Powders & Granules

Def Powder is a dosage form composed of solids or a mixture of solids reduced to a finely divided state. intended for external or internal use.

Def Granules are prepared agglomerates of powdered materials. often used in making tablets.

Q) What is the main difference between powders and granules?

The size.

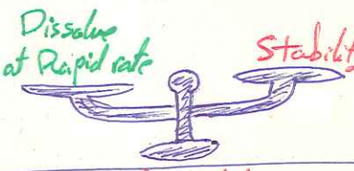
	Powders	Granules
Size	smaller	larger
Dust	Dust	No dust ✓
Flowability	May be Bad	Good ✓
Content	A powder contains single material	May contain more than single material

Note) A powder material has a uniform size (PSD) → Prevent segregation (Demixing)

Q) Why do we use powders? : Applications of Powders

- **Dosing Flexibility**
  - Quantity of medication can be altered easily for each dose.
- **Can be mixed in Food**
  - * For children who cannot swallow
- **When the drug is Too Bulky** to be prepared as capsules or tablets.
- **To make liquid dosage forms**
  - Solutions
  - Suspensions
  - * Incorporated into semisolid dosage forms
- **To provide Rapid Onset of action**
  - Dissolution rate ↓
  - Bioavailability ↑

Powder Balance (Small PSD)



Stability — Risk of adsorption of [Humidity & Air]
Risk of decreasing wetting properties

Preformulation Considerations

Physicochemical Considerations

- Particle size PSD & Analysis
- Morphology (eg) Spherical, needle shape or cylindrical
- Flowability
- Uniformity
- Purity
- Solubility & Stability
- Compatibility

* PSD for powders and granules: Range

Table 6.1 Sieve No. and mesh size

Extremely Coarse (1cm) — (10mm) — 1 μm or less — Colloidal Dimension

USP Descriptive Terms [In Monographs]

- Very Coarse
- Coarse
- Moderately Coarse
- Fine
- Very Fine

Q) How to understant the descriptive terms?

* The terms are related to the proportion of powder that is capable of passing through the opening of ~~Standard~~ standard sieves.

The Effect of Particle Size On

- Dissolution Rate
- Suspendability
  - Sedimentation rate ↓ when particle size ↓
- Uniformity
- Penetrability
  - e.g. 1–5 μm deep in the lung
  - 3 μm : Alveoli
- Lack of grittiness
  - * Intended for ointments, creams and ophthalmic preparations
  - 50–100 μm

Methods for Particle Size Analysis & Determination

- Sieve Analysis
  - * Particles passes through series of sieves by mechanical shaking.
- Microscopy
  - * Size
  - * Morphology
  - → Calibrated grid
- Light Energy Diffraction
  - (Recall) spectrophotometer
- * Laser scattering
- * Laser Holography
- Sedimentation Rate
  - → Using Stok's Law
  - * Pipette method
  - * Hydrometer method.

Q) What is the importance of the Collection & Containment system?

→ Protects the environment from chemical dust, reduces product loss & Prevent product contamination.

Q) What is levigation? Why do we use it?

→ It is a process of trituration and milling (often using spatula) used in small-scale preparation of ointments & suspensions to reduce the particle size and grittiness of the added powders.

Q) How can we (Prepare) a uniform mixture of two or more different powders?

→ It is best to reduce the particle size of each powder individually before weighing and blending (mixing).

Q) What determins the methods of blending (mixing)?

* Nature of the ingredients * Amount of powder * The equipment used.

Blending Methods

Spatulation

Def: is "mixing" small amounts of powders by movement of spatula through them.

* Very little compression.
* Good for eutectic mixtures

Trituration

Def: Is the process of both comminution & mixing.

* Bad for eutectic powders

Sifting (Sieving)

Def: The process of mixing by passing the powders through sifters.

* Bad in the case of incorporation of potent drugs into diluent powder

Tumbling

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* Mixing in rotating chamber

e.g) V-blender → Small, Large.

Case: How to mix eutectic materials? → Without compression. → Add inert diluents → Magnesium oxide, Magnesium Carbonate

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Case: How to mix a small amount of potent substance with large amount of diluent?

→ By "geometric dilution" to insure uniformity.

Def Topical powders are powders intended to be used on the skin in which the particle size is small enough to pass at least No. 100-mesh sieve to minimize skin irritation.

Def Insufflated powders are finely divided powders intended to be applied in a body cavity; ears, nose, vagina or throat.

Topical Powders

Properties

- Impalpable
- Free flowing
- Easily adhere to skin

Usually Consist of:

Vehicle	Adherent	API & Aromatic material
- TALC - Corn starch	- Mg stearate - Ca stearate - Zinc stearate	

USE

- Highly sorptive powders should not be used on oozing wounds as a hard crust may form
- Hydrophobic powders prevent loss of water from the skin and do not cake on oozing surfaces.

Insufflated Powders

Applied on body cavities using "insufflator" or puffer

- The device appropriate for anti-infectives

Polyox = Ethylene Oxide Polymer
- Can be incorporated into insufflated powders.
- Forms viscous, muco-adhesive gel when applied on moisture

Q) What is "Pulverization"? The action of reducing to fine particles.

Comminution [Reducing the size of chemical substance]

Small scale

- Grinding with mortar & pestle.
- Mortar with rough surface.

On large scale

- Mills and Pulverizers [Machines]

Eg) Fitz Mill + Product containment sys.

- Blades used for grinding action in the comminuting chamber
- Particles pass through a screen
- Collection Container

Def Segregation is an undesirable separation of the different components of the blend.

Q) What causes powders "segregation"?

Percolation (Sifting)

Coars
Fine

Fluidization (Air entrapment)

note) Striation patterns during slipping or powder transfer.

Dusting

*Fine, light particles remain suspended in the air.

Q) How to minimize or prevent segregation?

- Minimum transfer steps & drop heights.
- Use of a deflector - destributor
- Appropriate venting
- Slow Fill transfer rate
- Control dust generation & fluidization.

Hygroscopic & Deliquescent Powders

[absorb moisture]

Def Deliquescents are powders that absorbs moisture from the air to the extent that they will partially or wholly liquify.

Case: How to prevent these powders from moisture?

→ Dilute with inert drying powder. → Store in dry place in tightly closet container

→ Incorporate a dessiccant packet.

Efflorescent Powders

Def Are "Crystalline" powders that contain water of crystallization. When this water is lost, the powder sticky or pasty.

Case: How to protect these powders?

→ Use the ankydrous salt form → Use a drying bulky powder

→ Use a light, non-compacting method of miking.

Explosive Powders Mixture

* Some combinations may react violently when mixed together.

→ Special precautions.

Medicated Powders

Routs of Administration

- Orally
- Inhalation
  - local
  - Systemic
- Injections
  * sterile
- Vaginal Douches
- For External Use

Aerosol Powders (inhalation powder)

Def is one used with a device that aerolizes & deliver an accurately metered amount.

→ Particle size of the micronized medication is between 1–6 μm.

Def A DPI is a device used to administer an inhalation powder in a finely divided state.

Inhalation Product contain

- Inert propellant
- Diluents
  * α-lactose monohydrate.

Why?

① Aid in flowability

② Aid in uniformity.

③ Protect from humidity.

Incorporation of Liquids into a Dry Powder

- Liquids can be adsorbed onto an inert material
  - lactose
  - starch

  → Then added geometrically
- * If the material is pasty, it can be added to increasing quantities of dry powder.
- * Preparing alcoholic solution and spraying it evenly on the powder.