



CLASSIFICATION OF DRUGS

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Abstract

A crude drug is any naturally occurring, unrefined substance derived from organic or inorganic sources here I discussed about classification of drugs according to Ayurveda.

Key Word- Classification, Drugs, Plant, Animal, Source, Organic.

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INTRODUCTION

Drugs- A crude drug is any naturally occurring, unrefined substance derived from organic or inorganic sources such as plant, animal, bacteria, organs or whole organisms intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease in humans or other animals.

Nature and sources of Drugs

1. Natural
2. Semi-synthetic
3. Synthetic
4. Biosynthetic
5. Gene therapy

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Natural Drugs <ul style="list-style-type: none"> • Plants, • Microorganisms • Animals • Minerals 	Plants: Morphine from Poppy capsules. Atropine from belladonna leaves. Quinine from Cinchona bark. Castor oil from castor seeds.
	Animals: Insulin from Pig or Ox pancreas.

	<p>Thyroxine from Pig or Ox thyroid gland.</p> <p>Heparin from Pig or Ox liver.</p> <p>Cod Liver Oil from Cod fish Liver.</p>
	<p>Microorganisms</p> <p>Penicillin from <i>Penicillium notatum</i>.</p> <p>Streptomycin from <i>Streptomyces griseus</i>.</p> <p>Bacitracin from <i>Bacillus subtilis</i>.</p>
	<p>Minerals</p> <p>Calcium, Magnesium, Aluminium, Sodium, Potassium and Iron salt.</p> <p>Liquid paraffin from petroleum.</p>
Semi-Synthetic Drugs	<p>These are prepared by chemical modification of natural drugs in laboratories.</p> <ul style="list-style-type: none"> ✓ Ampicillin from Penicillin-G. ✓ Dihydroergotamine from Ergotamine. ✓ Dehydroemetine from Emetine.
Synthetic Drugs	<p>They are prepared by chemical synthesis in pharmaceutical laboratories.</p> <ul style="list-style-type: none"> ✓ Sulphonamides ✓ Salicylates ✓ Barbiturates ✓ Benzodiazepines
Bio-Synthetic Drugs	<p>These are prepared by cloning of human DNA into bacteria like E.Coli.</p> <ul style="list-style-type: none"> • CLONING means production of identical subjects like parents. • TECHNIQUE is called Recombinant DNA technology or Genetic Bioengineering. ✓ Human Insulins ✓ Human Growth Hormones ✓ Human Interferons, alpha & beta. ✓ Tissue plasminogen activator ✓ Human BCG vaccine.

	✓ Human Hepatitis-B Vaccine.
Gene Therapy	<p>It is the introduction of functional genetic material DNA into target cells to replace or supplement defective genes.</p> <p>It imparts new function to cells.</p> <ul style="list-style-type: none"> ✓ Cancers ✓ Alzheimer's disease, Sickle Cell Anemia ✓ Parkinsonism, Dwarfism. ✓ Diabetes mellitus, Multiple Sclerosis. ✓ Hypertension. ✓ Viral infections. ✓ Cystic fibrosis. ✓ Muscular dystrophy.

Plant sources

Part of plant	Name of plant	Active principle
Root	Rauwolfia serpentine	Reserpine
	Atropa belladonna	Atropine
Bark	Cinchona	Quinine and quinidine
Wood	Sandal wood	Sandal wood oil
Flower	Clove	Eugenol
Fruit	Senna	Senergin
Seed	Nux vomica	Strychnine
Leaf	Digitalis	Digoxin
Corn	Colchicum	Colchicine
Bulb	Urginea	Squill

Plant Products

Organic acids	Glycosides	Tannins	Antibacterials
Alkaloids	Oils	Resins	Gums, Waxes.

Organic acids	<ul style="list-style-type: none"> • Salts of potassium , calcium and magnesium • Examples include- • Citric acid • Tartaric acid • Salicylic acid
Alkaloids	<ul style="list-style-type: none"> • Organic nitrogenous. • Basic, insoluble in water. • Names end with 'ine'. • Atropine, morphine, nicotine. • Pilocarpine, caffeine, emetine. • Animal alkaloids are called amines. • Adrenaline, Nor Adrenaline, Dopamine, Histamine & 5-HT.
Glycosides	<ul style="list-style-type: none"> • Organic non-nitrogenous. • Neutral or Highly acidic, soluble in water. • Hydrolyse on heating with mineral acids & split in two components, sugar & non-sugar (aglycone or genin). • Sugar responsible for water and lipid solubility, cell permeability, tissue fixation & potency. • Genin responsible for phaermacological actions, e.g. Digoxigenin & Digitoxigenin.
Saponins	<ul style="list-style-type: none"> • Plant glycosides having the distinctive property of frothing. On hydrolysis they yield aglycones. They are of two types – 1.Steroidal – digitonin , senegin 2.Triterpenoidal – glycyrrhizin
Fixed Oils	<ul style="list-style-type: none"> • Fixed Oils from plants are Glycosides of Oleic, Palmitic & Stearic acids. • Edible, used for cooking. • Mustard, Sunflower, Peanut & Coconut oil. • Castor oil used as purgative. Fixed oils from animals – Cod liver, Shark liver oil.
Volatile Oils	<ul style="list-style-type: none"> • From flowers, leaves, fruits & seeds of plants. • Contain 'terpene' serving as solvent. • Water soluble with smell & taste.

	<ul style="list-style-type: none"> • Volatilized by heat & possess aroma. • No food value. • Used as carminative, antiseptic or flavoring agent. • Cardamom, peppermint, clove or turpentine oil. • Camphor, menthol solid at room temp.
Mineral Oils	<ul style="list-style-type: none"> • Mixture of hydrocarbon of methane obtained from petroleum. • Liquid paraffin used as laxative. • Soft & Hard paraffin used as ointment bases.
Tannins	<ul style="list-style-type: none"> • Organic non-nitrogenous substances obtained from plants. • Water soluble. • Tincture of catechu used as anti-diarrhoeal agent. • Tincture of Kalmegh used as appetiser.
Resins	<ul style="list-style-type: none"> • Solid non-volatile formed by oxidation or polymerization of volatile oils in plants. • Insoluble in water, soluble in alcohol. • Podophyllum resins used as cauterizing agent in venereal warts. • Jalap & Colocynth used as purgatives. • Oleoresin is a mixture of resin with volatile oil, eg. Male fern extract.
Inactive (Inert) Plant Products.	<ul style="list-style-type: none"> • Gums are polysaccharide secreting products of plants. Thick mucilagenous colloids form with water. Gum acacia & Gum tragacanth used as emulsifying agents for preparation of emulsions & suspensions. • Waxes are vegetable waxes, animal waxes like sheep wool & honeycomb by bees. • Bees wax is yellow & converted to white wax by bleaching. • Waxes used for ointments, creams, suppositories.

Classification Of Crude Drugs

1. Alphabetical Classification
2. Taxonomical Classification

3. Morphological Classification
 4. Pharmacological Classification
 5. Chemical Classification
 6. Chemo-taxonomical Classification
 7. Sero-taxonomical Classification
1. **Alphabetical Classification-** It is the simplest way of classification of any disconnected items. Crude drugs are arranged in alphabetical order of their Latin and English names or sometimes common names or sometimes local language name (vernacular name). Eg- Indian Pharmacopoeia, British Pharmacopoeia, British Herbal Pharmacopoeia, United States Pharmacopoeia and National Formulary, British Pharmaceutical Codex, European Pharmacopoeia.
 2. **Taxonomical Classification-** Different plants possess different characters of morphological, chemical, embryological, serological and genetics. This type of classification is helpful for studying evolutionary development. In this classification the crude drugs are classified according to kingdom, subkingdom, division, class, order, family, genus, and species in the following manner-

Kingdom	Plantae		
Superdivision			
Division			
Class	Angiosperms-plants which produce flowers and fruits. Gymnosperms- plants which don't produce flowers.		
Subclass	Dicotyledonae- plants with two seed leaves. Monocotyledonae-plant with one seed leaf.		
Superorder	A group of related plant families, classified in the order in which they are thought to have developed their differences from a common ancestor. Name of superorders ends with – <i>idea</i>	Dicotyledonae <i>Magnoliidae</i> <i>Hamamelidae</i> <i>Caryophyllida</i> <i>e</i> <i>Dilleniidae</i> <i>Rosidae</i> <i>Asteridae</i>	Monocotyledonae <i>Alismatidae</i> <i>Commelinidae</i> <i>Arecidae</i> <i>Liliidae</i>
Order	Each superorder is further divided into several orders. The names ends with – <i>ales</i>		

Family	Each order is divided into families. These plants with many botanical features in common. The name of the family ends with – <i>aceae</i> .
Subfamily	The family may be further divided into a number of subfamilies, which group together plants within the family that have some significant botanical differences. The names of subfamilies ends with – <i>oideae</i>
Tribes	A further division of plants within a family based on smaller botanical differences, bin still usually comprising many different plants. The names of the tribes end in – <i>ae</i> .
Sub tribe	A further division based on even smaller botanical differences, often only recognizable to botanists. The names of the sub tribes end in- <i>inae</i> .
Genus	This is the part of the plant name that is most familiar, the normal name that you give a plant. The plants in a genus are often easily recognizable as belonging to the same group.
Species	This is the level that defines an individual plant. The name will describe some aspect of the plant- the color of flowers, size or shape of the leaves or it may be named after the place where it was found, it is used to identify the particular plant. the name of species should be written in small letters after the genus name.
Variety	A variety is plant that is only slightly different from the species plant, but the differences are not so insignificant as the differences in a form. The name follows the genus and species name, with var. before the individual variety name.
Cultivar	A cultivar is a cultivated variety- a particular plant that has arisen either naturally or through deliberate hybridization. It is written in the language of the person who describe it.

3. Morphological Classification- In this type of classification drugs are arranged according to the morphological or external characters of the plant parts, which part is used as a drug, eg- leaves, roots, stem etc. As per morphological classification drug can be classified as organized and unorganized drug. This type of classification is

helpful to identify and detect adulteration. This system of classification is more convenient for practical study especially when the chemical nature of the drug is not clearly understood.

Organized drug	Unorganized drug
These may be of plant or animal origin	These may be of plant, animal or mineral origin
These are direct part of plant or animal	These are the product of plant or animal
These have cellular structure	These do not have well defined cellular structure
Generally identified by morphological characters	Generally identified by organoleptic characters
Woods- quassia, sandalwood, red sandalwood Leaves- Digitalis, gymnema, mint, senna, tulsi, vasa Bark- Arjun, ashok, cinnamon Flower- Clove, saffron Fruits- Amala, bael, coriander, vidang Seeds- linseed, nutmeg, nuxvomica Root & Rhizome- aconite, calamus, glycyrrhiz, jatamansi Plant & Herb- ergot, ephedra, bacopa, kalmegh, datura centella Hairs & Fibers- cotton, hemp, jute, silk, flax	Dried latex- opium, papain Dried Juice- Aloe, Kino Dried extracts- agar, black catechu, alginate Waxes- Beewax, spermaceti, carnauba wax Gums- Acacia, guar gum, Indian gum, sterculia, tagacanth Resins- Asafoetida, benzoin, guggulu, coal tar, tolu balsam Volatie oils- Turpentine, anise, coriander,peppermint, rosemary sandalwood, eucalyptus, camphor Fixed oils and fats- coconut, olive, sesame, almond, cod-liver, kokum butter Animal products- beewax, gelatin, musk Fossil organism & minerals- bentonite, talc, kaolin

4. Pharmacological Classification- in this group according to their pharmacological action or of most important constituent or their therapeutic use is termed as pharmacological or therapeutic classification of the drug. Drugs like digitalis, squill and strophanthus having cardio-tonic action are grouped irrespective of their parts used or phylo-genetic relationship or their parts used or phylo-genetic relationship or the nature of phyto-constituents they contain. This system of classification can be used for suggesting substitutes of drugs, if they are not available at particular place or point of time.

Pharmacological category	Example	Pharmacological category	Example
Drugs acting on GIT		Drugs acting on Respiratory system	
Bitter	Cinchona, Quassia, Gentian	Expectorant	Vasaka, Liquice, Ipecac
Carminative	Fennel, cardamom, Mentha	Antitussive	Opium(codine)
Emetic	Ipecac	Bronchodilators	Ephedra, Tea
Antiamoebic	Kurchi, Ipecac	Drug acting on Autonomic Nervous System	
Laxative	Agar, Isabgol, Banana	Adrenergic	Ephedra
Purgative	Senna, Castor oil	Cholinergic	Physostigma, Pilocarpus
Cathartic	Senna	Anticholinergic	Datura, Belladonna
Drugs acting on Cardio-vascular system		Drug acting on Central Nervous System	
Cardio tonic	Digitalis, strophanthus, squill	Central analgesic	Opium (morphine)
Cardiac depressant	Cinchona,	CNS depressant	Belladonna,

	Veratrum		Opium, Hyoscymus
Vasoconstrictor	Ergot	CNS stimulant	Tea, Coffee
Antihypertensive	Rauwolfia	Analeptic	Nuxvomica, camphor, lobelia
Antispasmodic	Datura, Hyoscymus, Opium, Curare	Anticancer	Vinca, Podophyllu m, Taxus
Antirhumatic	Aconite, Colchicum, Guggul	Astringent	Caatechu, Myrobalans
Antihelmintic	Quassia, Vidan g	Antimalarial	Cinchona, Artemisia
Immunomodulator y	Ginseng, Ashwagandha, Tulsi	Immunizing agent	Vaccines, Sera, Anti toxin
Drug acting on skin membrane	Beewax, wool fat, Balsam of tolu, balsam of peru	Chemotherapeutic	Antibiotics
Local Anaesthetic	coca		

5. **Chemical Classification-** in these classification crude drugs are classified on the basis of active constituents. Plants contain various constituents in them irrespective of the morphological or taxonomical characters, the drug with similar chemical constituents are grouped into the same group. It is popular approach for phyto-chemical studies.

Chemical constituents	Plant
Alkaloids	Cinchona, Datura, Vinca, Ipecac, Nux-vomica
Glycosides	Senna, Aloe, Ginseng, Glyeyrrhiza, Digitalis
Carbohydrates and its derived products	Accaia, Tragacanth, Starch, Isabgol

Volatile oil	Clove, coriander, fennel, Cinnamon, cumin
Resin and Resin combination	Benzoin, Tolu, Balsam, Balsam of peru
Tannins	Catechu, Tea
Enzymes	Papain, Caesin, Trysin
Lipids	Beewax, Kokum butter, Lanolin

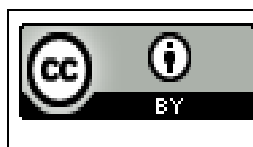
6. **Chemo-taxonomical Classification-** this system of classification relies on the chemical similarity of taxon; it is based on the existence of relationship between constituents in various plants. There are certain types of chemical constituents that characterize certain classes of plants. This gives birth to entirely a new concept of chemotaxonomy that utilizes chemical facts/ characters for understanding the taxonomical status, relationship and the evolution of the plants. It is the latest system of classification that gives more scope for understanding the relationship between chemical constituents, their biosynthesis and their possible action.
7. **Serotaxonomical Classification-** The serotaxonomy can be explained as the study about the application or the utility of serology in solving the taxonomical problems. It expresses the similarities and the dissimilarities among different taxa and these data are helpful in taxonomy. It determines the degree of similarity between species, genera, family etc, by comparing the reaction with antigens from various plant taxa with antibodies present against a given taxon.

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