Powders and Granules

Introduction to Powders and Granules (Short)

- Powders and granules are solid dosage forms composed of finely divided particles (powders) or aggregated particles (granules) of one or more active pharmaceutical ingredients (APIs), with or without excipients.
- They are widely used in pharmaceuticals for oral, topical, and inhalation routes.

Powders:

- Finely divided dry substances, usually less than 1 mm in size.
- Can be used directly (e.g., dusting powders) or reconstituted before use (e.g., oral powders).
- Offer flexible dosing, fast dissolution, and rapid onset of action.

Granules:

- Larger, multi-particle aggregates of powders.
- Generally, more free-flowing, less dusty, and more stable than powders.
- Often used to prepare effervescent granules, sachets, or reconstitutable suspensions.

Advantages:

- Good chemical stability.
- Easy to adjust dose.
- Faster drug dissolution than tablets or capsules.

Disadvantages:

- Less convenient to carry and store.
- May have taste masking issues.
- Dose accuracy may vary if not measured properly.

Insufflations

Definition:

- Insufflations are finely divided powders intended for introduction into body cavities such as the ear, nose, throat, vagina, or lungs using a device called an insufflator that blows the powder into the desired site.



Sites of Application:

- Nasal cavity
- Throat (oropharynx)
- Vaginal cavity
- Ear canal
- Lungs (as dry powder inhalers)

Characteristics:

- Must be very finely divided (micronized).
- Require accurate dosing.
- May need to be sterile (especially for respiratory tract use).
- Delivered via insufflator or inhaler device.

Advantages:

- Rapid onset of action (especially pulmonary).
- Bypasses first-pass metabolism.
- Suitable for heat- and moisture-sensitive drugs.
- Localized delivery (nasal, throat, etc.)

Disadvantages:

- Requires special devices for administration.
- Risk of overdosing or inhalation issues.
- Fine particles can irritate mucosa.
- May require special packaging (e.g., dry powder inhaler capsules).

Examples:

- Budesonide DPI (for asthma)
- Sodium cromoglycate nasal insufflation (for allergic rhinitis)
- Streptomycin insufflation (historical use in TB)

Method of Preparation:

1. Selection of drug and excipients (e.g., diluents like lactose).
2. **Micronization**: Powders are ground to extremely fine particle size (usually <10 microns) using a jet mill or ball mill.
3. **Blending**: Uniformly mix drug with suitable carriers/diluents.
4. **Sieving**: Use very fine mesh sieves (e.g., 120–200 mesh).
5. **Sterilization**: If necessary, use aseptic processing or gamma irradiation.
6. **Packaging**:
    - For nasal/throat insufflations: fill into insufflator bulbs or bottles.
    - For pulmonary: fill into capsules or blister packs used in inhalers.

Packaging:

- Special insufflator devices or sprinkle bottles.
- Must be sterile.
- Powder blowers in hospital settings.

Labeling:

- "Use as directed by physician"
- Specify cavity (e.g., nasal insufflation)
- "For local use only"

Dusting Powders

Definition:

- Dusting powders are finely divided free-flowing powders intended for application to the skin, primarily for protection, astringent action, antiseptic, antifungal, or absorbent purposes.
- They are non-invasive and widely used in dermatological therapy.



Classification of Dusting Powders:

Type	Description	Example
Medicated	Contain active ingredients	Antifungal, antibacterial powders
Non-medicated	Used as protective or absorbent agents	Talcum powder, zinc oxide powder

Ideal Properties:

- Free-flowing
- Non-irritating
- Inert (should not react with skin or other ingredients)
- Adherent to skin to provide effective action
- Non-toxic and should not block sweat glands

Advantages:

- Reduces friction, moisture, and irritation.
- Useful for intertriginous areas (underarms, groin).
- Allows even coverage over large surfaces.
- Prevents bacterial or fungal growth in moist areas.

Disadvantages:

- Blowing or rubbing may generate airborne particles (inhalation hazard).
- Loss of drug during application if not well formulated.
- Not suitable for wet, oozing lesions.

Common Ingredients:

- **Base**: Talc, kaolin, starch, magnesium carbonate.
- **API**: Clotrimazole, miconazole, zinc oxide, boric acid.
- Antifungal/antibacterial agents.
- Perfumes (for non-medicated).

Method of Preparation:

1. **Selection of ingredients**
    - ➢ Choose non-reactive, non-toxic, and skin-friendly materials.
    - ➢ Ensure compatibility between API and base.

2. Grinding and size reduction

- Use mortar and pestle, mill, or pulverizer.
- Final particle size should pass 100–120 mesh sieve.

3. Blending

- Uniformly blend API with diluent using geometric dilution.
- Can be done in a rotating blender or manually with spatula.

4. Sieving

- Pass through a fine sieve (120 mesh) to ensure homogeneity and flowability.

5. Packaging

- Use wide-mouthed, sifter-top, or screw-capped containers.
- Avoid moisture; use desiccant if needed.
- Label as "For external use only".

Examples:

- Clotrimazole dusting powder (antifungal)
- Zinc oxide + starch powder (for prickly heat)
- Boric acid powder (antiseptic)

Packaging:

- Sifter-top containers (talc containers).
- Non-sterile (for skin); sterile (for surgical use).

Labeling:

- "For external use only"
- "Not for internal use"
- Avoid eyes and mucous membranes

Effervescent Powders

Definition:

- Effervescent powders are dry, finely divided powder mixtures that contain acidic and basic components, which react in the presence of water to release carbon dioxide gas, resulting in effervescence.

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