

Powders

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Powders

Definition:

Powder is defined as a uniform and dry mixture of one or more finely divided particulate material

OR

Pharmaceutical Powders are intimate mixtures of dry, finely divided drugs and/ or chemicals that may be intended for internal (oral powders) or external (topical or dusting powder) use

Powders

- Powders represent one of the oldest dosage forms.
- It is a preparation in which drug is blended with other powdered substances and used for internal or external purpose.
- Powder as a dosage form permits drugs to be reduced to a very fine state of division, which often enhances their therapeutic activity or efficacy by an increase of dissolution rate and/ or absorption.
- Divided powders are also found to be convenient for administering drugs that are excessively bitter, nauseous, or otherwise to the taste

Powders

- Although powders are not used now-a-days extensively **as a dosage form**, they are widely used **in preparation of various dosage forms**.
- Powdered drugs can be blended with other powdered materials prior to fabrication into other solid dosage forms such as tablet and capsule.
- Powdered drugs are frequently added to other ingredient to make ointments, pastes, suppositories, etc.

Powders

- A good powder formulation has a uniform particle size distribution.
- If the particle size distribution is not uniform, the powder can segregate as per to particle size which may result in inaccurate dosing or inconsistent performance.
- A uniform particle size distribution ensures :
 1. A uniform dissolution rate if the powder is to dissolve,
 2. A uniform sedimentation rate if the powder is used to remain in a suspension and
 3. Minimizes stratification when powders are stored or transported

Powders - Advantages

Powdered dosage forms exhibit the following advantages:

- Powders being the solid preparation are more stable than liquid and semi-solid preparations.
- Convenient forms, to dispense large dose of drugs. They can be best administered in powder form by mixing them with food or drinks
- Since powders are in the form of small particles they offer a large surface area and are rapidly dissolved in the gastrointestinal tract minimizing the problems of local irritation.
- More convenient to swallow, faster dissolution and absorption than tablets or capsules.

Powders - Advantages

- Powders offer a lot of flexibility in compounding or incompatible solids and possess good chemical stability.
- They are easy to apply
- They absorb skin moisture, which leads to reduced friction between skin surfaces, discourages bacterial growth and has a cooling effect.
- Can be applied to many body cavities such as ears, nose, tooth socket and throat.
- Can be made into many different dosage formulations eg capsules, tablets, powders for reconstitution, dusting powders, bulk powders, powders for inhalation etc.

Powders - Advantages

- Highly compatible compared to liquid dosage forms.
- Manufacturing of powder is economic, hence product cost is quite low as compared to other dosage forms.

Powders - Disadvantages

- Less convenient to carry
- Bulk powders are not suitable for administering potent drugs with a low dose.
- Difficult to mask the unpleasant taste of the drugs.
- Light fluffy powders may be inhaled by infants leading to breathing difficulties.
- Variable dose accuracy.
- Not suitable form for drug inactivated in the stomach or cause damage to stomach these should be presented as enteric-coated tablets.

Powders - Disadvantages

- Not suitable for bitter, nauseating and corrosive drugs, if are meant for oral administration.
- Difficulty of protecting hygroscopic, deliquescent or aromatic materials and not suitable for drugs which are unstable in normal atmospheric conditions.
- They are susceptible to physical instability.

Classification of Powders

The powders can be categorized into two classes **based on:**

- 1. Usage**
- 2. Quantity**

1. Based on Usage:

- a. **Internal Use:**
 - i. Simple Powders
 - ii. Compound powder
 - iii. Bulk powder e.g. effervescent powders or granules, non effervescent antacids laxatives and dietary powders

Classification of Powders

1. **Based on Usage:**

- b. **External Use:** Dusting powder. Snuffs, insufflation, sprays, aerosols, dentifrices, tooth powders, etc

Classification of Powders

2. **Based on Quantity: Depending on quantity to be ADMINISTERED**

b. **External Use:** Dusting powder, Snuffs, insufflation, sprays, aerosols, dentifrices, tooth powders, etc



Powders

Powders for Internal use:

1. Simple Powders: Unit dosage form of single crystalline powder or amorphous powder that are packaged in adequately folded papers and then dispensed in envelopes, metal foils, small heat sealed plastic bags. E.g. Aspirin powder



Powders

Powders for Internal use:

1. Simple Powders:

- Simple powders are prepared by blending the pre-weighed ingredients through geometrical mixing in increasing order of their weights
- The mixture obtained is divided into chunks of equivalent sizes; the quantity of chunks represents quantity of powder to be dispensed.

Powders

Powders for Internal use:

2. Compound Powders: These powders are made up of two or more ingredients that are mixed together.

Eg. A.P.C (Aspirin, Paracetamol and Caffeine) Powder



Powders

Powders for Internal use:

3. Bulk Powders:

- A wide mouth container is used to store bulk powders from where they can be easily removed using a teaspoon.
- When the specificity in dose is not required, they are delivered in large quantities
- Non potent substances like antacids, laxative, purgative etc are stored in bulk powder form
- Eg. Rhubarb Powder, Light magnesium carbonate powder, Ginger powder, etc

Genie In My Bottle

Himalayan Rhubarb

INCI: *rhuem emodi* powdered roots & rhizomes

Natural product, PATCH test recommended
Store in a cool, dry place to prolong shelf life

Nett Wt: Not less than 10/ 25/ 50/ 100 grams

Studio Craftarea
Made in India



Powders

Powders for External use:

- Usually contains non potent substances
- Can be dispensed in glass wide mouth , plastic wide mouths or in cardboard boxes.
- Bulk powders for external used are of four types.
 - (a) Dusting powders
 - (b) Snuffs
 - (c) Douche powders
 - (d) Dental powder
 - (e) Insufflation

Powders

(a) Dusting powders :

- These are used externally for local application not intended for systemic action
- The desired characteristics of powders include-
 - (a) homogeneity
 - (b) non-irritability
 - (c) free flow
 - (d) good spreadability and covering capability
 - (e) adsorption and absorption capacity
 - (f) very fine state of subdivision, and
 - (g) capacity to protect the skin against irritation caused by friction, moisture or chemical irritants

Powders

(a) Dusting powders :

- Dusting powders usually contain substances such as zinc oxide, starch and boric acid or natural mineral substances such as kaolin or talc.
- Talc may be contaminated with pathogenic microorganisms such as - *Clostridium tetani* etc., and hence it should be sterilized by dry heat.
- Dusting powders should not be applied to broken skin.
- If desired, powders should be micronized or passed through a sieve # 80 or 100.
- Dusting powders should preferably be dispensed in sifter-top containers. Such containers provide the protection from air, moisture and contamination as well as convenience of application
- They are widely used as lubricants, protective, absorbents, antiseptics, astringents & antiperspirants

Powders

(b) Snuffs :

- These are finely divided solid dosage forms of medicaments dispensed in flat metal boxes with hinged lid.
- These powders are inhaled into nostrils for decongestion, antiseptic, and bronchodilator action

(c) Douche powders :

- These powders are intended to be used as antiseptics or cleansing agents for a body cavity; most commonly for vaginal use although they may be formulated for nasal, otic or ophthalmic use also.
- As douche powder formulation often include aromatic oils, it becomes necessary to pass them through a # 40 or 60 sieve to eliminate agglomeration and to ensure complete mixing

Powders

- They can be dispensed either in wide mouth glass bottles or in powder boxes but the former are preferred because of protection afforded against air and moisture.

Zinc sulphate

Magnesium sulphate

Boric acid

Oil of lemon

Water

Powders

(d) Dental powders:

- Dental powders are rarely prescribed. However this class of powders is interesting from the compounding angle. This preparation is a type of dentifrice meant for cleaning the teeth.
- As such, dental powders contain detergents, abrasives, antiseptics and colouring and flavouring agents incorporated in a suitable base.
- Generally the base is calcium carbonate.
- The detergent is in the form of soap and the abrasive action is provided by finely powdered pumice stone. Essential oils are added to provide flavour and freshness to the mouth as well as antiseptic action.
- Essential oils, if present in smaller quantity, are easily absorbed by calcium carbonate and pumice. This makes the uniform distribution of the oil difficult. Best results are obtained if the oil is triturated in the solids taking considerable care to distribute it uniformly.

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Powders

(e) Insufflation

- Insufflations are a class of powders meant for application to the body cavities e.g., ear, nose, vagina etc.
- The powder has to be extremely fine and must find an entry to the cavity deep enough to bring about its action at the site.
- It is delivered to the affected part in a stream with the help of a device called an insufflator, which blows the powder to the site
- Some of the insufflations contain volatile liquid ingredients which may require uniform distribution in the powder
- The pharmaceutical industry packages the insufflations in pressurized form i.e., aerosols.
- Aerosols contain the medication in a stout container with a suitable valve, the delivery of the powder being accomplished by a liquefied or compressed gas propellant of very low boiling point. On pressing the actuator of the valve the propellant delivers the medication in a stream.

Powders

2. Bulk powders for internal use

Effervescent granules

- This class of preparations can be supplied either by compounding the ingredients as granules or dispensed in the form of salts.
- The ingredients whether in granular form or present as salts, react in presence of water evolving carbon dioxide gas.
- For evolution of the gas two constituents are essential, a soluble carbonate such as sodium bicarbonate and an organic acid such as citric or tartaric acid.
- The preparation can be supplied either as a bulk powder or distributed in individual powders.

Powders

2. Bulk powders for internal use

Effervescent granules

- There are three alternative methods of dispensing depending upon the nature of prescription:
 - (i) If the effervescent salts are prescribed to be dispensed in bulk form, no granulation is necessary. The ingredients are mixed uniformly and directions stated on the label to add the prescribed quantity to water, before use.
 - (ii) If the effervescent salt is prescribed in divided doses, the ingredients which cause effervescence on mixing with water are enclosed separately in papers of different colour. The patient is advised to take one powder of each color and add to water, before use. Quantities of the sodium bicarbonate and the organic acid, citric or tartaric, are equimolecular in proportion.

Powders

2. Bulk powders for internal use

Effervescent granules

(iii) In the third case the product contains all the ingredients mixed together in a granular form. Preparation of granular products requires pharmaceutical technique. If sodium bicarbonate and citric acid are taken in equimolecular proportion and mixed to make granules, the quantity of water of crystallization liberated from the citric acid is large enough to make the mass wet and carbon dioxide may be liberated during the preparation itself. If one tries to substitute citric acid by tartaric acid, which contains no water of crystallization; it may not be possible to form a mass necessary for granulation

Powders

2. Bulk powders for internal use

Effervescent granules

- Therefore both citric and tartaric acids are taken in suitable proportions leaving a little acid in surplus than the quantity required to neutralize sodium bicarbonate.
- This surplus is necessary to give the final preparation an acidic taste that is more palatable.
- There is a certain loss in weight of such a preparation due to the loss of water in drying the granules and partial loss of carbon dioxide due to its release during preparation.
- Heating is done on a water bath keeping all the ingredients thoroughly mixed in a porcelain dish.
- Gentle application of heat liberates the water of crystallization from citric acid and the mass tends to be coherent.

Powders

2. Bulk powders for internal use

Effervescent granules

- Prolonged heating may result in complete evaporation of the released water leaving the product in the form of a dry lump which cannot be rendered into granules.
- The coherent mass is transferred from the porcelain dish to an inverted sieve of suitable aperture size kept over a glazed paper.
- The mass is pressed through the sieve taking care to change the position of the sieve over the paper to prevent the formation of a lump of the sieved granules.
- The granules are dried in an oven taking care to regulate the temperature which should be generally kept below 80°C. The operation requires considerable skill and experience to obtain granules of uniform size and an elegant product.

Powders

2. Bulk powders for internal use

Effervescent granules

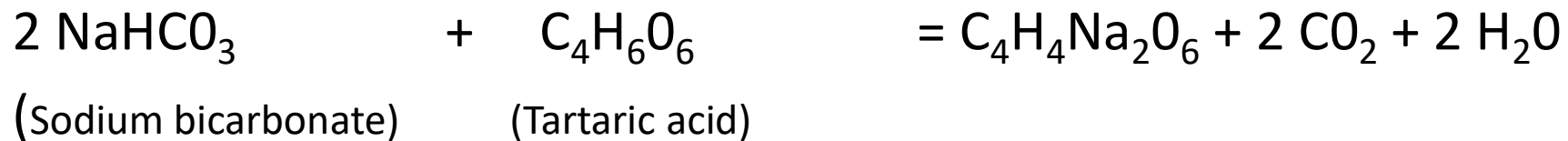
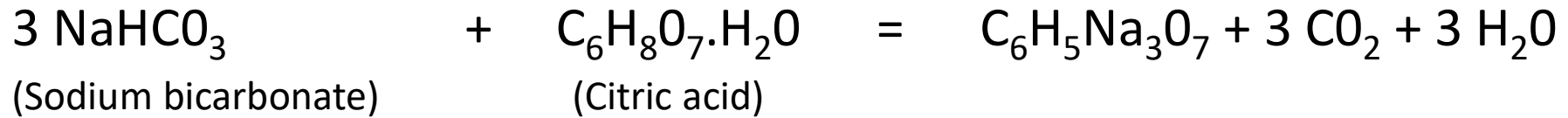
- If necessary, the dry granules are passed through a sieve of appropriate size to break larger granules which result due to sticking of the sieved wet granules.
- The water of crystallization of the citric acid and the water from the reactions make the material coherent.
- Loss of weight occurs during granulation due to (a) evaporation from the damp mixture, and (b) loss of carbon dioxide.
- The losses constitute approximately one-seventh of the weight of powder used and must be allowed for when calculating the amount to be prepared.

Powders

2. Bulk powders for internal use

Effervescent granules

Chemical reaction:



Powders

Eutectic mixtures

- Defined as mixture 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
- They are mixtures of substances that liquefy when mixed, rubbed or triturated together.
- The melting points of many eutectic mixtures are below room temperature.
- Examples of the substances which tend to liquefy on mixing are camphor, thymol, menthol, salol. Any two of these drugs turn to liquid when mixed.
- This problem can be solved during formulation of powders of such material by using inert adsorbent such as starch, talc, lactose to prevent dampness of the powder and dispensing the components of the eutectic mixture separately.

Powders

Cachets

- Cachets are the solid unit dosage form of drugs . These are molded from rice paper .
- which is made by pouring a mixture of rice flour and water between two hot polished cylinders .
- The water evaporates and a sheet of wafer is formed.
- Cachets are used to enclose nauseous or disagreeable powders are available from 0.2 to 1.5 g of powder .
- They are quite hard to swallow as such but they are softened by dipping in water for few seconds and then place on the tongue and swallowed with a water

Powders

Cachets

- The process of filling is similar to that of capsules.
- The drug is placed in one of the two halves of the cachet, the upper half is then placed over it and pressed with the help of a suitable device.
- The flange of the upper plate is moistened carefully taking care not to wet it, with the help of a dampener.
- The sealing takes place due to the moisture between the flanges of the upper and the lower half and the pressure over the flanges.
- About 15 minutes are allowed for drying of the seal. After this time the middle portion of the cachet is slightly pressed to ensure complete sealing.

Powders

Cachets

DISADVANTAGE

- It must be softened before swallowing .
- They cannot protect the drug against light moisture
- The shell of cachets are fragile

TYPES OF CACHETS

- ✓ Wet seal cachets
- ✓ Dry seal cachets

Powders

Cachets

Wet seal cachets

- A wet seal cachet is made up of two similar convex halves having flat edges .
- The weighed quantity of powdered drug is placed in one half , the edges of the other half moistened with water and placed exactly over the first half containing drug .
- The flat edges of both the halves are pressed together to seal it
- **DIRECTION : IMMEDIATELY IMMERGE IN WATER FOR FEW SECONDS AND THEN SWALLOW WITH DRAUGHT OF WATER**

Powders

Cachets

DRY SEAL CACHETS

- It consists of two halves , the upper half and the Lower half .
- The diameter of the upper half is slightly larger than the lower half .
- The powdered drug is filled in lower half and upper half is fitted over it .
- The filled cachets are then sealed in machine by pressing the two halves.
Eg. Sodium aminosalicylate

Powders

Cachets

DRY SEAL CACHETS

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Eg. Sodium aminosalicylate

Powders

Hygroscopic powders and Deliquescent powder

- The powders which absorb moisture from the atmosphere are called hygroscopic powders.
- But certain powders absorb moisture to such a great extent that they go into solution and are called deliquescent powders.
- Examples of such substances include ammonium citrate, pepsin, phenobarbitone, sodium bromide, sodium iodide, potassium citrate, zinc chloride etc.

Powders

Hygroscopic powders and Deliquescent powder

- Such substances are usually supplied in granular form in order to expose less surface area to the atmosphere.
- These powders should not be finely powdered.
- Such powders should be double wrapped.
- In humid weather or when dealing with very deliquescent substances, for their wrapping in aluminium foil or plastic cover is advisable.

Powders

Efflorescent powders

- Some crystalline substances liberate water of crystallization wholly or partly on exposure to humid atmosphere or during trituration and thus become wet or gets liquefy.
- Example of such substances include caffeine, citric acid, ferrous sulphate etc. the difficulty may be overcome by using corresponding anhydrous salt or an inert substance may be mixed with efflorescent substance before incorporating with other ingredient
- Problems pertaining to efflorescent powder include: water liberated when the drug or chemical is triturated may cause the powders to become damp or pasty.

Powders

Efflorescent powders

- If water is released to the atmosphere because of low relative humidity, the drug loses its crystallinity and becomes powdery.
- Water of hydration is given off; a given weight of the resulting powder no longer contains the same amount of the drug.
- Hence strategies for handling efflorescent powders includes: storage and dispense of these powders in airtight containers.
- The anhydrous form of the drug may be substituted for the hydrate, but be sure to make appropriate dose corrections.

Powders

Preparation of powders

- 1. Reduction of particle size of all ingredients**
- 2. Sieving.**
- 3. Weighing of each ingredient.**
- 4. Mixing.**
- 5. Packaging.**

Powders

MIXING OF POWDERS

- The aim of mixing is to obtain a homogeneous association of several solid products.
- Factors influencing the mixing of powders- nature of surface, density, particle size, particle shape, particle charge and proportion of materials.
- If these factors are not under control, segregation (demixing) can occur.
- Types of segregation include percolation, trajectory and densification.

Powders

Methods of Powder Mixing

1) Mechanical Mixing

2) Hand Mixing:

- a. Spatulation (spatula + tile)
- b. Trituration (mortar + pestle)
- c. Tumbling (wide mouth closed container)

3) Geometric dilution:

Entire quantity of potent drug (x volume) + (x volume) of the diluents + (2x volume) of the diluents + (4x volume) of the diluents.....repeated until all the diluents are used.

Powders

Powder packaging

PAPER WRAPPING

- Divided powders are supplied or dispensed by wrapping in suitable paper(glazed).
- The paper used for packing of powder should have following properties:
 - ✓ It should fold easily.
 - ✓ It should protect the powders without cracking at the fold.
 - ✓ It should impermeable to atmospheric condition.
 - ✓ It should be water repellent.
 - ✓ It should be light weight and elegant.

Powders

- Powder papers (glazed) of special grades are available readily in different in size otherwise pharmacist may cut the sheets in suitable size .
- The shape of the paper should be rectangular. The wrapping of powders may be single or double wrapping.
- **Packed in sifter top containers, pressurized containers, flat metalboxes.**

Powders

Evaluation of powder

Pharmaceutical powders are evaluated for following quality control parameters:

- Content uniformity
- Particle size and size distribution
- Flow property: Angle of repose, Flow rate Density: Bulk density, tapped density and true density Hausners ratio
- Moisture content
- Tensile and cohesive strength measurements
- Safety and efficacy

