PHARMACOGNOSY - I

UNIT 1 NOTES

INTRODUCTION TO PHARMACOGNOSY

- DEFINITION & SCOPE
- SOURCES OF DRUGS
- ORGANIZED & UNORGANISED DRUGS

CLASSIFICATION OF DRUGS

QUALITY CONTROL OF DRUGS

- ADULTERATION OF DRUGS
- EVALUATION OF DRUGS

IMPERFECT PHARMACY

CONNECT WITH US ON :

IMPERFECT PHARMACY

IMPERFECT PHARMACY

PHARMACOGNOSY

- Pharmacognosy is the branch of medical science in which we study about crude drugs obtained from plants natural sources such as Plants, animals and minerals.
- The term 'Pharmacognosy' is derived from the Greek word 'Pharmakon' means 'drug' and 'Ginosis' means 'knowledge'.

SCOPE OF PHARMACOGNOSY

Pharmacognosy has a vast scope in the field of Pharmaceutical sciences and healthcare due to increasing demand for natural and plant-based medicines.

① **Study of Natural Drugs** : Identifying and analyzing medicinal plants, animals and microbial sources for drug development.

② **Phytochemistry** : Extraction, Isolation and structural characterization of bioactive compounds from natural sources.

③ **Pharmacological Research** : Studying the biological effects and therapeutic application of natural products.

④ **Neutraceuticals** : Development of plant based dietary supplements, functional foods and skincare products.

⑤ Modern Drug Discovery : Screening natural compounds for potential drug leads in cancer, antimicrobial & neuropharmacological research.

⑥ Quality Control : Ensuring the safety, efficacy and purity of herbal medicines using analytical techniques like chromatography and spectroscopy.

SOURCES OF DRUGS

- In Pharmacognosy, drugs are obtained from various natural sources primarily from plants, animals & mineral sources.
- Drugs are obtained from following sources :

① Plant Sources
② Animal Sources
③ Marine Sources
④ Mineral Sources
⑤ Microbiological Sources

① PLANT SOURCES

- Plants are the most significant source of drugs in Pharmacognosy.
- They are the oldest source of drugs.
- Most of the drugs in ancient times were derived from plants.
- Almost all parts of plants are used as drug i.e leaves, stem, roots etc.
- For Example : leaves of Digitalis purpurea are the source of Digoxin and Digitoxin which are cardiac Glycosides.
- Examples :

- Alkaloids : Morphine, Quinine
- Glycosides : Digoxin, Sennoside
- Flavanoids : Rutin, Quercetin
- Essential Oils : Peppermint Oil

② Animal Sources

- Animal provides important medicinal substances, including hormones, enzymes and toxins used for therapeutic properties.
- Examples :

- Hormones: Insulin, Thyroid, Oxytocin
- Enzymes: Pancreatin, Trypsin, Pepsin
- Toxins & Venom: Antivenoms (Snake Venom)
- Carbohydrates: Honey

③ Marine Sources

- A huge part of earth surface is covered by seas and oceans, which contains about 5,00,000 species of marine organisms.
- Marine organisms like Algae, Sponges produce bioactive compounds with antimicrobial, anticancer and anti-inflammatory properties.
- Examples :

- Bryostatins : From Marine bryozoans
- Ecteinascidins : From tunicates
- Omega-3 Fatty Acids: From fish Oils

④ Mineral Sources

- Minerals are used in medicine for their physiological and therapeutic effects.
- Examples :

- Iron : Used in Anaemia Treatment
- Zinc : Essential for Immune function
- Magnesium Sulphate : Used as a Laxative

⑤ MICROBIAL SOURCES

- Microorganisms produce antibiotics, enzymes and immunosuppresants.
- Example :
  - Antibiotics : Penicillin, Streptomycin
  - Immunosuppresants : Cyclosporine
  - Enzymes : Streptokinase

ORGANISED DRUGS

- Organised Drugs are of plant or animal origin.
- They are direct part of plant or animals (leaves, fruits).
- They have proper cellular structure.
- They are solid in nature.
- They are identified by morphological characters.
- For such crude drugs microscopic evaluation is most useful.
- Examples :

① Leaves : Senna, Tulsi, Digitalis
② Fruits : Coriander, Amla
③ Barks : Cinnamon
④ Root : Ginger, Turmeric
⑤ Seed : Nux - Vomica
⑥ Flowering Part : Clove

UNORGANISED DRUGS

- They are obtained from plant, animal or mineral sources.
- They are not direct part of plant but derived from plants and animals by some process like extraction, distillation etc.
- They do not have cellular structures.
- They are solid, semi-solid or liquid in nature.
- They are identified by Organoleptic properties.
- They are classified as follows on the basis of their origin and nature.

① Dried Latex
② Dried Juices
③ Dried Extracts
④ Gums
⑤ Resins

① DRIED LATEX

- Dried latex is the solid form of natural latex obtained from plants and trees.
- It is commonly used to produce rubber, adhesive and medical products.
- Examples: Opium, Papaya

② Dried Juices

- Dried Juices are fruit or plant juices that have been dehydrated to remove water, leaving behind a concentrated powder or solid form.
- They are used for flavouring, nutrition and convenience in food and beverages.

③ Dried Extracts

- Dried extracts are concentrated plant or animal-derived substances where the liquid is removed, leaving behind a powder or solid form.

④ Gums

- Gums are natural, sticky substances from plants that dissolve in water and form a thick gel.
- They are used in food, medicines and industry as thickeners, stabilizers and adhesives.

⑤ Resins

- Resins are thick, sticky substances produced by plants that harden over time
- They are used in adhesives, perfumes and medicines.
- They are of two types:

ⓐ Oleoresins: Oleoresins are natural mixtures of resins and essential oils.

ⓑ Oleogum Resins: It contains resins, gums and essential oils

Classification Of Drugs

- The significant natural sources of drugs include higher plants, microbes, animals and marine organisms.
- Now for the study purpose, drugs can be classified in the following ways :

① Alphabetical Classification
② Morphological Classification
③ Taxonomical Classification
④ Chemical Classification
⑤ Pharmacological Classification
⑥ Chemotaxonomical Classification
⑦ Serotaxonomical Classification

① Alphabetical Classification

- In alphabetical classification, the arrangement of crude drugs is done alphabetically by their Latin or English names.
- Some Pharmacopoeia categorising the crude drugs as per this system are :

ⓐ Indian Pharmacopoeia
ⓑ British Pharmacopoeia
ⓒ United States Pharmacopoeia
ⓓ European Pharmacopoeia

Example :

- A - Amoxicillin
- B - Bromhexin
- C - Ciprofloxacin

Advantages

- Simple & Easy to use.
- Does not show repetitive entries.

Disadvantages

- Does not provide information about drug action & therapeutic use.
- Does not determine source of drugs.

② MORPHOLOGICAL CLASSIFICATION

- In morphological classification, the arrangement of crude drugs is done according to the plant part in use like roots, stems, leaves, barks, flowers, fruits, seeds etc.
- It can be further classified into two subtypes:

ⓐ Organised Drugs : They obtain directly from plant parts and contain cellular structures.

Example
- Roots : Rauwolfia, Gentian
- Barks : Cinnamon, Cassia
- Leaves : Digitalis, Senna
- Flowers : Clove, Rose
- Fruits : Amla, Capsicum
- Seeds : Almond, Castor

ⓑ **Unorganised Drugs** : • These drugs are prepared from plants through intermediate physical processes like incision, drying and extraction

- They can be classified as follows :

(1) Dried Latex : Opium
(2) Dried Juices : Aloe
(3) Dried Extracts : Agar
(4) Gums : Acacia
(5) Resins : Benzoin

Advantages

- Easy to classify drugs based on visible plant part.
- Helps in studying plant sources.

Disadvantages

- Does not include synthetic or semi-synthetic drugs.
- Does not classify drugs based on MOA or therapeutic use.

③ Taxonomical Classification

- Taxonomical Classification follows the principle of taxonomy, which includes the kingdom, Phylum, Class, Order, family & Genus of the biological Source
- Example of Taxonomical Classification of Nux-Vomica.

- kingdom : Plantae
- Phylum : Magnoliophyta
- Class : Magnoliopsida
- Order : Gentianales
- family : Loganiaceae
- Genus : Strychnos
- Species : Strychnos nux-vomica.

Advantages

- Helps in Drug discovery.
- Explains the evolutionary development

Disadvantages

- Requires knowledge of taxonomy for understanding.
- Limited to Natural Sources.

④ Chemical Classification

- Chemical Classification of drugs is a system that categorizes drugs based on their chemical structure, composition and functional groups.
- This classification helps in understanding the drug's properties, mechanism of action, metabolism and interaction.
- Examples :

① Alkaloids : Morphine, Quinine
② Steroids : Prednisone, Dexamethasone
③ Glycosides : Digitalis, Senna
④ Tannins : Pale Catechu, Ashoka
⑤ Volatile Oils : Clove, Peppermint
⑥ Lipids : Caster Oil, Bees Wax
⑦ Carbohydrates : Acacia, Agar
⑧ Vitamins : 0

Advantages

- Easy for study of chemical constituents.
- Predicts drug interaction and metabolism.

Disadvantages

- Doesn't indicate therapeutic use.
- Doesn't indicate source

⑤ Pharmacological Classification

- Pharmacological Classification of drugs is a system that categorizes drugs based on their MOA (Mechanism of Action) or how they interact with biological systems to produce a therapeutic effect.
- Example :

① Anti Inflammatory : Turmeric, Mint, Aloe
② Anti Asthmatic : Ephedra Vasaka
③ Anti Cancer : Vinca, Taxus
④ Laxative : Agar, Isabgol
⑤ Purgative : Senna, Caster Oil
⑥ Expectorant : Vasaka, Liquorice

Advantages

- Explains drug action clearly
- Useful for Prescribers.

Disadvantages

- Doesn't provide information about source
- Doesn't define chemical nature of drug

⑥ Chemotaxonomical Classification

- Chemataxonomical Classification of drugs is a system that classifies drugs according to principle of both taxonomy (biological classification) and phytochemistry (study of plant chemicals)
- Example :

Alkaloid Containing Plants

- Family : Apocynaceae → Rauwolfia Serpentina
- Family : Solanaceae → Atropa Belladona

Advantages

- Latest and provides better understanding.
- Scientific and systematic

Disadvantages

- Limited to Natural Products
- Complex & Require Expertise

Quality Control Of Drugs

Quality Control of Drugs of natural origin refers to the processes and procedures employed to ensure that medicinal products derived from natural sources are safe, effective, consistent and authentic.

Adulteration Of Drugs

- Adulteration of drugs of natural origin refers to the process of aiding or mixing harmful or inferior substances with natural drugs.
- The aim of adulteration is often to increase the volume or weight of the drug and make more profit.
- However, it can make the drug harmful, less effective or even dangerous for health.
- For Example: In herbal medicine, if a plant extract is mixed with cheaper substances (like powder from another plant), the quality and safety of drug can be affected.

Types Of Adulteration

Adulteration in drugs of natural origin can occur in several ways:

① Addition Of Foreign Substances

- This involves mixing a natural drug with other materials that don't belong there.
- These could be cheaper or harmful substances, like starch, sugar or harmful chemicals.
- For instance, a herbal powder might be adulterated with synthetic fillers, which reduces the potency and quality of medicine.

② Substitution With Inferior Ingredients

- Sometimes, a high quality ingredient is replaced with a similar but lower quality substance.
- This can be done to save costs.
- For Example: A herbal product claiming to be made from one type of rare plant might actually be made from a common, less effective plant.

③ Contamination

- Natural drugs can get contaminated with toxic substances during processing or storage.
- This could be due to the use of contaminated water, pesticides or other chemicals during the cultivation or manufacturing process.

④ Degradation or Spoiling

- If a natural product is stored incorrectly, it can degrade over time. Exposure to light, air or moisture can make the drug less effective or even harmful.
- In some cases, the product may contain mold or bacteria, leading to serious health issues.

CONSEQUENCES OF ADULTERATION

- Health Risks: The added substances can be harmful, cause allergic reactions or interfere with medicine's effectiveness.
  - for Example: Synthetic chemicals added to a natural remedy might cause side effects.

- Loss of Effectiveness:
  - When a drug is adulterated, its intended therapeutic effects may be reduced or lost.
  - This can lead to treatment failure or delayed recovery.

- Legal Issues:
  - Adulteration is illegal in most countries.
  - It violates health and safety regulations & anyone caught adulterating drugs can face serious legal consequences.

- **Trust Issues** :
  - Adulteration erodes public trust in natural medicines and herbal products.
  - When people find out that their trusted remedies are adulterated, they may stop using them.

EXAMPLE

- In Ayurvedic medicines, herbs like Ashwagandha or Brahmi are sometimes adulterated with cheaper, synthetic chemicals or fillers, reducing their potency.
- Essential Oils like lavender or Eucalyptus are sometimes adulterated with synthetic fragrances or diluted with cheaper oils, which can lead to skin irritation or loss of the oil's beneficial properties.

PREVENTION

- Always purchase natural drugs or remedies from reputable sellers. preferably those who follow good manufacturing practices.
- Look for certifications like GMP that ensure quality & authenticity.
- Be cautious of products that look or smell different than expected.
- ~~Regulatory~~ Regular laboratory testing of natural products for authenticity and purity can detect adulterants.

Evaluation Of Natural Drugs

- Evaluation of natural drugs ensures that they are authentic, effective and safe for use.
- Several methods are used to assess the quality and identity of these natural drugs as follows:

① Organolephic Methods
② Microscopic Methods
③ Physical Methods
④ Chemical Methods
⑤ Biological Methods

① Organoleptic Methods

- Organoleptic evaluation refers to assesing the quality of natural drug based on its sensory characteristics - sight, smell, taste and touch.
- This method is simple, fast and relatively inexpensive way to evaluate raw natural products.

- Color: The natural drug should have a consistent and characteristics color. Any deviation in color may indicate adulteration, contamination or degradation.
- Odor: Natural drugs like essential oils, herbs have a distinct smell. A change in odour can indicate spoilage or contamination.
- Taste: Herbal teas or powders may be evaluated based on their characteristic taste.

② Microscopic Methods

- Microscopic Examination involves the use of a microscope to study the physical characteristics of plant or herbal products.
- This method is particularly useful for identifying plant material and checking for contaminants.

; Plant Cells : Identification of specific plant cells, tissues and structures can help determine the authenticity of the drug.

- Presence of Adulterants : Microscopy can detect powdered plant material mixed with foreign particles such as starch, sand & other powdered plants.

③ Physical Methods

- Physical Evaluation involves assessing the physical properties of a natural drug.
- This indicates characteristics like size, shape, density and moisture content.

- Size & Shape : For example, while evaluating dried herbs or seeds, their shape & size should be conform to specific standards for that species.

- Moisture Content : Excess moisture can lead to microbial contamination or spoilage.

- Purity of Sample : Checking for any extraneous material such as dirt, dust or non-herbal parts of the plant.

④ Chemical Methods

- Chemical Evaluation is used to determine the chemical composition of a natural drug.
- This includes the identification & quantification of active ingredients and other chemical compounds in the drug.

- **Phytochemical Analysis** : It identifies the main bioactive compounds (eg. Alkaloids, flavanoids, terpenoids, glycosides etc) in plant material. it includes :
  - HPLC
  - HPTLC
  - UV Spectroscopy
  - NMR Spectroscopy
- **Heavy Metals Testing** : Many natural drugs can become contaminated with toxic metals during cultivation or processing.

⑤ Biological Methods

- Biological Evaluation involves assessing the pharmacological activity of a natural drug to determine its effectiveness & safety.

- **Clinical Testing** : Human clinical trials are performed to assess the therapeutic efficacy of the drug. It can help establish proper dosage, safety & effectiveness.
- **Toxicity Testing** : Before releasing a product, it's important to assess its safety

THANK YOU

FOR CHOOSING IMPERFECT PHARMACY AS YOUR STUDY PARTNER

IMPERFECT PHARMACY

JOIN US ON :

IMPERFECT PHARMACY

IMPERFECT PHARMACY

@IMPERFECTPHARMA

IMPERFECT PHARMACY

@IMPERFECTPHARMACY

IMPERFECT PHARMACY

IMPERFECTPHARMACY@GMAIL.COM