cap. 5mg.

(5) **Riboflavin (B_2)** : Modi mundi Pharma : Pyricontin continus Tab.100 mg controlled Relax Tab.

(6) **Niacin** : Whockhard : Recupev Powder 5.5 mg/50 gm sachet.

(7) **Niacinamide** : Pfizer : Protinex powder
or contains 15 mg/30gm. Nicotinic acid
: Raptakos : Heptaglobine Sy.
or Nicotinic acid 22.5 mg/15ml.Naicinamide

(8) **Biotin** (vitt.H) : Roche : Supradyn Tab. contain 0.25 mg/Tab.

(9) **Pentothenic acid** : Sigma Lab. : Calcium pentothinate Tab.25 mg/Tab.

(10) **Folic acid** : Comtack Labs. : Rubifol Tab. 1.5 mg/Tab.
: Sarabhai : Basiton Forte 1.5 mg/Tab.

(11) **PABA** : Franco India : Para Minol Cream
Melanocyl Oint.

(12) **Cyanocobalamine (B_{12})** : Rallis : Imferon B_{12} Inj. 500 mg/ml.
:Geno : Ferz Cap. 15 mcq/Cap.

(13) **Ascorbic acid** (Vit. C) :Sarabhai : Limcee Tab. 500 mg.
: Glaxo : Celin Tab. 500 mg.
: East India : Sorvicin Drops 100 mg/ml.

CHAPTER - 31

STEROIDAL DRUGS

Steroidal drugs act as hormones. These hormones are secreted by endocrine glands having specific physiological actions. These hormones reach the effector organ by blood stream.

Steroids are derivatives of perhydro-1,2-cyclopento-phenanthrene [Tetra cyclic] nucleus. The three cyclic rings of phenanthrene are called A, B, C, D rings and cyclopento is a D ring. Rings C & D is united by cis-arrangement.

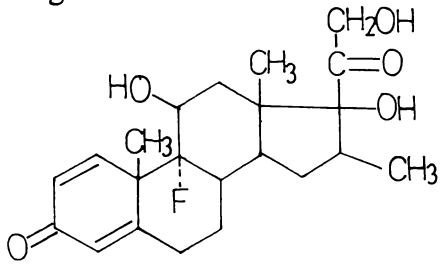
The cortex of adrenal gland secretes three types of steroids-gluco-corticoids, mineralo-corticoids and sex hormones. The sex hormones include oestrogen and androgens. Gluco-corticoids are cortisone and hydrocortisone and mineralocorticoids are aldosterone and deoxycortisone.

Sex hormones influence the maintenance and development of reproductive organs. Oestrogens and progesoteron influence female sex physiology and androgen has a role in male sex physiology.

Gluco-corticoids help in gluconeogenesis and their by act on glycogen storage and also in metabolism of protein and calcium. Mineralo-corticoids cause sodium retention and potassium excretion.

BETAMETHASONE

Betamethasone is an odourless, white to creamy white powder. It is slightly soluble in alcohol and very slightly soluble in water and chloroform. It is also available as betamethasone sodium phosphate and betamethasone valerate. The sodium phosphate salt is soluble in water and insoluble in organic solvents while and valerate salt is soluble in organic solvents and insoluble in water. It should be stored in air tight containers protected from light.



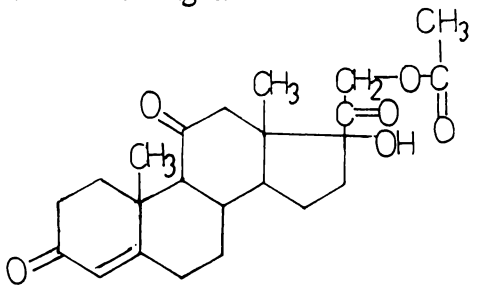
IUPAC Name : 7 α-Fluoro-11ß, 17 α, 21-trihydroxy-16ß methyl pregna-1,4-diene-3,20 dione.

Actions and uses : Betamethasone and prednisolone are having similar actions and uses. It is used in the treatment of rheumatoid arthritis, and bronchial asthma.

Officials : Betamethasone I.P.
Betamethasone Tablet I.P.
Betamethasone Sodium phosphate I.P.
Betamethasone Sodium phosphate Injection I.P.
Betamethasone Valerate I.P.
Bethamethasone Valerate Ointment I.P.

CORTISONE

Cortisone is available as cortisone acetate. This salt is an odourless, white crystalline powder. It is soluble in ether, chloroform, acetone and methyl alcohol, slightly soluble in alcohol and very slightly soluble in water. It should be stored in well closed containers, protected from light.



IUPAC Name : 17 α, 21-dihydroxy pregn-4-ene-3,11,20-trione 21-acetate.

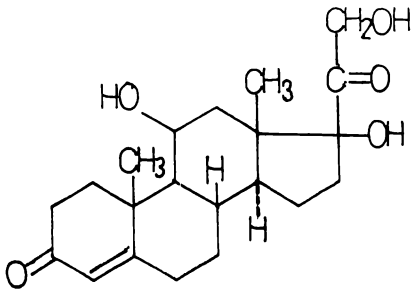
Actions and uses : Cortisone has actions and uses similar to adrenocortical hormone hydrocortisone. It is used in the treatment of inflammation. It is more effective orally than parenterally or topically. It is given in the treatment of rheumatoid arthritis, asthma, colitis, pulmonary granulomatosis and alcoholism.

It causes increase in urinary potassium level (hypokalemia), metabolic alkalosis, muscular weakness and glycosuria.

Officials : Cortisone Acetate I.P.
Cortisone Injection I.P.
Cortisone Tablets I.P

HYDROCORTISONE

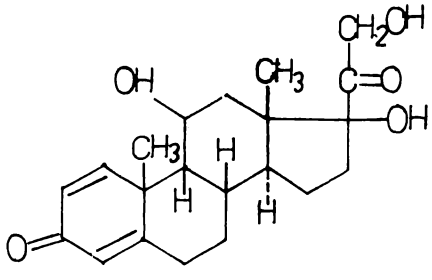
Hydrocortisone is an odourless, white crystalline powder. It is slightly soluble in alcohol and acetone but practically insoluble in water, chloroform and ether. It should be stored in well closed containers protected from light. Hydrocortisone is available as hydrocortisone acetate, hydrocortisone hydrogen succinate and hydrocortisone succinate.



IUPAC Name : 11 ß, 17α, 21 - Trihydroxy pregen-4-ene-3,20-dione.
Actions and uses : Hydrocortisone has actions and uses similar to glucocorticoids. It is used in the treatment of addisonians or post-ardrnalectomy crises and ulcerative colitis. Its acetate salt is used in the inflammatory conditions of eye and in the treatment of arthritis.
Officials : Hydrocortisone Acetate I.P.
Hydrocortisone Acetate Injection I.P.
Hydrocortisone Eye Ointment I.P.
Hydrocortisone Hydrogen Succinate I.P.
Hydrocortisone Sodium Succinate Injection I.P.

PREDNISOLONE

Prednisolone is an odourless, white crystalline powder. It is soluble in alcohol, dioxone, and methanol but very slightly soluble in water. It is a hygroscopic compound and should be stored in air -tight containers protected from light.It is available as prednisolone acetate, prednisolone sodium phosphate and prednisolone pivalate.

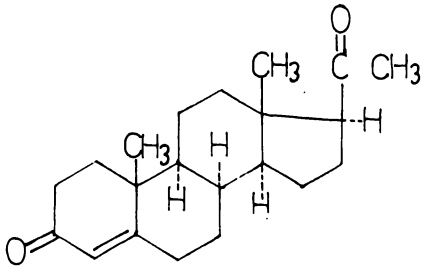


IUPAC Name : 11ß, 17α, 21-Trihydroxy pregna- 1,4-diene 3,20 dione.
Actions and uses : Prednisolone has glucocorticoid actions and is used as an anti-infammatory drug. It is four times more potent than hydrocortisone but its mineralo-corticoid activity is lesser (weaker sodium retaining effect). It is preferred for the treatment of rheumatoid arthritis, rheumatic fever, status asthmaticus and ulcerative colitis. The side effects include cushing's syndrome and dyspepsia in peptic ulceration.

Officials: Prednisolone I.P.
Prednisolone Tablet I.P.
Prednisolone Acetate I.P.
Prednisolone Pivalate I.P.

PROGESTERONE

Progesterone is an odourless, colourless to white crystalline powder. It is soluble in alcohol and ether, slightly soluble in arachis oil and ethyl oleate; practically insoluble in water and soluble in chloroform. It should be stored in air tight containers protected from light.

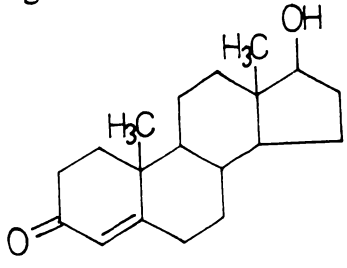


IUPAC Name : Pregn-4-ene-3, 20-dione

Actions and uses : Progesterone is secreted by *Corpus luteum* and converts the proliferative endometrium into a secretory phase. If pregnancy ensues it helps to maintain the decidua. Progesterone is used in the treatment of functional uterine haemorrhage and in intra-uterine devices for prevention of conception. It is responsible for development of breasts.The side effects of progesterone include gain in weight, mental depression and allergic skin rashes.

TESTOSTERONE

Testosterone is an odourless, white crystalline powder. It is soluble in alcohol, very slightly soluble in water and ethyl oleate. It should be stored in air tight containers protected from light.



IUPAC Name: 17ß -Hydroxyandrost -4- en-3-one.

Actions and uses : Testosterone is an androgenic hormone. It controls the development and maintenance of male-sex organs and male secondary sex-characters. In adolescent males it increses size of sex-organs and increases sexual activity. In small

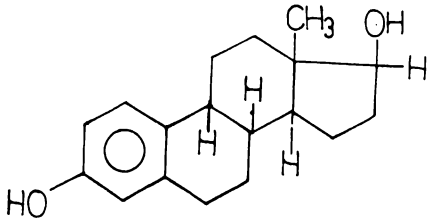
dose it increases spermatozoa production. These hormones are used in the treatment of mal developed testies, absent or delayed secondary sex-characters and in the treatment of gynaecomostia.

In females, testosterone and its derivatives are used in the treatment of dysmenorrhoea, uterine bleeding, releif of after-pains in labour and palliative treatment of carcinoma of the breast.

Officials : Testosterone Propionate I.P.
Testosterone Propionate Injection I.P.

OESTRADIOL

Oestradiol is available as oestradiol benzoate. The salt is an odourless, colourless to white crystalline powder. This salt is slightly soluble in acetone, alcohol and ethyl oleate but practically insoluble in water. It should be stored in well closed containers protected from light.



IUPAC Name :Estra-1,3,5-(10)-triene-3,17 ß - diol.

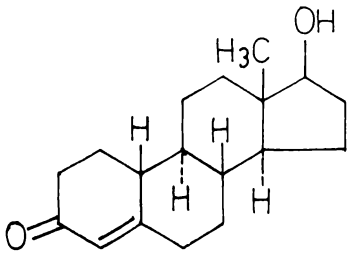
Actions and uses : Oestradiol is the most active naturally occuring oestrogen. It controls the functions of human uterus, particularly proliferation of endometrium, development of decidua and cyclic changes in the cervix and vagina. It also influences secondary sex characters, development of mammary glands and contractility of uterus.

It is used in the treatment of menopausal syndrome, senile vaginitis, vulvitis and to inhibit lactation.

Officials : Oestradiol Benzoate I.P.
Oestradiol Dipropionate I.P.
Oestradiol Propionate Injection I.P.

NANDROLONE

Nandrolone is available as decanoate, laurate and phenyl propionate salt. Nandrolone decaonate is a white crystalline powder with a faint characterstic odour. It is soluble in alcohol, ether, chloroform and very slightly soluble in water. It should be stored in nitrogen atmosphere in sealed containers protected from light below 10°C.



IUPAC Name : 4-Ene, 17ß-hydroxy-estra-3-one.

Actions and uses : Nandrolone has actions and uses similar to testosterone. Its anabolic properties are more than androgenic properties. It is used in the treatment of in-operable mammary carcinoma, acute renal failure and prevents nitrogen loss after severe burns.

Officials : Nandrolone Decanoate I.P.
Nandrolone Decanoate Injection I.P.
Nandrolone Phenylpropionate I.P.

(1) **Betamethasone** : Glaxo : Betnesol Tabs, Inj. O.5.- 6 mg daily.
(2) **Cortisone** : Indrsuifta : stemin Tab., Inj.:O.5.- 6 mg. daily
(3) **Hydrocortisone** : Hydrocortison sodium & succinate Inj. -Macleods : Prima cost
Dose : 100 ml gm. in inj or i.v.

(4) **Prednisolone** : Wyeth : Wysolone Tabs : 60mg/day and as required.
(5) **Progesterone** : Unichem : Uniprogestin Ing.: As reqd. & as directed.
(6) **Testosterone** : Intercase : Nuvircops 120-60 mg as initial increasing to 40-120 inj.
German ramedis : Testovindepoting : 250 mg 1 gm every 2-3 weeks.

(7) **Oestradiol** : Infar :Evalon Tab. : German remedise : Progynon Depot Inj.
Dose: As directed by physcian

(8) **Nadrolone** : Infer:Decadurabolin Inj.
Cadilla : Decaneurabol Inj. : Dose : 25-50 mg. in weekly to 3 weekly.

CHAPTER - 32

ANTINEOPLASTIC DRUGS

Neoplasm is also called as cancer or tumor. It means a relatively autonomous growth of tissue. Tumor indicates any abnormal mass or growth of tissue. Cancerous tumor is a malignant neoplasm with potential danger. Malignant neoplasm is the beginning of metastasis. These tumors have a rapid growth of cells but the rate of cell death is less and therefore a tumor is formed. Primary tumors can be treated by cytotoxic agents or exposure to radiation or by surgery but it is very difficult to treat secondary tumor.

Classification of antineoplastic agents :

(A) **Alkylating agents** : Azathioprine, Busulphan, Cisplatinum, Chloranmbucil, Cyclophosphamide.

(B) **Antimetabolites** : 5-Fluoro-uracil, 6-Mercapto-purine, Methotrexate.

(C) **Antibiotics** : Mitomycin, Daunorubicin and Actinomycin.

ACTINOMYCIN

Actinomycin D is also called dactinomycin. It is isolated from *streptomyces parvullus*. It is a powerful bacteriostatic and cytostatic agent. It is used for the treatment of wilms tumor [a kidney tumor of children] and gastrointestinal trophoblastic disease.

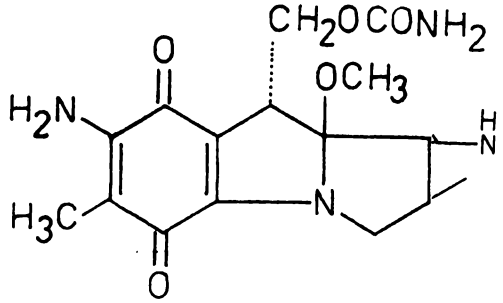
Dactinomycin binds with D.N.A by intercalation and interferes with synthesis of R.N.A and with protein synthesis.

Actinomycin is a bright red crystalline powder. It is soluble in water, freely soluble in alcohol, and very slightly soluble in ether. It is a hygroscopic compound and should be stored in air-tight containers protected from light below 40°C.

It is a tricyclic phenoxazine-3-one chromophore and has two identical penta petide lactone rings. It is the only agent which shows preference for purine-primidine D.N.A base sequence. It is also used in the treatment of tumors of uterus and testis, esterogenic sarcoma and other solid tumors.

MITOMYCIN

Mitomycin is isolated from *Streptomyces verticillatus* or *Streptomyces caespisosus*. It is a blue violet crystalline powder soluble in water, acetone, methanol and cyclohexanone. It should be stored in air-tight containers protected from light.

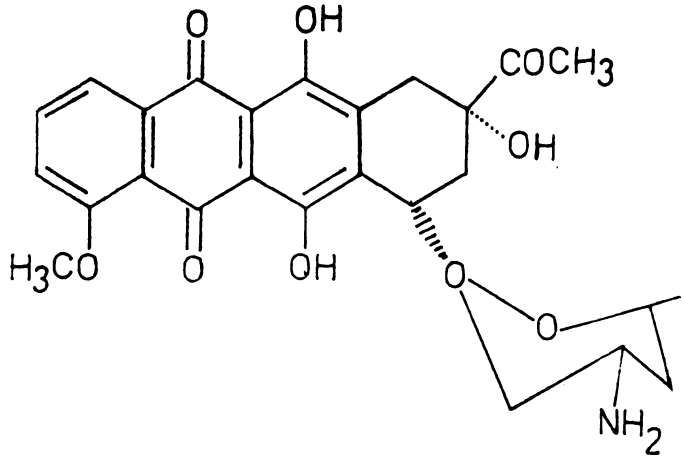


IUPAC Name : 6-Amino-1,1a,2,8,8a,8b-hexahydro-8-hydroxymethyl-8a-methoxy-5-methylazirino [2',3' : 3,4] -pyrrolo [1,2-a] indole-4,7-dione carbomate.

Actions and uses : Mitomycin binds preferentially to guanine and cytosine moieties of D.N.A, leading to cross-linkage to D.N.A and inhibits synthesis and functions of D.N.A. It is used in the treatment of carcinomas of bladder, breast, cervix, stomach, liver and prostate.

DAUNORUBICIN

Daunorubicin is available as hydrochloride salt. It is an orange-crystalline powder. It is freely soluble in water and methanol, slightly soluble in chloroform and practically insoluble in acetone. It is hygroscopic compound and stored in air-tight containers below 40°C.

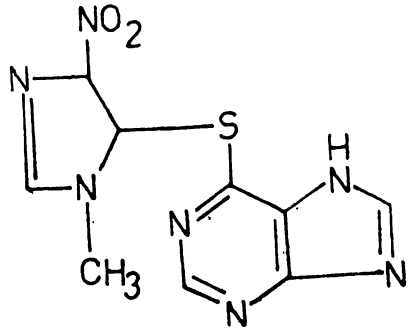


IUPAC Name : 8- [Acetyl-10-[3-amino-2,3,6,-trideoxy-α-L-lyxohexopyanosyl) oxy] -7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-5-12-naphtacenedione.

Actions and uses : Daunorubicin forms a stable complex with D.N.A and interferes with synthesis of nucleic acid. It is given in the treatment of acute lymphoblastic leukaemia in combination with vincristine and prednisone.

AZATHIOPRINE

Azathioprine is a pale yellow, odourless-powder. It is soluble in alkali hydroxides, sparingly soluble in mineral acids and practically insoluble in alcohol and chloroform and should be stored in air-tight containers protected from light below 30°C.



IUPAC Name : 6-[(1-methyl-4-nitro-1H-imidazol-5-yl) thio]-1H-purine.

Actions and uses : Azathioprine is a cytotoxic and immunosuppressant agent. It is converted into another cytotoxic drug mercaptopurine, thus providing prolonged action. It is used in the treatment of acute leukaemia and as immunosuppressive in organ transplantation. It is also used as immunosuppressive in lupus erythomatosus and polyarthertis nodosa. It is also useful in severe rheumatoid arthritis, ulcerative colitis, various nephritis, etc.The side effect are gastro-intestinal disorder pain in joints, liver damage, etc.

BUSULPHAN

Busulphan is an odourless white crystalline powder, freely soluble in acetone and chloroform, and very slightly soluble in water, alcohol and ether. It should be stored in air-tight containers protected from light.

$$CH_3\text{-}SO_2\text{-}O(CH_2)_4\text{-}O\text{-}SO_2\text{-}CH_3$$

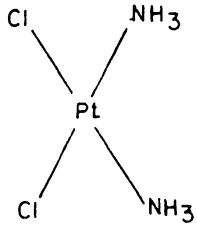
IUPAC Name : 1,4-Bis { methane sulfonoxy } butane.

Actions and uses : Busulphan is a cell-cyclic, non-specific alkylating agent and inihibits cell division. Its main action is on bone-marrow granulocyte production and platelet production. It is given orally in the treatment of chronic myeloid leukaemia. It reduces size of the spleen.

The undesirable effects are hyperpigmentation and amenorrhoea. Blood infusion should be given along the drug every week and a check on platelets counts and granulocyte count should be stable.

CISPLATIN

Cisplatin is a yellow or orange yellow crystallin powder. It is slightly soluble in water; sparingly soluble in dimethyl formamide and practically insoluble in alcohol. It should be protected from light.



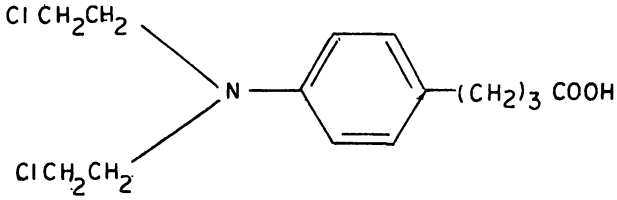
IUPAC Name : Cis - Diammine dichloro platinum.

Actions and uses : Cisplatin is a cell-cyclic, non specific antineoplastic drug. It is used in the treatment of metastatic tumours of testis, ovary and advanced bladder cancer. It is given by intravenous infusion.

The adverse effects are nephrotoxicity, myeloid suppression and neurotoxicity. It may cause nausea and vomitting.

CHLORAMBUCIL

Chlorambucil is a white crystalline powder with a slight odour. It is soluble in alcohol chloroform and acetone but practically insoluble in water. It should be stored in air-tight containers protected from light.Chlorambucil is an irritant; avoid contact with skin and mucous membrane.



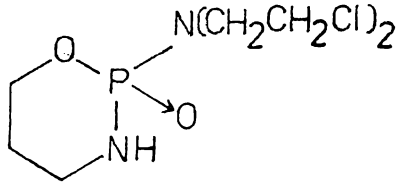
IUPAC Name : 4-[4-Bis {(2-chloro ethyl)amino}phenyl] butyric acid.

Actions and uses : Chlorambucil is a cytotoxic agent which damages cells by fragmentation of nuclear chromosomes. It is used in the treatment of follicular lymphoma, lymphocytic lymphoma with or without leukaemia, hodgkin's disease, reticulum-cell,sarcoma, chronic myelocytic leukaemias, rheumatoid arthritis and systemic lupus erythematosus.

It may produce severve neutropenia, thromobocytopenia and irreversible damage to bone morrow.

CYCLOPHOSPHAMIDE

Cyclophosphamide is an odourless white crystalline fine powder with a slightly bitter taste. It is freely soluble in alcohol, soluble in water and very slightly soluble in ether. It should be stored in air tight containers below 30°C.



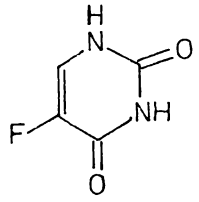
IUPAC Name : 2-[Bis (2-chloro ethyl)amino]perhydro-2H-1,3,2,-oxazaphosporine 2-oxide.

Actions and uses : Cyclophosphamide is a cyto-toxic drug. It probably broken down at nitrogen phosphorus linkage and act as alkylating agent in liver.It is used in the treatment of hodgkins disease, multiple myeloma, lymphosarcoma, lymphatic leukaemia, ovarian tumour and other tumors. It is also used in the treatment of inoperable breast and bronchial cancers. The side effects are cardiac toxicity, gastro intestional, pulmonary disturbances, etc.

Officials : Cyclophosphamide I.P.
Cyclophoamide Injection I.P.
Cyclophosphamide Tablets I.P.

FLUOROURACIL

Flurouracil is an odourless-white crystalline powder. It is soluble in water, very slightly soluble in alcohol and practically insoluble in chloroform and ether. It should be stored in air-tight containers protected from light.



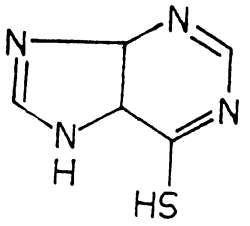
IUPAC Name : 5-Fluro pyrimidine-2,4-[1H,3H]- dione.

Actions and uses : Flurouracil is an analouge of uracil. It competitively blocks biosynthesis of ribonucleic acid. It is used in the treatment of respiratory tract, gastro intestinal tract and breast cancer. It is also used in the treatment of solar keratoses on the skin. The side effects are nausea, vomiting, diarrhoea, depression in bone marrow, etc.

Officials : Flurouracil I.P.
Flurouracil Injections I.P.

MERCAPTOPURINE

Mercaptopurine is an odourless yellow crystalline powder. It is soluble in alkali hydroxide, very slightly soluble in water, alcohol, ether and acetone. It should be stored in air tight containers protected from light.



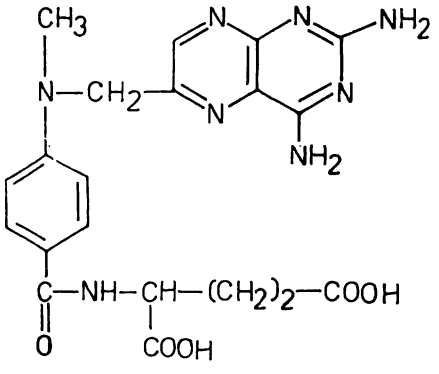
IUPAC Name : 6-mercaptopurine.

Actions and uses : Mercaptopurine is a analogue of adenine and blocks the components of nucleic acid,it interfere with nucleic acid biosynthesis. It is used in the treatment of acute leukaemia or chronic myeloid leukaemia. It is also immuno-suppressant in the treatment of nephrotic syndrome and auto-immuno haemolytic anaemia.

Officials : Mercaptopurine I.P.
Mercaptopurine Tablets I.P.

METHOTREXATE

Methotrexate is a yellow to orange crystalline powder. It is soluble in alkali hydroxides, very slightly soluble in water, alcohol, ether and chloroform. It should be stored in air tight containers protected from light.



IUPAC Name : N-{4-[(2,4-diaminopteridin-6-ylmethyl)methylamino] benzoyl} L-glutamic acid.

Actions and uses : Methotraxate is a cyto-toxic and folic acid antagonist. It combines irreversible with dihydrfolate reductase and inhibits nucleic acid synthasis, thereby stops cell division. It is used in the treatment of leukaemia and meningial leukaemia. It should be given intrathecally because it can not cross blood-brain barrier. It is also used in the treatment of choriocarcinoma, testicular cancer and breast cancer. Its immunosuppressive action is used in the treatment of dermatomyositis. The side effects are nausea, vomiting, diarrhoea, ulceration, abdominal cramp, etc.

Officials : Methotrxate I.P.
Methtrexate Tables I.P

(1) **Actinomycins** : Actinomycin-D Inj. 15 µg/kq I.V. daily Inj. for 5 days.

(2) **Busulphan** : B.Wellcome: myleran Tab. : Dose depends on condition-4-8 mg/day.

(3) **Chlorambusil** : B.wellcome : Leukeran Tabs : As directed.

(4) **Cisplatin** : Biochem : Cisplatin Inj.: Dose depend upon the type of tumour.

(5) **Cyclophosphamide** : Biochem : Cycloxan Tab., Inj.: 40-50 mg/kg. in div. doses.

(6) **Fluorouracil** : Biochem : Fluracil Inj., Cap. : 12 mg/kg. wt.once daily.

(7) **Mercaptopurine** : B. Wellcome : Nenthol Tabs : As directed and reqd.

(8) **Methotrexate** : Biochem : Biotrexate Inj., Tab : 12 mg/m^2 max. upto 15 mg.

(9) **Mytomycin** : Biochem : Mitomycin-C-Kyowa : 6-10 mg. i.v.Inj. twice weekly

(10) **Azathioprine** : Searle : Azoran Tab. 50 mg
B.Wellcome : Imuran 0.5 mg

(11)**Daunorobicin** : Sigma Lab. : Rubidomycin Inj.
Dabur : Adrim Inj.

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