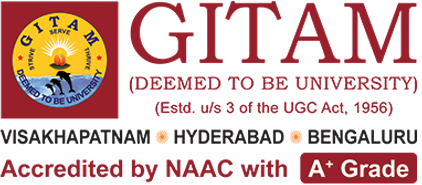
|  |
| --- |
| **GITAM Institute of Pharmacy** |
| **SOLID DOSAGE FORMS** |
| **POWDERS** |
|  |
| **Dr. SUVENDU KUMAR SAHOO** |
|  |

|  |
| --- |
|  |



**Introduction**

Powders are the solid dosage forms. They are considered as the **oldest and simplest** dosage forms since supplied either in the bulk or as an individual dose in the fine state of subdivision of drug or drugs with or without the diluents. ***A powder is a homogeneous mixture of more or less finely divided particulate material in dry form****.* Usually bulk powders are supplied for **externally** used proposes and individual doses for **internally** used purposes. A pharmacist view for powders as a dosage form should be important for their state of sub-division, homogeneous mixing if contain more than one drug, their dispensing procedures depending on physical and chemical properties of the drugs and diluents, their packing and labelling.

Powders are still very commonly used dosage forms m many of the dispensaries, simply because of their simple formulation and packaging techniques. Sometimes, few of the drugs, for internal use are not dispensed in fine state of sub-division but-rendered to a granular form using some processes. This form of medicament is called **granules**. They are usually supplied in bulk form. Granules are formulated in such a way that they should evolve carbon dioxide gas when added to water before taking the dosage orally. Such form of powders is called effervescent granules.

Now a days, powders for internal use are very conveniently replaced by tablets and capsules while powders for external use with sprays and insufflations.

**Advantages of Powders**

1. They are most versatile and convenient to prescribe, compound and administer.
2. They provide the **precise dose**, physician has the option to deviate from the conventional dose of the medicament.
3. They are **more stable than liquid dosage forms** since remained in solid state. Most of the drugs degrade when comes in contact with moisture.
4. There are very **less chances of chemical reactions** among the drugs present in a mixture because of the absence of moisture. Hence, no incompatibility is found.
5. Being available in a very fine state of sub-division, they show **rapid rate of dissolution** and hence **rapid rate of absorption**. This advantage is over other solid dosage forms like tablets.
6. They are **taken easily** in bulk quantities either with food or some drink.
7. They are **easy to carry** than liquids.
8. They are most **economical dosage forms** since they do not require large number of machinery or special techniques.
9. They are **easily administered** to those patients who are not in a condition to swallow through feeding tube after dispersing them in water. So powders are suitable for unconscious patients who are hospitalized or infants and children who cannot swallow the tablets or capsules.

**Disadvantages of Powders**

* 1. Drugs which are **sensitive** to the atmospheric conditions like air, moisture and light; are not suitable for dispensing in the form or powders.
  2. Drugs which are **bitter, unpalatable, corrosive** and **nauseous**; are not suitable for dispensing in the form of powders.
  3. Drugs which are **hygroscopic, deliquescent, oxidizing and effervescent** in nature may arise problems in dispensing processes.
  4. Drugs which are **volatile** in nature are not advisable to dispense in the form of powders.
  5. It includes **number of operations** like milling, sieving, mixing, drying etc. Hence, time consuming to compound.
  6. In **powders for external use**, it requires finest state of sub-division of powders. Hence, become **costly**.

**Classification**

**(a) Divided powders**

When the powde rs are supplied individually as a single dose in separate packets, they are called divided powders. These are unit dose powders normally packed in properly folded papers and dispensed in envelopes, metal foil, small heat-sealed plastic bags or other containers

**(i) Simple powders**

Simple powders contain only one ingredient either in crystalline or amorpous form. These powders should preferably be reduced to fine powder, weighed properly and supplied in a single dose packet separately. The wrapping of powders may be single wrapped or double wrapped (lined with waxed paper) according to the properties of the drugs. If the drug is resistant to atmospheric conditions, it can be wrapped singly and if sensitive to those conditions, it must be double wrapped.

For Example:

RX

Paracetamol 500 mg

Make a powder. Signa: one t.i.d

**(ii) Compound Powders**

Compound powders contain two or more ingredients supplied in the form of fine state of powder in divided dose, i.e. each dose is supplied in a single packet.

For Example:

RX

Aspirin 250 mg

Paracetamol 150 mg

Caffeine 50 mg

Fiat pulvis : Mitte tales sex.

Signs: one t.i.d.

Method: Powder each ingredient and weigh required quantities. Mix them in geometrical proportions and supply m divided doses. Wrap each dose m a double-wrapped paper.

Wrapping of pow ders is to form a packet by a special type of foldings of white demy paper.

**(b) Bulk powders (For internal use)**

Bulk powders means supplied in bulk quantities and patients are instructed to take out the ***exact dose*** with the help of measuring spoons and take according to the directions of the prescribers. Popular bulk powders for internal use are ***antacids, laxatives, electrolyte replenishers*** etc. Bulk powders are only advised to dispense when the drugs are ***non-potent*** because patients have to measure dose themselves. They may do some mistake while measuring the dose and may create the condition of toxicity.

Internally used bulk powders are supplied either in powder form or in the form of effervescent granules.

For example:

RX

Compound rhubarb powder B.P.C. (Gregory’s powder)

Rhubarb, in powder 250 g

Light magnesim carbonate 325 g

Heavy magnesim carbonate 325 g

Ginger, in powder 100 g

Make a powder

*Direction:* 0.5 to 5.0 g to be taken twice a day

**2. Powders for external use**

They are the powders supplied in bulk for external use and often sprinkled as per the requirement of the patients directly on the wound through perforated or sifter-top containers.

Containers may be made of materials like cardboard, glass or plastic. Sometime wide-mouthed containers are also preferred instead of special type of containers.

**(a) Dusting powders**

Dusting powders are the well known example of externally used bulk powder. They are-free flowing, very fine powders for external use containing **antiseptics, antipruritics, astringents, antiperspirants, absorbents, protectives and lubricants.** The fine state of subdivision of the powder is must to eradicate the effect of **irritation** and enhance the **effectiveness** and **homogeneity**. The purpose of ingredients like absorbents and lubricants is to **absorb the watery portion** of the wound and get **stuck on** the applied part of the body and to enhance **spreadability** or **flow property** so as to make powder easy to flow on the wounded part respectively.

**i) Medical Dusting Powders**

They are usually applied on **superficial skin conditions** and **sterility is rarely essential**. However, they must be **free from spores** of dangerous pathogens like ***tetanus, gas gangrene and anthrax***. Some of the ingredients (talc and light kaolin) are sterilized by maintaining the whole of the powders at not less than **160ºC for at least an hour**. Other constituents like starch and zinc oxide are not sterilized. The purpose of these ingredients in dusting powders is as follows:-

***Talc:*** being an excellent lubricant, it is used to enhance the flow property of the powder.

***Starch:*** being an excellent absorbent, it is used to absorb the watery portion of wound and get stuck on that part for long tune.

Apart from these additives dusting powders contain ***Boric acid, Salicylic acid and Zinc oxide*** as antiseptics.

Medical dusting powders are not advised to be applied on open wounds or areas of broken skin.

Hence label of this powder must bear the following instructions:

* + - For external use only.
    - Do not apply on open wounds and broken skin.

For example:

***RX***

***Dusting powder***

Purified talc, sterilized 50 g

Starch powder 25 g

Zinc oxide 20 g

Salicylic acid 5 g

**(ii) Surgical Dusting Powers**

They are used in ***body cavities*** and ***major wounds***, on ***burns*** and on the ***umbilical cords*** or infants; therefore it is essential to sterilize such powders. They usually contain antibacterial agents like cholrhexidine and hexachlorophane and sterilisable maize starch and sterilized talc.

**(b) Insufflations**

Externally used powders for body cavities are called insufflations and are defined as follows:

They are medicated dusting powders that are blown by an insufflator into the regions such as nose, throat, body cavities like teeth sockets, vagina, ear to which it would be difficult to apply the powder directly. Sometimes insufflations intended for the nose are used in the same way as snuff.

Insufflations have some limitations like:-

(1) Difficult to obtain a measured quantity of medicament.

(2) Blocked if powder become slightly wet.

Metered valve aerosol pressure containers overcome these limitations.

**(c) Sunffs**

Decongestion or bronchodilator actions are called sunffs.

**(d) Dentifrice**

Dentifrice is a powder used to clean the teeth with the help of tooth brush. It should have the following characteristics: -

* 1. It should be finely powdered.
  2. It should have cleansing action.
  3. It should have mild degree of abrasiveness;
  4. It should have good flavour.
  5. If it is a paste, then it requires moistening agents, thickening agent, and sweetening agents.

To fulfil the above characteristics of dentifrice, various types of ingredients are added in its formulation like detergents e.g. sodium laurylsulphate provides cleaning action, precipitated calcium carbonate, dibasic calcium phosphate, calcium sulphate, magnesium carbonate, sodium bicarbonate and sodium chloride provide mild degree of abrasiveness; volatile oils and saccharine provide the flavour and taste; glycerin and sorbitol act as a moistening agents and starch, tragacanth and cellulose derivatives act as a thickening agents.

**3. Special Powders**

Some special types of powder are dispensed which require special techniques to dispense since the ingredients show their peculiar properties.

**(a) Eutectic Mixtures**

They are the mixtures of powders which **when mixed, turns to liquid**. Some of the drugs which tend to liquefy on mixing are ***Camphor, Thymol, Menthol, Phenol, Aminopyrene, Chloral hydrate, Acetylsalicylic acid, Salol and Acetanilide***. Any two of these drugs turn to liquid when mixed. Such mixtures are named eutectic mixtures and are defined as *the mixtures of low melting point ingredients which on mixing together turn to liquid form due to depression in melting point of the mixture below room temperature.* The reason is that each ingredient **becomes the impurity** for another one, therefore melting point of each of the ingredient is further lowered to below the, room temperature and ultimately the mixture is liquified.

For example:

***RX***

***Nasal insufflations***

Menthol 5 parts

Camphor 5 parts

Ammonium chloride 30 parts

Magnesium carbonate, light 60 parts

**(b) Effervescent Powders or Granules**

They are specially formed solid dosage form of medicament intended to be taken internally.

The basic requirements for effervescent granules are:

(1) Medicament

(2) Sodium bicarbonate

(3) Citric acid

(4) Tartaric acid

The purpose of taking such type of ingredients is to produce effervescence when such preparation is added to water before administration. Carbon dioxide gas is released as a result of acid-base reaction. The preparation is advised to be taken while effervescing. The advantages of effervescent granules are:

The carbonated water formed serves to mask the saline or bitter taste of the drugs.

Carbon dioxide stimulates the flow of gastric juice and accelerates absorption of medicament.

***Effervescent granules*** are preferred to effervescent powders in order to decrease the rate of dissolution in water due to decrease in surface area. The reaction is sustained so as to avoid complete loss of carbon dioxide.

For example:

***RX***

***Effervescent Sodium Phosphate USP***

Sodium Phosphate, dried and powdered 200 g

Sodium bicarbonate 177 g

Tartaric acid, in dry powder 252 g

Citric acid, monohydrate 162 g

**(c) Powders to be reconstituted**

They are supplied in powdered or granules form with the instructions that that the patients should add specified amount of freshly boiled and cooled water to granules or powders. The bottle is shaken so as to form a homogeneous solutions or suspensions. The label should bear ***storage conditions*** and the ***time limit*** within which the reconstituted preparation should be consumed.

Powders to be reconstituted is necessary to dispense when ***a large dose of medicament*** is required. Tablets or capsule does not serve the purpose as number of them will have to be administered. Secondly, when the ***drug is not stable*** for a long time, reconstituted powders overcome these two problems.

**(d) Hygroscopic and Deliquescent Powders**

Hygroscopic substances absorb the moisture contents from the atmosphere because of less vapour pressure then the atmospheric water vapour pressure. After the absorption of the moisture, they remain in the powder form. **Deliquescent substances** also absorb the moisture contents from the atmosphere and turn to liquid form. Examples of such substances include ***ammonium citrate, sodium bromide, sodium iodide, zinc chloride*** etc. This creates a serious problem to the stability of the medicaments which are sensitive against moisture. To minimize the exposure to the atmosphere, such substances must be supplied m granular form. They should never be supplied in fine powder form, since this increases the surface area and hence the exposure to the atmosphere. While dealing with such types of ingredients, apparatus and glassware must be absolutely dried. The packing of these powders is very important. Powders must be carefully packed in **double wrapped** paper or one may use **aluminium foil** or **plastic paper** to cover the packet.

**(e) Efflorescent powders**

Efflorescent substances are those crystalline substances, which becomes powdery and liberate their water of crystallization. Examples of efflorescent substances include ***caffeine, citric acid, ferrous sulphate, quinine hydrochloride, and sodium phosphate*** etc. The water liberated from an efflorescent substance can cause a powder to become pasty and to liquefy. A possible remedy is to employ the respective anhydrous salt. Anhydrous salt may have tendency to attract moisture from the air and should be handled in a manner similar to that in case of hygroscopic powders.