**CHAPTER: PHARMACEUTICAL DOSAGE FORMS**

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**1.0 INTRODUCTION**

Drugs are compounds that, when provided to a life forms, alter biological functions that are neither nutrients or required dietary elements. The term "drug" derives from the old French word "drogue," which means "dry herb," and is frequently used considered synonymous with "medicine," "pharmaceutical product," and "pharmaceuticals" to refer to chemical substances intended for use in the diagnosis, prevention, treatment, and management of disease(s) in humans and other animals. The physical appearance of a dose of a chemical compound used as a treatment or prescription intended for administration or ingestion is referred to as Dosage Form (DF). Among the numerous common dose forms include pill, tablet, or capsule, drink or syrup, aerosol or inhaler, liquid injection, pure powder or solid crystal (e.g., by oral intake or freebase smoking), and natural or herbal form such as plant or food of some kind. The route of administration (ROA) for drug delivery is identified by the substance's dose form. The component composed of excipients and active pharmaceutical ingredient is known as pharmaceuticals dosage form.



**Figure 1: Route of administration of several dosage forms**

**Pharmaceutical excipients**, also known as pharmaceutical ingredients, are inactive, non-medicinal chemicals that are purposefully placed in a medication product to fulfil various and specific pharmaceutical objectives during manufacture, storage, or usage. Other than the Active Pharmaceutical Ingredient (API), drug products typically contain other substances (e.g., bulking agents, disintegrants, stabilizers, solvents, lubricants, binders, preservatives, etc.) to ensure that the drug product is acceptable to regulatory authorities and patients in terms of manufacturability, appearance, and performance For optimal absorption, drug dosage forms must be dissolved in GI fluids. Absorption and bioavailability of a water-insoluble medication are reduced due to poor dissolution rate and solubility in the GI tract. There are numerous proven methods for converting water-insoluble medicines into oral dosage forms.

**Dosage forms are split into two categories:**

1) The ingredient's physiological state (solid, liquid, or gas),

2) The route of administration (ROA) pathway into the body. Enteral (oral, buccal, sublingual, and rectal), topical (transdermal), parenteral, inhaled (nasal), vaginal, ocular, and otic are the most common ROA types.

**Dosage forms are required for the following reasons in addition to enabling the safe and convenient administration of the requisite dose of drug ingredients to the sites of action**:

* To achieve a quick onset of effect after medication administration, such as parenteral dosage forms or inhalational/respiratory dose forms.
* To disguise the unpleasant taste or odour of a drug material, such as capsules, flavor-masked solutions, coated pills, and so on.
* Nanosuspension, for example, can be used to provide increased bioavailability, changed disposition, and drug targeting.
* To deliver drug products that are stable, efficacious, and safe for ingestion under specific storage circumstances, such as powders for reconstitution.
* To protect the drug molecules from the damaging effects of gastric juice after oral administration of the dosage form, such as enteric-coated tablets.
* To supply medicinal formulations that avoid first pass metabolism, such as injections, topical dose forms, and so on.
* To deliver medications at a predetermined rate and for an extended length of time, such as modified-release tablets, capsules, and suspensions.
* To deliver pharmaceutical medicines that bind to a specific physiological site of action, such as targeted-release tablets, capsules, and so on.
* To provide an effective dosage form for giving medications that are poorly water-soluble or insoluble in an appropriate vehicle, such as suspensions.
* To deliver liquid dosage forms of chemicals that are sterile, transparent, and devoid of particulates, such as injections and eye drops.

**ADVANTAGES OF DOSAGE FORM: -**

* It is not harmful to the gastrointestinal tract because it is easily and quickly absorbed.
* The capsules and sugar coating for tablets help hide the unpleasant taste and odour of medications.
* It can be produced in bespoke sizes, shapes, and colours as needed.
* It can protect the API from environmental factors like as moisture, temperature, and light.
* Handling and ingesting
* Comfort on the stomach
* Perceptions of therapeutic benefit
* Patients convenances
* Acceptability
* Flexability of dosage form

**DISADVANTAGES OF DOSAGE FORM**

* When taken as a pill, several medications induce stomach discomfort.
* These dose forms are not appropriate for hygroscopic medicines.
* Patients may avoid ingesting medication if they are bothered by the taste and odour.
* Coating, tablet encapsulation, and the complex process of capsules may raise production costs in the pharmaceutical sector.

Dosage forms differ based on the technique or route of administration. Through various routes, solid dosage forms, semi-solid dosage forms, liquid dosage forms, and gaseous dosage forms are employed for disease diagnosis or treatment. Solid dosage forms are the most common dosage forms in pharmaceuticals; they contain one or more-unit doses of medication. In comparison to other dosage forms, the solid dosage form is the most often utilised and prescribed by doctors. It can be taken orally in the form of tablets, capsules, powders, and so on. One of the most often utilised oral solid dose forms is the tablet.

There are basically three types of dosage form is available like solid, liquid and semi-solid. These are further classified in their category as given below:

**1.1 Solid**

We now discuss various forms of dosages in brief to understand them better:

**1.1.1 Tablets**

Tablets are unit solid dosage form of medicament or medicament with orwithout suitable diluents. They are prepared usually by compression.Tablets are generally meant for oral administration but may be used by other routes of administration.

e.g. Aminophylline tablets, Paracetamol tablets, Antacid tablets

**1.1.1.1Properties of tablets**

* A tablet must be strong and hard to withstand mechanical shock during manufacturing, packing, shipping, dispensing and use.
* The drug content of the tablet must be bioavailable that is, the tablet must be able to release its content in a predictable and reproducible manner.
* The tablet must be chemically and physically stable to maintain its chemical and physical attributes during manufacture, storage, and use.
* The tablet should have elegant product identity which is free from any tablet defect.
* Tablets must be uniform in weight and in drug content.

**1.1.1.2 Types of tablets**

**Compressed Tablet:**Compressed tablets represent a significant proportion of tablets that are clinically used to provide systemic administration of therapeutic agents either in an uncoated state (i.e., in their simplest form) or in a coated state.

**Sugar coated tablet:** These are compressed tablets that have been coated with concentrated sugar solution to improve patient’s compliance, increase aesthetic appeal, mask objectionable tastes or odours, increase stability and/or modify the release of therapeutic agent(s)

**Film Coated tablet:** Film-coated tablets are conventional tablets coated with a thin layer of polymer (e.g., hydroxypropyl methylcellulose, hydroxypropyl cellulose) or a mixture of polymers (e.g., Eudragit E100) capable of forming a skin-like film. The film is usually coloured and also impacts the same general characteristics as sugar coating with the added advantage of being more durable, less bulky, and less time-consuming to apply.

**Effervescent tablets**: Effervescent tablets are uncoated tablets that generally contain organic acids (such as tartaric or citric acid) and sodium bicarbonate in addition to the medicinal substance or API.  They react rapidly in the presence of water by releasing carbon dioxide which acts as a disintegrator to produce either a drug suspension or an aqueous solution. These tablets are prepared by compressing granular effervescent salts (organic acid and bicarbonate) with the medicinal substances. A typical example of this tablet type is Ca C1000 Sandoz effervescent tablet (Novartis).

**Enteric-coated tablets:** Enteric-coated tablets are compressed tablets that have delayed-release properties. They are coated with polymeric substances (such as cellulose acetate phthalate/cellulose acetate butyrate; hydroxypropylmethylcellulose succinate; and methacrylic acid copolymers) that resist solution in gastric fluid but disintegrate and allow drug dissolution and absorption in the intestine.

**Chewable tablets:** Chewable tablets are big sized tablets which are difficult to swallow and thus, are chewed within the buccal cavity prior to swallowing. They are especially useful for administration of large tablets to children and adults who have difficulty swallowing conventional tablets or antacid formulations in which the size of the tablet is normally large and the neutralisation efficacy of the tablet is related to particle size within the stomach.

**Buccal and Sublingual tablets:**Buccal and sublingual tablets are small, flat, oval tablets that are intended to be dissolved in the buccal pouch (buccal tablets) or beneath the tongue (sublingual tablets) for absorption through the oral mucosa to produce a systemic effect. These tablets are employed to achieve either rapid absorption into the systemic circulation e.g. glyceryltrinitrate sublingual tablets or, alternatively, to enable oral absorption of drugs that are destroyed by the gastric juice and/or are poorly absorbed from the gastrointestinal tract.

**1.1.2 Capsules**

Capsules are the solid unit dosage form of drug in which the drug or drugs are enclosed in a practically tasteless, hard or soft gelatin which is practically soluble in water. Two types of capsules are available:

**Hard gelatin capsules** are made up of two cylindrical halves, one slightly larger in diameter but shorter in length known as cap and the other slightly shorter in diameter but longer in length known as base.

**Examples of hard gelatin capsules**: Ampicillin capsules, multivitamin capsules.

**Soft gelatin capsules** are flexible in nature. They may be spherical, ovoid cylindrical or tubes. The small spherical capsules are also known as ‘pearls’. Soft gelatin capsules are used to enclose solids, semisolids or liquids. For oral administration the capsule is placed on the tongue and swallowed with a drink of water. **Examples of soft gelatincapsules**: Chloramphenicol soft gelatin capsules.

**1.1.3 Dusting powder**

These are medicated powder meant for external application on to the skin and are generally applied in a very fine state (Passed through sieve no. 80) of subdivision to avoid local type of irritation. Dusting powders are of two types: (i) Medical (ii) Surgical.

**Medical dusting powders** are mainly used for topical skin conditions and used as antiseptics, antipruritic (Prevention from Itching), astringent (precipitate the blood protein), and antiperspirant, absorbent, protective and lubricant purposes. e.g. Dicophane dusting powder Zinc and salicylic acid dusting powder Zinc, starch and talc dusting powder.

**Surgical dusting powders** are used in body cavities, and also on major wounds as a result of burns, microbial infection and umbilical cords of infants. Surgical dusting powders must be sterilized before their use.

Antiseptic Dusting powders are generally prepared by inter mixing of two or more ingredients together which must be sterilized such as starch, kaolin or talc taken as one of the ingredients of the formulations. Talc and kaolin are commonly used because they are chemically inert. However, since these materials are usually contaminated with harmful pathogenic bacteria, which must be sterilized. e.g. Neosporin powder.

**1.1.4 Insufflations**

These are finely subdivided powders meant for introduction into the body cavities such as Nose, ears, tooth sockets and vagina with the help of an special devise known as ‘insufflators’, without which it will be difficult to apply the powders directly into the cavity with the help of pressurized devise. Insufflators spray the powder into stream of finely divided particles all over the main site of application.

Few problems are generally faced while using the insufflators:

(i) It is very difficult to deliver a measured quantity of the drug as a uniform dose.

(ii) Chances of Blockage is there when it is slightly wet or the powder used is wet.

**Use:** The insufflations are used to produce a local effect, as in the treatment of ear, nose and throat infection with antibiotics or to produce a systemic effect from a drug that is destroyed in the gastrointestinal tract(GI Tract).

**1.1.5 Dentrifices (tooth powders)**

These are the cleansing agents which are generally used with the help of tooth brush for cleansing the surfaces of the teeth. They are available in the form of fine powders and pastes. They may contain

* A suitable detergent or soap for foam formation
* Some abrasive substance like calcium sulphate, magnesium carbonate, sodium carbonate in fine powder (passed through proper sieves).
* Artificial sweetening agent e.g. saccharin sodium
* Suitable flavoring agents e.g. peppermint oil, clove oil.
	+ 1. **Effervescent granules**

These types of granules are specially prepared as solid dosage form of medicament, meant for oral intake. They contain a medicament mixed with citric acid, tartaric acid and sodium bicarbonate. Sometimes artificial sweetening agents such as saccharin or sucrose may be added as a sweetening agent.

**Ingredients used:**

**(i) Sodium bicarbonate:** When sodium bicarbonate reacts with thecitric/tartaric acid and mixture is added to water. The above mixturesevolved carbon dioxide produces effervescence.

**(ii) Citric acid and tartaric acid:** The quantity of citric acid and tartaric acidis slightly more than is necessary to neutralize the sodium bicarbonatebecause effervescent preparations are more palatable if it is slightly acidic.Tartaric acid is anhydrous in nature but citric acid (Hydrated form) has one molecule of water of crystallization. On heating, water of crystallizationliberated and this molecule of water in moist condition thus producedallows partial interaction between the acids and bicarbonates, during which more water is formed.

The water of crystallization of the citric acid and the water from thereactions makes the material coherent.

**(iii) Medicaments** may contain inorganic salts containing water of crystallization are incorporated. E.g. Magnesium and sodium sulphates,sodium phosphate and lithium citrate.

**Methods of preparation:** There are two methods of preparation hot method and Wet method.

**Hot method:** A large evaporating dish is heated on water bath. All theweighed powders are taken in that hot dish to ensure rapid evaporation ofwater liberated from citric acid. Thus a coherent damp mass is prepared.The water required for granulation is provided from two main sources: From one molecule of water of crystallization of citric acid which isliberated during heating.

The water produced from the reactions of citric acid and tartaric acid with sodium bicarbonate.

**Wet method:** In this method the mixed ingredients are moistened with non-aqueous solvent (e.g. Alcohol) to prepare a coherent damp mass. Thecoherent damp mass from both the methods is then passed through sieveno. 8 and dried in an oven at a temperature not exceeding 600C. The driedgranules are passed through the sieve to break the lumps which may beformed during drying in an oven. The dried granules must be packed in atightly closed air tight container.

**Use:** Before taking the required quantity of the granules are dissolved inwater; the acid and bicarbonate react together producing effervescence.The carbonated water produced from the release of carbon dioxide servesto mask the bitter and saline taste of drugs. More over carbon dioxide stimulates the flow of gastric juice and helps absorption of medicament.

**1.1.7 Lozenges**

Lozenges are solid dosage form of medicaments which are meant for slowrelease of medicament in the mouth. Along with active medicament theycontain a sweetening agent, flavoring agent and a strong binding agent.They may be prepared either by mouldingor by compression. Examples are compound bismuth lozenges, liquorice lozenges.

**1.1.8 Pessaries**

Pessaries are solid unit dosage form of medicament which is meant forintroduction into the body cavity i.e. vagina. The various kinds of basesused for the manufacture of pessaries are such that at room temperaturethey retain the original shape but when inserted into the body cavity eitherit melts or dissolve in the cavity fluids to release the medicament.They may be prepared either by moulding or by compression.

E.g. Lactic acid pessaries, nystatinpessaries.

**1.1.9 Powders**

Powders are solid dosage form of medicament which is meant for internal as well as external use. The powders meant for internal use are known asoral powders (taken by oral route of administration) whereas those meantfor external use are known as dusting powders( Medicated powders having antiseptic action).

The powders may be simple or compound.When the powders are dispensed in large quantities in a container and thepatient is asked to measure a specified quantity as a dose then these powders are known as bulk powders.e.g.1. Bulk powder for internal use: e.g. Compound sodium chloride anddextrose oral powder. Compound rhubarb oral powder

2. Bulk powder for external use: e.g. Snuffs, Talc dusting powders, Tooth powder.

**1.1.10 Cachets**

Cachets consist of a dry powder enclosed in a shell. The shell is prepared from a mixture of rice flour and water by moulding into suitable shape and then dried.

Two types of cachets are there:

**Wet seal cachets:** Lower half of the cachet is filled with the powdered drug. Then the projection of the upper half of the cachet is moisten with water, and pressed over the lower half. The cachet is dried for 15 minutes.

**Dry seal cachets:** Drug powder is filled in the lower half and the upper half is pressed over it just like a capsule.

**Use:** They are mainly used for administering the drug with disagreeable taste and a large dose. A cachet should be absorbed in water for few seconds and then positioned on the tongue and taken along with water.

e.g. Sodium aminosalicylate cachets, Sodium aminosalicylate and isoniazid cachets.

**1.1.11 Suppositories**

Suppositories are having special type of solid dosage form containingmedicament for insertion into rectum, vagina, nasal cavity or body cavitiesother than mouth. These products are so formulated that after insertion, they will either melt of dissolve in the cavity fluids to release the medicament.

Suppositories vary in shapes, sizes and weights. General suppositories from1 to 2 gm are prepared with either cocoa-butter or glycerogelatinbase.e.g. Aminophylline suppositories, Glycerogelatin suppositories.

* 1. **Liquid**

**Applications:** Applications are usually suspension, emulsion, liquid or viscous preparations intended for application to the skin. It should be dispensed in colored fluted bottles in order to distinguish them from preparations meant for internal use. The container should be labeled “FOR EXTERNAL USE ONLY”.

Examples of applications are calamine application compound B.P.C. dicophane application B.P.C.

**1.2.1 Monophasic liquid dosage forms** Monophasic liquid dosage forms are represented by true solution or colloidal solutions. Solution comprises of solute and solvent. The major part of the solution which is present in a larger quantity is known as “solvent”, whereas the lesser component present in a smaller quantity is termed as “solute”.

**Classification**

1. For internal use e.g. syrups, elixirs, linctuses, drops and draughts.

2. For External use which are of two types:

(a) To be applied to the skin e.g. liniments and lotions etc.

(b) For body cavities e.g. gargles, throat paints, mouth washes, eye drops, eye lotions, ear drops, nasal drops, sprays and inhalation.

**1.2.2 Aromatic waters**

Aromatic waters (Aroma containing preparations) are also known as medicated waters. They are dilute, usually saturated, aqueous solutions of volatile oils (e.g. peppermint oil, cinnamon oil) or volatile substances (e.g. camphor) which is used as pharmaceutical aid.

**Uses:**

(i) Some of them have a mild therapeutic action such as carminative (expulsion of gases from the stomach) but

(ii) Mainly they are used as flavoring agents (Pharmaceutical Aid) in preparations meant for internal use.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Concentrated preparation** | **Dilute By Volume** | **Use** |
| **Concentrated** | **Water** |
| Anise water | Concentrated Anise Water | 1 | 39 | Flavoring agent, Carminative andMild expectorant |
| Camphor water | Concentrated Camphor water | 1 | 39 | Flavoring agent, Carminative and Mild expectorant |
| Caraway water | Concentrated Caraway water | 1 | 39 | Flavoring agentand Carminative |
| Chloroform Water | Concentrated Chloroform Water | 1 | 1 | Preservative andFlavoring agent |
| Dill Water | Concentrated Dill Water | 1 | 39 | Flavoring agent & Carminative (in gripe water) |
| Peppermint water | Concentrated Peppermint water | 1 | 39 | Carminative andpreservative |

Aromatic waters are prepared by two methods as per Indian pharmacopoeia:

**(1) Solution method:** \* Aromatic oil is vigorously shaken with 500 times its volume of Purified Water. The shaking is repeated several times during a period of 30 minutes. The mixture set aside for 12 hrs or overnight and then filtered. Alternatively, the aromatic oil may be triturated with a sufficient quantity of powdered talc or of Keiselghur, or of pulped filter paper and 500 times its volume of purified water and filtered.

**(2) Dilution from concentrated waters:** One part (by volume) of concentrated aromatic water is diluted with 39 parts of Purified Water.

e.g. Preparation of Camphor Water

Formula:

|  |  |  |
| --- | --- | --- |
| **S No.** | **Name of the Ingredients** | **Quantity** |
| 1 | Camphor | 1 gm |
| 2 | Alcohol (90%) | 2 ml |
| 3 | Purified water q.s. | 1000 ml |

Camphor is dissolved in Alcohol- act as distributing agent (90%) and then the solution which contains camphor is added drop by drop to the purified water. After each addition the mixture is shaken vigorously until the weighed amount camphor is dissolved. Undissolved part of camphor can be removed by filtration.

E.g. Preparation of Cinnamon Water Concentrated B.P.C.

Aromatic oil i.e Cinnamon oil is dissolved in the alcohol and then sufficient quantity of purified water was added in successive small portions, to produce 1000 ml. The mixture was shaken vigorously after each addition. Small amount of purified talc was suspended in water and a filter bed is prepared on the filter paper. The filter bed was air dried and followed by oven drying and then the solution was filtered through it.

**1.2.3 Syrups**

Syrups are saturated concentrated liquid oral preparations in which the vehicle is a concentrated aqueous solution of sucrose or other sugar may be natural sugar or artificial sugar depending upon the type and requirement of the patient. Syrups generally are not issued directly to the patients when it is issued to the patients:

(i) If it is clear it is called **elixir** and

(ii) if it is suspension it is called **mixtures.**

Simple syrup IP is a saturated solution of sucrose in purified water. The concentration of sucrose is 66.7 % w/w as per Indian pharmacopoeia.

Syrup containing medicine/drug substances is called medicated syrups and those containing aromatic or flavored substances are known as flavored Syrup.

**Advantages of syrups:**

1. Syrups have the tendency to retard oxidation because it is partly hydrolyzed into reducing sugar e.g dextrose and levulose.

2. Syrups prevent the decomposition of many vegetable drug substances.

Syrups have high osmotic pressure which prevents the fermentation, growth of bacteria, fungi and molds which are the main causes of degradation of active constituents in solutions of vegetable matter.

3. They are palatable in nature. Due to its sweetness it is used as a valuable vehicle for the administration of unpalatable substances.

The syrups may be divided into two categories:

* **Syrups prepared by simple solution or admixture**

E.g. Simple Syrup IP

|  |  |  |
| --- | --- | --- |
| **S No** | **Name of the Ingredients** | **Quantity** |
| 1 | Sucrose | 667 g |
| 2 | Purified water q.s | 1000 g |

Method: Sucrose is added to the purified water and dissolved by heating. The solution is then cooled and the required volume is made up with the required amount of purified water.

e.g. Ginger Syrup IP

|  |  |  |
| --- | --- | --- |
| **S No** | **Name of the Ingredients** | **Quantity** |
| 1 | Strong Ginger Tincture | 50 ml |
| 2 | Syrup, Sufficient to produce | 1000 ml  |

Procedure: Both ingredients are taken together and mixed thoroughly. Transfer the preparation into a container. Labeled it properly and dispensed it.

* **Syrups made by a process of extraction**

e.g. Tolu Syrup IP

|  |  |  |
| --- | --- | --- |
| **S No** | **Name of the Ingredients** | **Quantity** |
| 1 | Tolu balsam | 12.5 g |
| 2 | Sucrose | 660 g |
| 3 | Purified water q.s | 1000 g |

**Procedure:** After boiling the purified water it is added to tolu balsam contained in a measured vessel. The vessel is covered lightly and the contents are boiled gently for half an hour. Purified water is added to adjust the specified weight. The mixture containing drug substances is cooled, filtered and then sucrose is added. The above solution is heated on a water bath to dissolve the sucrose. Finally sufficient quantity of purified water is added to produce the final required weight.

**1.2.4 Elixirs**

Elixirs are oral preparation containing potent or nauseous drugs having clear liquid which are taken by oral route. They are having pleasant flavor and usually attractive colored and are very much stable.

(i) Elixirs typically contains the drugs which may have doses less than or equal to 60 mg or potent drugs, such as antibiotics, antihistamines and sedatives.

The main Vehicles used in preparation of elixirs are alcohol, glycerol (glycerin) and propylene glycol. Elixirs are mainly used for the production of clear solution. Essential oils from flavoring agents may produce opalescence (turbidity), hence alcohol 10 - 20% is useful for keeping oils in this type solution.

(ii) When potent medicine having low solubility is required to be dispensed, a mixture of solvents that will give complete solution is used. e.g. Phenobarbitone is practically insoluble in water but a clear product can be achieved by dissolving in alcohol and then diluting with glycerol and water. e.g. One part of paracetamol ( NSAID) is soluble in 70 parts of water, 7 parts of alcohol, 9 parts of propylene glycol or 40 parts of glycerol. In paracetamol elixir a mixture of alcohol, propylene glycol and glycerol is used as vehicle.

Other adjuncts used are:

(i) **Chemical stabilizers:**e.g. Neomycin Elixir B.P.C. is adjusted to pH 4 to 5 with citric acid to minimize the darkening that occurs on storage. e.g. Disodium edetate should be incorporated to sequester heavy metals that catalyse decomposition of antibiotic.

(ii) **Colouring agents**: These are used to impart color to the preparation. e.g. Amaranth, Magenta red, tartrazine, Saffron

(iii) Sweetening agents are used to impart sweetness in the preparation. e.g. Sucrose syrups, glycerol, sorbitol solution, invert syrup and saccharin sodium are used.

(iv) **Flavors:** These are the agents which is used to impart flavor to the preparation.

e.g. Blackcurrent Syrup in Chloral Elixir, Concentrated Raspberry Juice with invert syrup, Lemon spirit with simple syrup and invert syrup, Compound Orange Syrup

(v) Preservatives are used to prevent the preparation from degradation.

e.g. · 20% alcohol, propylene glycol or glycerol are preservative

Syrup is self-preservative due to high osmotic pressure

The most common additional preservative in chloroform; it is used in the form of double strength water.

Sometimes the preparations contain benzoic acid and methyl parahydroxy benzoate.

**1.2.5 Linctuses**

Linctuses are liquid dosage form having oral viscous nature that is usually prescribed for the relief of cough and cold. Linctuses contain drug or active constituent which are having demulcent action (which soothes the inflamed mucous membrane preventing contact with air in the surroundings), sedative or expectorant action. The viscous vehicle prolong the duration of action of the active medicaments and soothes the sore membrane of the throat.

The prescribed dose is 5 ml and it should be taken in small doses, sipped with sipper if available and swallowed slowly without diluting it with water in order to have the maximum and prolonged contact of active medicaments with the affected part.

Simple Syrup is generally used as a vehicle. For diabetic patients Sorbitol solution or artificial sweetening agents may be used instead of Simple Syrup.

**1.2.6 Glycerin or glycerites**

Glycerin are the viscous preparations in which the drug is dissolved in glycerin with or without heating. Due to its high viscosity it is beneficial to impart prolong duration of action. These type of preparations are used as pharmaceutical aid and are generally incorporated with antiseptic or anti-inflammatory preparations.

e.g. icthammol glycerin, tannic acid glycerin, phenol glycerin.

**1.2.7 Collodions**

Collodions are liquid preparations meant for topical application to the skin. They are very much convenient for application on small cuts and abrasions and are also used when longer period of contact time is required in between the skin and the medicament.

* The vehicle which is generally used are volatile and evaporates when applied on to the skin, leaving a flexible, protective covering in the form of film at the site.

**Preparations**

* Volatile solvents used are ether and alcohol. Film producing ingredient is pyroxylin (nitrocellulose)

Plasticizer giving the flexibility is castor oil. Preparation

The solution is made by shaking all the ingredients in a closed container, allowing them to stand for few days while impurities settle down and then decant the supernatant liquid, because the solution is too volatile for filtration. **Storage:** Collodions are stored in small well closed light resistant containers.

**1.2.8 Liniment**

Liniments are semiliquid, liquid or semisolid preparations meant for application on the skin. They may be alcoholic or oily solutions or emulsions. Most of them are rubbed /massaged onto the skin e.g. counterirritant type. Some are applied on warm dressing or with the help of brush.

e.g. Analgesic liniments and soothing type.

Liniments must not be applied to broken skin because it can cause irritation on the skin. e.g. Soap Liniment BPC, Camphor Liniment BP, Methyl salicylate liniment BPC Alcohol is the main vehicle used in liniments to increases the penetration effect of counter-irritant molecules through skin.

**1.2.9 Lotions**

Lotions are liquid dosage form mainly meant for external or topical application without friction. They are either dabbed on the skin or applied on a suitable dressing with the help of cotton and covered with water resistant material to reduce evaporation. e.g. Copper and zinc sulfate lotion is used for impetigo

Zinc sulfate and salicylic acid for ulcer Salicylic acid lotion for dandruff Salicylic acid and mercuric chloride lotion for follicular infection Copper and Zinc sulfate have astringent action. Salicylic acid has keratolytic action.

**1.2.10 Gels**

Gels are aqueous colloidal suspensions of the hydrated forms of insoluble medicaments e.g. aluminum hydroxide gel, used as antacid.

**1.2.11 Extracts**

Extracts are concentrated preparations containing the active constituents of vegetable or animal drugs. The drugs are extracted with the help of suitable solvents and the product is concentrated by one of three types of extract -

*Liquid Extract* of which 1 ml usually contains the active constituents from 1 g of drug.

*Dry Extract* obtained by completely removing the solvent under reduced pressure.

*Soft Extract* obtained by evaporation to a plastic mass.

**1.2.12 Tinctures**

These are mainly concentrated alcoholic preparations containing the active principles of vegetable drugs. They are weaker than extracts. They are usually prepared by maceration and percolation (methods of extraction), or may be prepared by dissolving the liquid extract of chemical substances (e.g. iodine) in alcohol or hydroalcohol solvent. e.g. Belladonna tincture Aromatic cardamom tincture Iodine tincture.

**1.2.13 Spirits**

Spirits are alcoholic or hydro alcoholic solutions of *volatile* substances. They are mainly used as flavoring agents but a few of them have medicinal value. e.g. Chloroform Spirit, Lemon Spirit, Compound Orange Spirit.

**1.2.14 Infusions**

(i) ***Fresh Infusions*** are made by extracting vegetable drugs for a short time with cold or boiling water (making of tea). They quickly deteriorate as a result of microbial contamination and therefore must be used within 12 hours.

(ii) **Concentrated infusions**are made by cold extraction with usually 25 % concentration of alcohol. The alcohol preserves the product for an indefinite period. Dilution of 1 part of concentrated infusions with 10 parts of water gives a preparation corresponding fresh infusion. e.g. Concentrated Compound Gentian Infusion concentrated Senna Infusion.

**1.3 Semisolid**

In this section, we have discussed various forms of semi-solid dosages.

* + 1. **Creams**

Creams are semi solid viscous liquid or semisolid emulsions intended for application to the skin i.e. for external use. Creams are of two types, aqueous creams and oily creams. In case of aqueous creams the emulsions are oil-in-water type and in case of oily creams emulsions are of water-inoil type. Due to the presence of water soluble bases they can be easily removed from the skin. The aqueous creams have a great tendency to grow bacterial and mold growth, therefore a preservative must be added in their formulation. e.g. cetomacrogol cream, cetrimide cream, hydrocortisone cream, zinc cream BPC.

**Advantages of creams:**

1. Creams are more acceptable to the patients because they are less greasy and are easier to apply.
2. They are more stable and interfere less with skin functions.
3. O/w type of creams (superior to w/o type) can be rubbed directly on to the skin more readily and easily absorbed and are easily removed by washing. W/o type base can be spread more evenly.
4. O/w type of cream are less likely to soil clothes.
5. Evaporation of water from o/w type of cream may causes cooling sensation.
6. O/w creams absorb the discharges from the wound (liquid exudates) very quickly.
7. W/o creams (i.e. cold creams) restricts limited evaporation from the skin, it can be used on non-weeping surfaces to prevent dehydration (in dry season), restore softness. This property is said to be ‘emollient’.

**Disadvantages:**

1. Since it is a semisolid preparation and containing oil in large amount, some of which are inedible, hence creams are not used for internal use. Basically creams are meant for application onto the skin.
2. The aqueous phase is more prone to the growth of molds and bacteria hence suitable preservatives should be used.
3. Sometimes rancidifications of oils take place due to oxidation.

**1.3.2 Jellies**

Jellies are semisolid transparent or non-greasy semisolid preparations meant for external application to the skin or mucous membrane. They are used for medication or lubrication purposes.

E.g. Contraceptive jellies (spermicidal action) Ichthammol jelly etc.

They are used for mainly lubricating catheters, surgical gloves and rectal thermometers used for measuring thermometer. The gelling agents used for jellies may be gelatin, or a carbohydrate such as starch, tragacanth, sodium alginate or cellulose derivative.

**1.3.3 Ointments**

Ointments are the soft semisolid, greasy preparations meant for external application on to the skin or mucous membrane (rectum and nasal mucosa). They usually contain active constituents/ medicament dissolved, suspended or emulsified in the ointment base which may be water soluble or water insoluble. Ointments are chiefly used for their emollient and protective action to the skin.

e.g. compound benzoic acid ointment, cetrimide emulsifying ointment

**1.3.4 Pastes**

Pastes are mostly semisolid preparations meant for external application to the skin. They may contain large amount of finely divided powdered solids (passed through proper sieve) such as starch, zinc oxide, calcium carbonate etc. They provide a protective coating over the areas to which they are applied. The base may be anhydrous (liquid or soft paraffin) or water soluble (glycerol or a mucilage). Their stiff nature make them useful as protective coatings.

e.g. magnesium sulfate paste.,zinc and coal tar paste

**1.3.5 Ophthalmic ointment**

Ophthalmic ointments are meant for application to the eye. It should besterile in nature and free from irritation. It should be packed in sterilecontainers which should keep the preparation sterile (free from microorganisms) until whole of it is used up.

e.g. Atropine eye ointment Chloromycetin eye ointments

**Difference between Paste and Ointment:**

|  |  |
| --- | --- |
| **Paste** | **Ointment**  |
| Particle size: Paste contains a large amount of finely powdered solids. As a result they are often stiff. | Ointments contain very less amount of powdered solids. Hence they are soft. |
| When applied on the skin the paste should adhere well and remain in contact with the area of application. | Ointments are very less viscous, hence spread beyond the area of application. |
| They are porous in nature because of the water soluble bases hence the perspiration can move/escape through it. | Ointments are non-porous because of the oleaginous bases – hence perspiration cannot escape through it. |
| They are less greasy than ointments. | They are more greasy than pastes |

**References**

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