

SOURCES OF DRUGS

Medications can be obtained from various sources like ;

PLANT SOURCE: Digitalis and opium are derived from parts of plants (seeds,stem,roots,leaves,resin etc) or its products.

ANIMAL SOURCE: Drugs like insulin and thyroid are derived from glandular products from animals.

MINERAL SOURCE:Drugs like potassium chloride and lithium carbonate are derived from minerals.

SYNTHETIC SOURCE:Drugs like barbiturates , sulphonamides and aspirin are manufactured in the laboratories by natural processes. This removes side effects and enhances its potency.

Classification of different sources of drugs :

BIOLOGICAL : Plants, microbes, animals.

MARINE : Cardio vascular active substances

Anti cancer compounds

Anti microbial compounds

Antibiotic compounds

Anti inflammatory compounds

Anti spasmodic compounds

Marine toxins

MINERAL: Herbo minerals

BIOLOGICAL SOURCE OF DRUGS

The biological source of drugs is classified as follows :

Vegetable/ Plant sources : Drugs (eg) digitalis, vinca, rauwolfia, cinchona, liquorice, aloe, opium, etc .,

Microbial sources : Drugs (eg) gelatin, cantharides, shellac, musk and medicinal leech etc.,

Animal source : Drugs (eg) killed cultures of bacteria and viruses, diphtheria, polio, tetanus, typhoid, rabies, hepatitis –B- vaccines etc are obtained from animals.

PLANT SOURCE

- Various diseases have been treated by using plant products.
- Ayurveda, siddha, unani systems are using plant based medicines. 2,00,000-2,50,000 belonging to 10,500 genera and around 300 families.
- The genera are spread in to families like Solanaceae, Compositae, papaveraceae, Scrophulariaceae, Leguminosae, Rutaceae, Rubiaceae, Umbelliferae, Dioscoriaceae, Gnetaceae, Bromeliaceae, Apocynaceae, Rhamnaceae, Caricaceae, Plantaginaceae, Sterculiaceae, Ericaceae, Liliaceae and Graminae.
- Seed bearing plants (spermatophytes) flowering plants (angiosperms) non flowering plants (gymnosperms) have produced many useful plants.

ANIMAL SOURCE HORMONES

These are mammalian products secreted directly into the animal blood by its endocrine or ductless glands.

THYROID: Thyroid glands of sheep and pigs are used for the preparation of thyroxine and liothyronine which is administered Orally.

INSULIN: From the pancreas of cattle pigs. It is made by recombinant DNA technology. used for treating diabetes mellitus.

EPI NEPHRINE : This hormone acts as the neurotransmitter in the sympathetic nervous system.

OXYTOCIN : The posterior pituitary gland secretes this polypeptide hormone which includes uterine contraction during labour pain, and also stimulates milk secretion in mothers.

This hormone is prepared from the pituitary glands of cattle and pigs. It can also be synthesised.

VASOPRESSIN : It is a peptide hormone obtained from the pituitary gland of the healthy cattle and pigs. It is used in the treatment of intestinal paralysis and also diabetes insipidus due to anti diuretic action.

GONADOTROPIN : This hormone is secreted by the gonadotrope cell present in the pituitary gland of vertebrates.

ENZYMES

These are produced by the living organism and act as biological catalysts. These are proteins having a molecular weight ranging from 13,000-8,40,000.

PANCREATIN : It is prepared from the pancreas of pigs. It is used for treating pancreatitis.

TRYPSIN : This serine protease present in the digestive system of vertebrates hydrolyses proteins.

CHYMO TRYPSIN : This digestive enzyme causes proteolysis.

PEPSIN : It is a proteolytic enzyme present in the gastric juice. It is obtained from the glandular layer of the stomach of pigs. Pepsin is used in the **achylia gastrica**, which occurs when stomach does not produce acid and pepsin.

FIBRINOLYSIN : The pro fibrinogen isolated from human plasma is activated through the action of streptokinase to produce fibrinolysin which is used for treating venous thrombosis and pulmonary embolism.

HYALURONIDASE: This belongs to group of enzymes of hyaluronic acid (a muco polysaccharide) .

- Some micro organisms produce hyaluronidase which is present in the heads of leeches, in snake venoms, and in mammalian testes.
- Commercially this preparation is obtained from animals.it facilitates the administration of fluids through hypodermoclysis.
- (a method of administering fluids or medication sub cutaneously, under the skin)

ANIMAL EXTRACTIVES AND ORGANS

This group comprises of liver and stomach preparations and bile. Liver and stomach obtained from tanned healthy animals. Bile is naturally secreted by the liver and temporarily stored in the gall bladder. Bile carries sodium salts of bile acids (de hydro cholic acid , tauro cholic acid and de oxy cholic acid) ox bile is the major source of these acids.

OTHER USEFUL ANIMAL DRUGS

- **Carmines** (a colouring agent) obtained from cochineal insects,
- **Cod liver oil** (obtained from the liver of cod fish)
- **Cantharidin** (an irritant constituent of cantharides insects)
Heparin, wool fat and lanolin are obtained from the animals. These are included in formulations and used in cosmetic industries.

MICROBIAL SOURCE

- Organisms viewed under the microscope are termed microbes (Eg) – Viruses, bacteria and rickettsiae
- Various immunizing biologicals or drugs obtained from these micro organisms provide either active or passive immunity to a person against many infectious diseases.

VACCINES

- These are suspensions made up of living, dead microbes. According to their source vaccines are of 3 types. **Viral vaccines, bacterial vaccines and rickettsiae vaccines.**
- All these vaccines are prepared individually from viruses, bacteria and rickettsiae.

Viral vaccines: These vaccines containing (live or killed virus) are the prophylactic agents acting against small pox, rabies, influenza, polio, measles and mumps.

Small pox vaccines : These vaccines carry live virus of vaccinia (cow pox) grown in a vaccinated bovine calf skin. In liquid form these vaccines are smooth aqueous suspensions of infected tissues with 40 -60% of glycerine or sorbital and not more than 0.5 % of phenol (preservative).

Poliomyelitis vaccines

Polio virus vaccine inactivated : it is a sterile suspension carrying strains of inactivated poliomyelitis virus.

Polio virus vaccine live oral : it is a formulation carrying one or a combination of live, attenuated polio virus strains.

Rickettsiae vaccines : These vaccines carry rickettsiae microbe and induce active immunity against typhus fever. Rickettsiae are a group of gram – negative micro organisms. Their size is between average sized bacteria and the large viruses. Growth of rickettsiae is not possible in artificial media , it requires chick embryo or monkey kidney tissue cultures for growing.

Typhoid vaccines : These vaccines are a sterile suspension of killed selected strain of *salmonella typhi* (typhoid bacilli) they immunize the person against typhoid fever.

Cholera vaccine : These vaccines are a sterile suspension containing killed *cholera vibrios* and *vibrio cholerae* in suitable diluents like saline etc., They produce active immunity against cholera.

Plague vaccines : These vaccines are a sterile suspension having killed selected strain of *Yersinia pestis* (*plague bacilli*) they provide immunity against the disease.

Pertussis vaccines : These vaccines are a sterile suspension carrying strain of killed *Bordetella pertussis* or particular strains that show high antigenic efficiency. They immunize the person against pertussis or whooping cough.

BCG(Bacillus Calmette Guerin) vaccines : These vaccines are dried , living culture of *Mycobacterium tuberculosis* var *bovis* strain. They actively immunize the person against tuberculosis.

TOXOIDS

- These microbial products provide active immunity against disease with poisonous bacterial waste products are called toxins.
- Bacteria excreted toxins which get dissolved in the surrounding culture medium are **exotoxins**.
- While bacteria excreted toxins that remain in the bacterial body are **endo toxins**.
- Treating exotoxins with formaldehyde decreases their toxic properties but retains their antigenic property. The products so obtained are fluid toxoid or adsorbed toxoid (eg ., tetanus and diphtheria toxoids).
- Triple antigen or DPT (Diphtheria pertussis tetanus vaccine) is given to young children against diphtheria, tetanus, whooping cough.

MARINE SOURCE OF DRUGS

- Since ancient times the 139 million square of sea water covering 71% earth has been a rich source of important elements, food, raw materials and drugs.
- A number of new drugs are under investigation at present.
- Shark liver oil, cod liver oil, sodium alginate, agar agar and chitin are marine drugs.
- Novel medicinal agents were obtained from marine sources which provides various therapeutic effects.

Cardio vascular active substances

- **Anthopleurin:** It is a peptide derived from *Anthopleuro xanthogrammica* yielding type A and B (AP-A and AP-B) and *elegantissima* yielding type AP-C anthopleurins.
- **Eptatretin:** It is obtained from a neural bronchial hearts of pacific hog fish *Eptatretus stoutii*. It acts as a potent cardiac stimulant which directly stimulate mammalian myocardium just like adrenaline.
- **Laminine:** It is a basic amino acid compound with hypotensive effects and is obtained from marine algae *Laminaria angustata*
- **D(-)Octopamine:** It is obtained from *octopus macropus*, *octopus vulgaris* and causes adrenergic and cardio vascular response.

- **Saxitoxin:** It is obtained from butter clams *Saxidomus gigantea*, *California mussel* and *Mytilus californianus* and produces hypotensive effect.
- **Autonomium:** It is obtained from *Verongia fistularis*. Study in mice showed CNS stimulant effects causing a significant increase in spontaneous motor activity.
- **ATX-II:** This is a poly peptide, it also produces a potent cardio tonic effect on mammalian heart.
- **Eledosin:** It is obtained from the posterior salivary glands of *Eledone moschata*. It is a potent hypotensive compound and produces strong vasodilator effects.

- **Holothurin and Asterosaponin:** These are marine saponins having tri terpenoid moiety as its aglycone part, and steroidal aglycone.
- Holothurins are available in sea cucumbers (family – *Holothuroidea* and phylum *Echinodermata*). They produce cardio tonic, ichthyotoxic and haemolytic actions.
- Holoxins (holotoxin A, B and C) are de sulphated holothurins showing anti fungal activity.
- **Spongosine:** It is a nucleoside a methoxy derivative of adenosine obtained from the extract of ***Cryptothia crypta*** (a caribbean sponge). It reduces the rate as well as the force of heart contractions.

CYTOTOXIC (ANTI CANCER)COMPOUNDS

- **Ara-C:** It is therapeutically employed for treating acute myelogenous leukemia and human acute leukemia.
- It is cytosine arabinoside, obtained as a synthetic compound from the natural moieties present in caribbean sponges
- (for eg) spongosine and spongouridine.
- **Crassin Acetate:** It belongs to cembranoids(cyclic di terpenes obtained from soft corals) it is obtained from caribbean gorgonian and *pseudoplexaura porosa* and shows in vitro cytotoxic effect to human leukemic cells.
- *Sinularia flexibilis* a soft coral produces simularin, di hydro simularin and simulariolide.

ANTI MICROBIAL COMPOUNDS

- Several anti microbial compounds are obtained from marine organisms including sea cucumber, marine algae, sponges, sea hare, gorgonian corals and red algae.
- Holotoxin A, B and C (Steroidal glycoside) anti fungal in nature zonarol and iso zonarol are obtained from sea cucumber ***Stichopus japonicas***.
- Tetra bromo heptanone is obtained from the brown algae ***Dictyopteris zonaroides***.
- Four isomers of poly halo – 3-butene – 2-one and seven isomers of poly thalo acetones are obtained from Red algae ***Bonnemaisonia hemifera***.

- Aeroplysinin-1(+) obtained from Red algae *Asparogopsis taxiformis*.
- Aeroplysinin -1(-) obtained from sponge *Verongia aerophoba*.
- 2-cyano-4,5-di bromo pyrrole obtained from sponge *Agelas oroides*.
- Prepacifenol obtained from Red algae *Laurencia pacifica* and *Laurencia filiformis*.
- Thelpin obtained from Annelida *Thelepsus setosus*.
- De bromo laurenterol obtained from sea hare *Aplysia californica*
- Eunicin obtained from Gorgonian corals *Eunicia mammosa*.

ANTIBIOTIC COMPOUNDS

- 2,4-Di bromo-6-(3,4,5-tri bromo pyrrole-2-yl) phenol obtained from marine bacterium *Pseudomonus bromutilis*.
- Cycloeudesmol obtained from Red algae *Chondria oppositoclada*.
- Variabilin, ircinin-1 are obtained from sponge *Ircinia strobilina* and *Ircinia oros*.
- 3,5-Di bromo -4-hydroxy benzene-1-acetamide obtained from sponge *Verongia archery*

ANTI INFLAMMATORY AND ANTISPASMODIC COMPOUNDS

Manoalide: It is a non steroidal anti inflammatory compound obtained from *Luffariella variabilis* (sponge).it also shows analgesic activity.

Flustramine A and B: These compounds are obtained from *Flustra foliaceae* a Swedish marine moss and have muscle relaxant action.

Tetradotoxin:It is extracted from the liver and ovaries of puffer fishes. It exhibits a strong anti spasmodic action.

MARINE TOXINS

Sea micro organisms that act as autotrophs are also a source of toxins which are external metabolites as well as endotoxins.

Ciguatoxin:it is obtained from *Gambier discustoxicus*. The term ciguatoxin means an ailment arising due to ingestion of marine snails.

Palytoxin:This long chain poly hydroxy macro molecule is obtained from *Palythoa* species.it has a most potent coronary vaso constrictor activity.

Red tide toxins: (paralytic shell fish toxins): These toxins include brevetoxin,saxitoxin,gonyautoxins etc. Their presence brings change in colour of surface water like yellow,brown,green and not red always.

MISCELLANEOUS COMPOUNDS

This group includes the marine products that are insecticides, Anthelmintics, anti coagulants and other compounds with special properties.

Kainic acid obtained from *Digenea simplex* red algae. It is a potent convulsant and also shows anti ascariasis activity.

Domoic acid obtained from *chondria armata* red algae also shows effect against ascaris and pin worm.

Aplysinopsin is obtained from *Verongia spengeli* a yellow sponge . It shows anti depressant action in animals and is also cytotoxic in nature.

MINERAL SOURCE (HERBO MINERALS)

- **Shilajit** is a herbo mineral drug which act as tonic and stimulant.
- **Asbestos** (amianthus) contains double silicate of calcium and magnesium with little iron montmorillonite. It is used in bacterial filters of caustic alkalis, heat resistant insulator, fire proof gloves and clothing.
- **Bentonite**(whilkinite) contains zinc oxide and ferric oxide(0.5%) used as a suspending agent, emulsifier,base for plasters,lipsticks and depilatories.
- **Calamine** contains zinc oxide and ferric oxide (0.5%) used as skin protectant and local astringent.