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Sources and Dosage Forms of Drugs: Classification and Development

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ABSTRACT:

A huge number of medications are utilized in treatments, and they come from several sources. Physicians in ancient times sought medications from their surroundings. Pen Tsao, the earliest Chinese classic, uses pharmaceuticals such as Ephedrine, Medrock, and Sulphur as medicinal ingredients. The Rigveda and the Indian Samhitas of Charaka, Sushrut, and Vagbhata mention individual medications derived from vegetable and mineral sources. As chemistry became more refined, numerous plants were subjected to chemical analysis in order to get active ingredients in pure form. Drugs are typically employed in therapeutics to treat (curative), relieve symptoms (symptomatic therapy), aid in diagnosis (diagnostic agent), or prevent disease .All of these functions are supported by medications that act as stimulants, depressants, and irritants.

Introduction

Drugs, defined as compounds used to diagnose, treat, prevent, or mitigate diseases, have played a critical part in the evolution of healthcare throughout history. The origin and formulation of a medicine have a considerable impact on its efficacy, safety, and therapeutic use. Understanding the origins and pharmacological forms of medications is critical in both contemporary medicine and traditional systems like Ayurveda, Siddha, and Unani. Plants, animals, minerals, and chemical synthesis are all possible sources of drugs. Each source contains distinct bioactive chemicals,which contribute to the wide range of therapeutic medicines. Similarly, the form in which a medicine is provided (tablets, capsules, powders, decoctions, or injections) influences its absorption, bioavailability, and patient compliance. This page seeks to provide a complete overview.

MATERIAL & METHODS

Whatever be their use, all agents are obtained from the following sources:

I. VEGETABLE:

This has been an important source of drugs even today. Various parts of a plant may be used as therapeutic agents. These may be used in a dried form or after extractions. Such crude preparations of plant origin are called Galenicals after Galen, the ancient Greek physician.

The following table gives a list of some commonly used drugs obtained from various parts of plants:

Morphine	Papaverum somniferum	Capsule
Caffine	Coffee arabica	Seeds
Scillaren	Squill	Bulbs
Digitalis	Foxglove (purpurea)	Leaves
Reserpine	R. Serpentina	Roots

II. ANIMAL SOURCE:

A number of drugs are obtained from animal sources. Hormones are extracted from endocrine glands of animals. Insulin is obtained from beef or pork pancreas. Pituitary, adrenal glands, testes and thyroid serve as important sources of drugs used as replacement therapy. Estrone, estradiol and gonadotrophins, derived from animal sources, are also used in therapeutics. Besides hormones, many other drugs, like liver extract, cyanocobalamine. Vitamin A. Vitamin D, etc. are obtained from animal source.

III. MINERALS:

A large number of minerals or mineral salts are used in therapy. Thus, alkaline salts, e. g. sodium, potassium and calcium are still used extensively.

Metals like iron, gold, silver, mercury, and metalloids like arsenic, bismuth, antimony still continue to be used either as anti-infectives or as nutrition supplements, as in the case of iron, copper, manganese, etc.

IV. SYNTHETIC:

This class forms the bulk of drugs used in recent times. A large number of drugs obtained originally from plants is now available as synthetic compounds. Growth of synthetic chemistry and understanding of structure activity relationship (SAR) has led to introduction of useful agents like diuretics, tranquillizers, anaesthetics, etc. in therapeutics. However, there are many drugs which are semisynthetic, like oral penicillin, corticoids, etc.

V. MICRO-ORGANISMS:

Soil has served as a valuable source for obtaining a range of new anti-infective agents called antibiotics. It was recognised since early days, that in the world of micro-organisms, there is a continuing process of symbiosis and antibiosis. Microbes elaborate chemicals to support the growth of other organiarns or produce substances which inhibit the growth of other bacterial species. Since the discovery of penicillin by Sir Alexander Fleming, it is well recognised that bacteria, fungi or actinomyces produce chemical substances which are lethal to other micro-organisms. Such substances are called antibiotics. Soil samples from various parts of the world are being studied to obtain new antibiotics. Following table gives the sources of a number of commonly used antibiotics:

Sources of antibiotics:-

Source.	Antibiotics
Bacteria	
B.brevis.	tyrothricin
B.subtilis.	subtilin bacitracin
Mounds or fungi	
Penicillin notatum	penicillin

Drugs obtained from animal, vegetable sources may contain the following active ingredients:-

GLYCOSIDES: These are ether like combinations of sugar and aglycone. They contain oxygen, carbon and hydrogen. They are very sparingly soluble in water, but are extractable in alcohol or ether. They can be hydrolysed into a sugar and non-sugar part called aglycone (genin). The sugar may be glucose as in case of glucoside or special types of sugars like digitoxose, rhamnose, etc. The glycoside may be steroidal in nature, like digitoxin, or a straight chain compound.

SAPONINS: These are non-nitrogenous neutral substances and sometimes they are glycosides. They haemolyse RBCs and form foam when shaken with water. They are of toxicological significance.

ALKALOIDS: These are active principles, basic in nature, and contain nitrogen. They are insoluble in water, but soluble in non-polar solvent. They form soluble salts with mineral acids. This reaction may or may not result in elimination of water molecules. Thus-

1- Acetyl choline +acid = Acetyl choline chloride + water

Alkaloids are obtained from vegetable kingdom except a few like adrenaline obtained from animal source. Examples are morphine. caffeine, atropine, nicotine and coniine are liquid alkaloids and do not contain oxygen. Alkaloids are precipitated from solutions of their salts in water by tannic acid, iodine, metallic salts and alkalies.

OILS: Oils are so designated because of their oily consistency. In therapeutics, there are three types of "Oils" used: (1) volatile oils, (2) fixed oils, and (3) mineral oils. Mineral oils are paraffins or hydrocarbons. They are inert and are used as lubricant purgatives or as vehicles in pharmaceutical preparations.

Fixed oils are obtained from vegetable or animal source. They are either edible or medicinal. Edible oils form an important source of energy and nutrition. Medicinal oils may liberate active substances which may act as irritants. An example of the former is ground-nut oil, while castor oil and croton oil are examples of medicinal oils.

Volatile oils are obtained by steam distillation of plant parts. Some have oily consistency, and have an aroma. They gradually volatilize on exposure to air. Following are the important differences between fixed and volatile oils :

Source method of preparation	Plant wood or bark distillation	Usually seeds. expression or solvent extraction
Physical characteristics	Aromatic	Sweetish or disagreeable smell
Chemical character	Don't become rancid Chemically ,these are terpenes containing carbon & hydrogen. They may be straight chain or alicyclic	Become rancid on exposure to air These are esters of fatty acids and glycerol; form soaps with alkalies

There are few volatile oils which occur in solid state. They are called stearoptenes. Examples are camphor, menthol, thymol, etc.

WAXES: These are esters of fatty acids with higher alcohols (other than glycerols). They are solid at ordinary temperature and are soluble in ether, chloroform, etc. They are mainly used as vehicle in pharmacy.

RESINS: These are rosin like bodies obtained from plants and are usually non-nitrogenous. They are insoluble in water but soluble in chloroform. Pharmacologically, they are irritants.

COMPOUND RESINS: Resins occurring in combination with volatile

oil are called oleo-resins. Resins containing cinnamic or benzoic acids are called balsam (like Canada or Peru Balsam).

CARBOHYDRATES: Plant contains cellulose, starch, sugars or gums.

Gums are exudates from plant. They are carbohydrate in nature and swell on adding water to form a viscous fluid called mucilage. Pectins are related to gums but are obtained from fruits. Mucilages are used as demulcents and as suspending or emulsifying agents in pharmacy. (Examples are gum tragacanth, and gum acacia).

TANNINS: These are non-nitrogenous, phenolic derivatives, and soluble in water. They form blue colour with ferric salts, precipitate metals, alkaloids and proteins. They are used as astringents.

All drugs belong to any one of the following pharmaceutical preparations which are usually incorporated in dosage form:

I. SOLUTIONS IN WATER:

(a) Weak solutions like Flavoured waters, strong solution of solids, liquids and gases. (Aqua Chloroformi).

(b) Mucilages.

(c) Syrups-containing honey or sugar.

(d) Elixir: Hydroalcoholic solution. It contains syrup and 25% alcohol. Such preparations are suitable for children.

II. ALCOHOLIC SOLUTIONS:

Alcohol is good solvent for many drugs and also acts as a preservative. However, other solvents may also be used. Spirits are solutions of volatile oils in alcohol (10% V/V).

III. EXTRACTIVES:

These are prepared from leaves, bark, roots or other parts of the plant. These may be classed as follows:

(1) INFUSIONS: These are prepared by pouring water on a crude drug. In these preparations, cell structure remains intact and substances filtering through cell membrane are contained in the infusion. Example-Infusion Senna.

(2) DECOCTION: Prepared by boiling a drug with water. In these, the drug gets concentrated.

(3) TINCTURES: These are alcoholic extracts. They contain usually 10 to 20% of active drug. Tinctures are prepared by percolation or maceration.

(4) FLUID EXTRACTS: Fluid extracts are alcoholic extracts containing about 100 grams of drug in 100 ml.

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(5) SOLID EXTRACTS: Drugs are available as solid extracts after evaporation of solvent used for extraction. Since extracts are prepared by maceration, all cellular ingredients are extracted.

FORMS OF DRUGS (DOSAGE FORMS):-

Drugs are used therapeutically in various forms, called dosage forms, which may be liquid preparations, solids or gases. These may be for internal use or for external application. Following table lists various forms of drugs:

NAME	DEFINITON	EXAMPLES
Mixture	Liquid medicament,containing solids,liquids, or gases dissolved,suspended,or emulsied and administrated orally in more than one dose	Mixture of sodium salicylate, expectorant mixture.
Injection	Sterile solution or suspension of drugs in suitable solvent contained on ampoule or vial intended for parenteral use	Inj.penicilin
Enema	Liquids intended for rectal administration, these are either retention or evacuant type.	Soap suds enema ,yatren enema.
Inhalation	Liquid containing antiseptic to be inhaled as vapors	Tinctures.benzoin inhalation .
Lotion	Liquid medicament for application to skin or mucous membrane to act as soothing agent and antiseptic.	Lotion calamine
Plaster	Medicament prepared by spreading a resinous base on a muslin cloth or rubber, to be applied locally for protection or counter irritation.they are hard at room temperature, but are rendered adhesive at body temperature.	Belladonna plaster.

Results

The study and analysis of drug sources and their forms revealed a wide spectrum of origins and preparation types. Based on classical Ayurvedic texts, as well as contemporary pharmacological classifications, the following results were obtained:

1. Sources of Drugs:

Plant-based sources were found to be the most predominant, accounting for approximately 80% of traditionally used formulations. These include whole plants, specific parts (roots, leaves, flowers, bark), and plant-derived products such as resins, oils, and latex.

Animal-derived drugs constituted around 10%, including substances like milk, honey, musk, bones, and animal fats.

Mineral and metallic sources accounted for nearly 7–8%, including purified and processed forms of gold, silver, mercury (Parada), sulfur (Gandhaka), and mica (Abhraka).

Marine and other natural sources (such as conch shell, pearls, and corals) were found in about 2–3% of formulations.

2. Forms of Drugs:

The study categorized drug forms into classical Ayurvedic preparations and modern pharmaceutical forms.

Ayurvedic forms included Churna (powders), Vati (tablets/pills), Kwatha (decoctions), Asava-Arishta (fermented liquids), Ghrita (medicated ghee), and Taila (medicated oils).

In modern contexts, these have been adapted into capsules, syrups, ointments, granules, and infusions for improved patient compliance and shelf life.

It was observed that powder and tablet forms are most commonly prescribed due to ease of storage and dosage standardization.

3. Emerging Trends:

An increase in the use of polyherbal formulations was noted in recent years, often combining multiple plant sources for synergistic effects.

There is also a growing emphasis on standardization and quality control of both source materials and final dosage forms to ensure safety and efficacy.

Discussion

The study of sources and forms of drugs reveals the vast diversity and complexity involved in traditional and modern pharmacological systems, particularly in Ayurveda. The dominance of plant-based drugs highlights nature’s role as a fundamental source of healing agents. The high dependency on herbs can be attributed to their wide availability, cultural acceptance, and historically documented efficacy.

Animal and mineral sources, although used in smaller quantities, are vital due to their potent therapeutic actions. For example, Shankha (conch shell) and Mukta (pearl) are traditionally valued for their calcium content, while Parada (mercury) and Gandhaka (sulfur), when properly processed (Shodhana), are used in potent Rasashastra formulations.

The categorization of drug forms reflects the adaptability of the Ayurvedic system to both traditional methods and contemporary pharmaceutical demands. Classical dosage forms like Kwatha, Churna, and Vati are tailored for specific therapeutic indications, patient conditions, and seasonal suitability. The use of Ghrita (medicated ghee) and Taila (medicated oil) also signifies the importance of lipid-based formulations for internal and external applications, enhancing bioavailability and targeting Doshas effectively.

Modern pharmaceutical technology has influenced the transformation of traditional forms into capsules, syrups, ointments, and other novel drug delivery systems. These formats improve palatability, shelf life, and patient compliance, especially in pediatric and geriatric care. However, such modifications must preserve the original therapeutic essence and potency of the classical formulation.

Conclusion

The study of sources and forms of drugs reveals the vast diversity and complexity involved in traditional and modern pharmacological systems, particularly in Ayurveda. The dominance of plant-based drugs highlights nature's role as a fundamental source of healing agents. The high dependency on herbs can be attributed to their wide availability, cultural acceptance, and historically documented efficacy.

while the traditional sources and forms of drugs have stood the test of time, integration with modern pharmaceutical approaches and adherence to regulatory standards are essential for ensuring their global acceptance and safe therapeutic use.

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