

PHARMACEUTICS-I (BP103T)

UNIT: 2

CLASS: 8

TOPIC: Liquid Dosage Forms

These are the pharmaceutical dosage forms that are designed to provide maximum therapeutic response in population with difficulty of swallowing of tablets or capsules or to produce rapid therapeutic response. Water is the major ingredient used in these dosage forms. Two types: Solutions and dispersed systems.

Solutions are the liquid dosage forms in which the one or two active ingredients are mixed uniformly in a solvent.

In case of dispersed systems, one phase of the system is distributed in another phase. If a solid phase is suspended in a liquid phase it is termed as a 'suspension', if one liquid phase is dispersed in other liquid phase it is termed as an 'emulsion'.

ADVANTAGES:

- Faster absorption than solids.
- More flexibility in achieving the proper dosage of medication.
- Palatable.
- It is easy to swallow than solid dosage form especially in case of geriatric and paediatric populations.
- Some drugs cause gastric irritation when administered in Solid dosage form, e.g. potassium iodide and bromide. Hence, they are to be administered in liquid dosage form

DISADVANTAGES:

- Shorter life than other dosage form.
- Harder to measure accuracy.
- Need special storage condition.

- Less stable.
- Easily affected by microorganisms.
- Bulky to carry around.
- Easy to loss by the breakage of the container.
- Measuring dose is required.

Types of Liquid dosage forms (LDF)

Syrup, Otic Preparation, Collodion, Nasal Preparation, Aromatic Water, Spirit/Essences, Elixir, Mouthwash, Tinctures, Gargle, Fluid Extract, Astringent, Douche, Enema, topical solution, Liniment etc.

Syrups are concentrated aqueous preparations of a sugar or sugar substitute with or without flavouring agents and medicinal substances. Types of syrup: a. Medicated syrups: Syrups containing flavouring agents with medicinal substances. b. Flavoured Syrups: Used as vehicles for unpleasant tasting medications; the result is medicated syrup.

Elixirs are clear, sweetened hydro-alcoholic solution. These are Intended for oral use and are usually flavoured to enhance palatability. Usually less sweet than syrups and less viscous. They are classified into two classes, a. Non medicated elixirs – vehicles, b. Medicated elixir – used for therapeutic effects.

Tincture: A liquid preparation produced by macerating prepared plant material in a mixture of alcohol and water at room temperature over a prescribed period of time, which is then pressed and filtered to yield a fluid into which active constituents of the herb have dissolved. Made by soaking plant/animal material in alcohol for 72 hrs or so. Commonly used solvent is ethanol. Other solvent includes Vinegar, Glycerine and Distilled water.

Otic preparations are products that are applied to or in the ear to treat conditions of the external and middle ear. These products are used to treat dermatitis of the ear, cerumen build up and ear infection. Nasal Preparations are liquid, semi-solid or solid preparations intended

for administration to the nasal cavities to obtain a systemic or local effect. These are as far as possible non-irritating and do not adversely affect the functions of the mucosa and its cilia.

Suspension is a heterogenous mixture containing solid particles that are sufficiently large for sedimentation. A suspension consists of a dispersion of relatively coarse particles, usually in aqueous vehicle. Suspensions may be used for oral and topical administration. Like solutions, oral suspensions are useful in children and patients who cannot tolerate a solid dosage form.

Emulsion is a mixture of two or more liquids that are normally immiscible. Emulsions are two-phase systems consist of liquid drug substances. They are classified as: • oil-in-water emulsion (O/W) • water- in-oil emulsion (W/O) Emulsions can be administered • topically, orally, and I.M.

Liniment also known as embrocation, is a medicated topical preparation for application to the skin. Preparations of this type are also called balm. Liniments are of a similar viscosity to lotions (being significantly less viscous than an ointment or cream) but unlike a lotion a liniment is applied with friction; that is, a liniment is always rubbed in. Liniments are topically used to relieve pain and stiffness, such as from sore muscles or from arthritis.

Infusion is a dilute solution of the readily soluble constituents of crude drugs (from the soft parts of plants). Fresh infusions are prepared by macerating the drugs for a short period of time (15 min) with boiling water. **Decoctions** is an extract of the water-soluble and heat-stable constituents of crude drugs (from the hard parts of plants) by boiling in water for 30 min, and cooling. Infusions and decoctions are of short duration (not more than 3 days).

Collodion is a flammable, syrupy solution of pyroxylin ether and alcohol. There are two basic types; flexible and non-flexible. The flexible type is often used as a surgical dressing or to hold dressings in place. When painted on the skin, collodion dries to form a flexible cellulose film. While it is initially colourless, it discolours over time. Non-flexible collodion is often used in theatrical make-up. These are used as a topical protectant, applied to the skin to close small

wounds, abrasions, and cuts, to hold surgical dressings in place, and to keep medications in contact with the skin.

EXCIPIENTS USED IN LIQUID DOSAGE FORM

Pharmaceutical excipients are substances other than the pharmacologically active drug which are include in the manufacturing process or are contained in a finished pharmaceutical product dosage form. In most of the formulations these are present in a greater proportion with regards to active pharmaceutical ingredient, as it forms about the bulk of the formulation, it is necessary to select an excipient which satisfies the ideal properties. Excipients act as protective agents, bulking agents and can also be used to improve bioavailability of drugs in some instances.

1. VEHICLE

Vehicles, in pharmaceutical formulations, are the liquid bases that carry drugs and other excipients in dissolved or dispersed state.

Pharmaceutical vehicles can be classified as under; aqueous vehicles: Water, hydro-alcoholic, polyhydric alcohols and buffers. Oily vehicles: Vegetable oils, mineral oils, organic oily bases or emulsified bases.

WATER is the most widely used vehicle in the preparation of pharmaceutical solutions. It acts as a universal solvent in solubilizing many active ingredients.

Alcohol (Ethyl Alcohol) It is used as a primary solvent for many organic compounds.

Alcohol has been well recognized as a solvent and excipient in the formulation of oral pharmaceutical products. Next to water, alcohol is the most useful solvent in pharmacy.

It is invariably used as hydro-alcoholic mixture that dissolves both water soluble and alcohol soluble drugs and excipients.

Glycerol (or Glycerine) is a clear, colourless liquid, with thick, syrup like consistence, oily to the touch, odourless, very sweet and slightly warm to the taste. It is miscible with both water and alcohol. Glycerol is obtained by the decomposition of vegetable or animal fats or fixed oils

and containing not less than 95 percent of absolute Glycerine. It is soluble in all proportions, in Water or Alcohol. It is also used to improve viscosity, taste and flavour

2. BUFFERING AGENTS: These are the agents which are added to maintain different ranges of pH of the solution. They resist the change in pH of the solution, (modified phosphate buffer, sodium acetate buffer).

3. ISOTONICITY MODIFIERS: These are the agents added to maintain the isotonicity of the solutions similar to that of various body cavities. These are mainly added for ophthalmic solutions, injectable solutions and solutions applied for mucous membrane. E.g.: Dextrose and 0.9% NaCl solution.

4. VISCOSITY MODIFIERS: In order to increase the residence time of the aqueous based solutions that are intended for skin, eye, and ears, some gelling agents, in low concentrations are added to increase the viscosity of the product. They also improve palatability and ease pourability of the product. e.g. Hydroxy propyl methyl cellulose (HPMC), hydroxyethyl cellulose (HEC), methylcellulose (MC)

5. PRESERVATIVES: Preservatives are substances added to various pharmaceutical dosage forms and cosmetic preparations to prevent or inhibit microbial growth. An ideal preservative would be effective at low concentrations against all possible micro-organism, be non- toxic and compatible with other constituent of the preparation and be stable for the shelf-life of the preparation. Ethanol, Propylene glycol, Glycerine, Benzoic acid and sorbic acid.

6. ANTIOXIDANTS: Antioxidants are currently used as efficient excipients that delay or inhibit the oxidation process of molecules. These are agents used to prevent the products like vitamins, essential oils and fats from oxidation. The oxidation reaction may be due to heat, light and heavy metals. To prevent from heat and light they should be stored at cool temperature and in light resistance container respectively. EDTA or citric acid is mostly used to prevent oxidation by heavy metals like Fe, Cu. Other antioxidants: Ascorbic acid, citric acid.

7. SWEETENING AGENTS: These are the agents added to mask the bitter taste of the active Ingredient. Sucrose is widely used sweetening agent. Polyhydric alcohols such as sorbitol, mannitol and glycerol also act as sweeteners and can be used for diabetic preparations.

8. FLAVOURS AND PERFUMES: These are the agents added to mask the unpleasant taste or odour and make the preparation more acceptable to take. Enable the easy identification of the product. Example Natural products like Fruit juices (raspberry), extracts (liquorice), spirits (orange and lemon), syrups (black current). Some flavours are associated with special preparations. E.g.: peppermint is associated with antacid preparations. Artificial perfumes are cheaper, more readily available and more stable than natural products.

9. COLOURING AGENTS: These are the agents added to enhance the appearance of the preparation. They should be non-toxic, non-irritant and should not show any therapeutic activity. Both natural and artificial colouring agents are available. Natural colouring agents: These include materials extracted from Plants and animals. e.g. Carotenoids, chlorophylls, saffron, red beet root extract, caramel. Synthetic colours: Azo compounds. These are widely used as they give wide range of bright and stable colours.

10. WETTING AGENTS/SURFACTANTS: Wetting agents are routinely used in pharmaceutical formulations, in liquid dosage forms to create a homo dispersion of solid particles in a liquid vehicle. This process can be challenging due to a layer of adsorbed air on the particle's surface. Hence, even particles with a high density may float on the surface of the liquid until the air phase is displaced completely. The use of a wetting agent allows removal of adsorbed air and easy penetration of the liquid vehicle into pores of the particle in a short period of time.

For an aqueous vehicle, alcohol, glycerine, and PG are frequently used to facilitate the removal of adsorbed air from the surface of particles. For non-aqueous liquid vehicle, mineral oil is commonly used as a wetting agent. Typically, hydrophobic API particles are not easily wetted

even after the removal of adsorbed air. Hence, it is necessary to reduce the interfacial tension between the particles and the liquid vehicle by using a surface-active agent. For example, sodium lauryl sulphate is one of the most commonly used surface-active agents.

2 MARKS QUESTIONS

1. Define liniment.
2. What is an infusion.
3. What are the advantages and disadvantages of liquid dosage forms?

10 MARKS QUESTIONS

1. Write briefly about excipients used in liquid dosage forms.