Tablets

Introduction to Tablet



- Tablets are **solid dosage forms** containing active pharmaceutical ingredients (APIs) and excipients, intended for oral administration.
- They are the most commonly used form of drug delivery due to their ease of administration, accurate dosing, stability, and cost-effectiveness.

Definition

- A tablet is a **compressed unit dose** of medication prepared by compressing powders or granules into a solid form.

Advantages of Tablets

- **Convenience:** Easy to carry, store, and administer.
- **Accurate Dosage:** Provides precise and consistent dosing.
- **Stability:** Longer shelf-life compared to liquid forms.
- **Cost-Effective:** Economical to produce and package.
- **Versatility:** Can be designed for immediate or controlled release.

Disadvantages of Tablets

- **Swallowing Difficulty:** May not be suitable for children or elderly patients.
- **Absorption Issues:** Delayed onset of action compared to liquid or injectable forms.
- **Processing Challenges:** Requires specialized equipment and conditions.

Ideal Characteristics of Tablets

An ideal tablet should possess the following features:

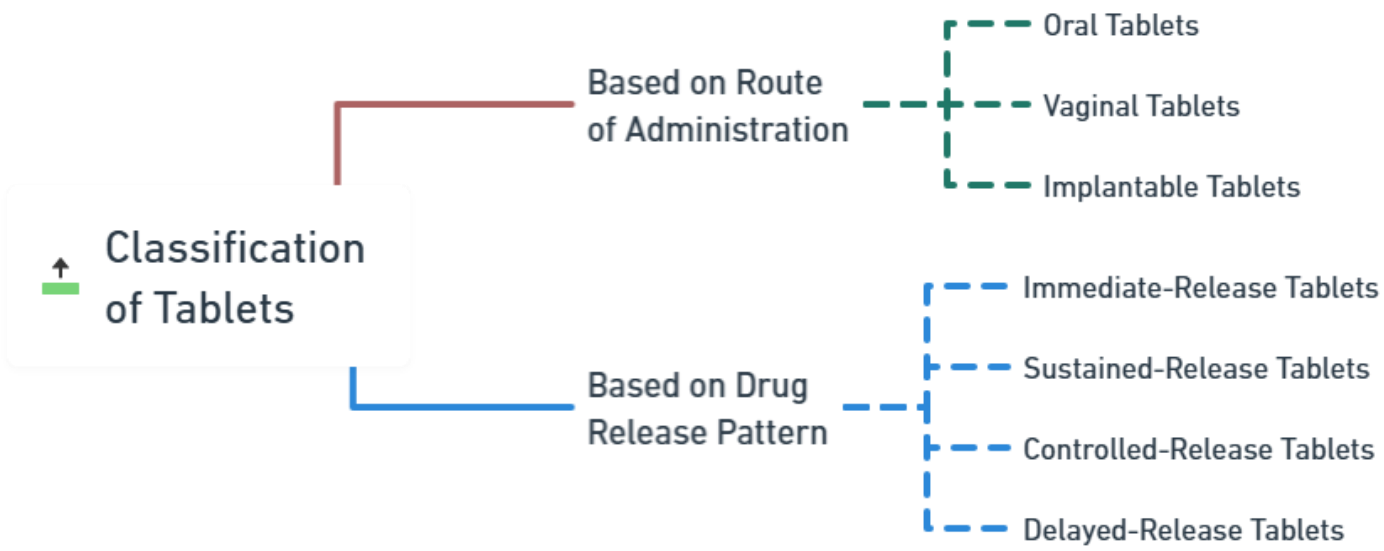
1. **Physical Properties:**
   - Uniform weight, size, and shape.
   - Smooth surface with no cracks or chips.
   - Proper hardness and mechanical strength to withstand handling.
2. **Chemical Properties:**
   - Chemically stable to prevent degradation of API.
   - Compatible with excipients.
3. **Biopharmaceutical Properties:**

- Must disintegrate and dissolve quickly to release the drug.
- Provides predictable bioavailability.

4. Functional Properties:

- Should be free of contaminants.
- Easy to swallow and palatable.

Classification of Tablets



A. Based on Route of Administration:

1. Oral Tablets:

- **Conventional Tablets:** Disintegrate and dissolve in the gastrointestinal tract (e.g., Paracetamol).
- **Chewable Tablets:** Meant to be chewed before swallowing (e.g., Antacids).
- **Effervescent Tablets:** Dissolve in water before administration (e.g., Vitamin C).
- **Sublingual Tablets:** Dissolve under the tongue for rapid absorption (e.g., Nitroglycerin).
- **Buccal Tablets:** Dissolve in the buccal pouch for slow absorption (e.g., Fentanyl).

2. Vaginal Tablets:

- Inserted into the vagina for localized treatment (e.g., Clotrimazole).

3. Implantable Tablets:

- Placed under the skin for long-term drug release (e.g., Hormonal implants).

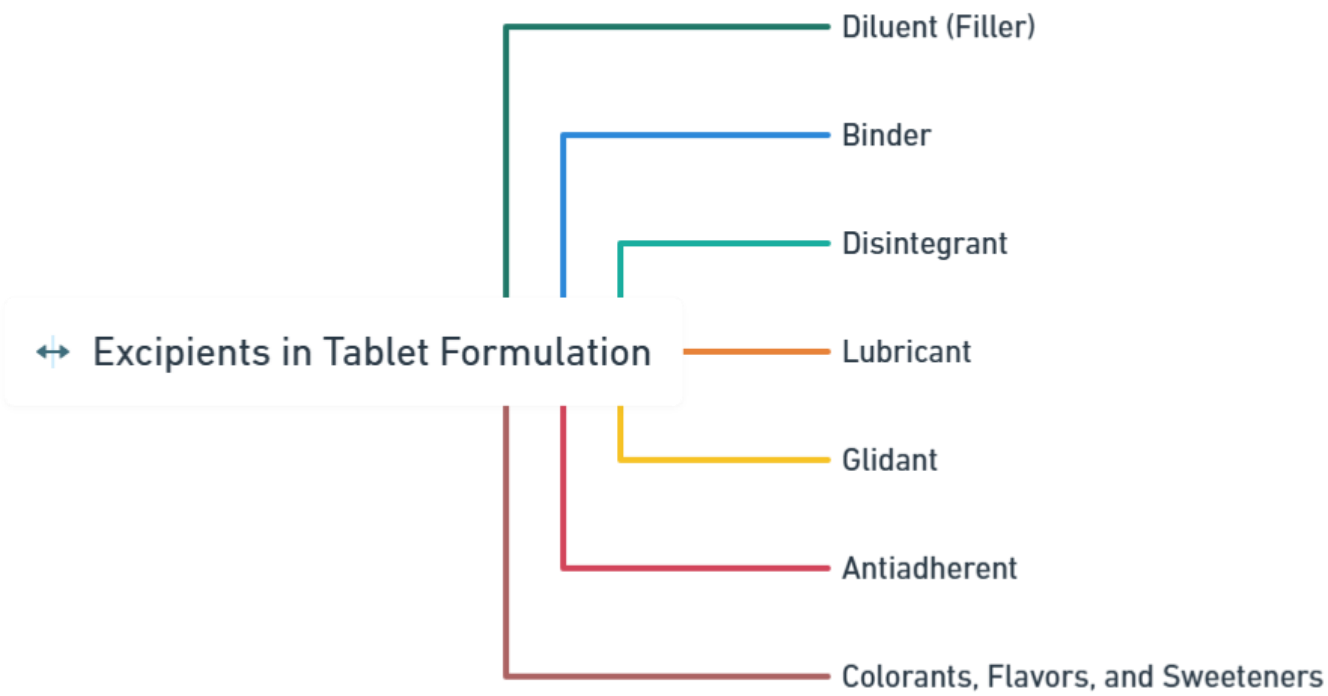
B. Based on Drug Release Pattern:

1. **Immediate-Release Tablets:** Quickly disintegrate and release the drug.
2. **Sustained-Release Tablets:** Gradual release over time.

3. **Controlled-Release Tablets:** Precisely control the drug release rate.
4. **Delayed-Release Tablets:** Release drugs at a specific site in the GIT (e.g., Enteric-coated tablets).

Excipients Used in Tablet Formulation

- Excipients are inactive substances used to aid the manufacturing process and enhance the performance of the drug.
- They serve multiple functions:



1. Diluent (Filler)

- Increases bulk to produce an acceptable tablet size.
- **Examples**: Lactose, microcrystalline cellulose (MCC), dicalcium phosphate.

2. Binder

- Promotes particle adhesion, ensuring tablet cohesion and integrity.
- **Examples**: Starch paste, polyvinylpyrrolidone (PVP), hypromellose (HPMC).

3. Disintegrant

- Facilitates tablet breakup or disintegration after administration for immediate release of drug.
- **Examples**: Starch (corn, potato), sodium starch glycolate, croscarmellose sodium.

4. Lubricant

- Reduces friction between tablet and die wall during compression and ejection.

- **Examples**: Magnesium stearate, stearic acid, talc.

5. Glidant

- Improves flow properties of powders or granules by reducing interparticle friction.
- **Examples**: Colloidal silicon dioxide, talc.

6. Antiadherent

- Prevents sticking of powder or granules to tablet punches.
- **Examples**: Magnesium stearate, talc.

7. Colorants, Flavors, and Sweeteners

- Enhance appearance and patient acceptance.

Ideal Properties of Excipients:

1. **Inert and Stable:** Chemically non-reactive, physically and thermally stable.
2. **Safe and Non-toxic:** Suitable for human consumption.
3. **Compatible:** Should not interfere with drug activity or stability.
4. **Effective Functionality:** Performs intended role (binder, filler, etc.).
5. **Economical and Easy to Process:** Cost-effective and supports manufacturing.
6. **Regulatory Compliance:** Meets pharmacopoeia standards.
7. **Biocompatible:** Supports drug absorption without affecting bioavailability.
8. **Aesthetic Enhancer:** Improves appearance, taste, or texture if needed.

Formulation of Tablets

- Formulating a tablet involves selecting appropriate APIs and excipients and determining their proportions to achieve desired tablet properties.

Steps involved in tablet formulation:

1. **Weighing:** Accurately measuring active and inactive ingredients.
2. **Mixing or Blending:** Homogenizing the ingredients.
3. **Granulation:** Improving flow properties and compressibility.
4. **Drying:** Removing moisture.
5. **Lubrication:** Adding lubricants and glidants.
6. **Compression:** Forming tablets using a tablet press.
7. **Coating (if required):** Applying protective layers for various purposes.

Types of Tablets and Their Formulation Considerations

A. Conventional Compressed Tablets

- These are the most basic form of tablets, intended for immediate release after ingestion.

Formulation Considerations:

- Requires proper flow properties and compressibility of powders.
- Disintegration within 15–30 minutes is ideal.
- Typically includes fillers, binders, disintegrants, and lubricants.

B. Effervescent Tablets

- These tablets contain acid and carbonate or bicarbonate components that react in the presence of water to release carbon dioxide, aiding in quick disintegration and dispersion.

Formulation Considerations:

- Contain citric acid and sodium bicarbonate.
- Moisture-sensitive; require special packaging (e.g., aluminum foil).
- May include sweeteners and flavoring agents.

C. Chewable Tablets

- Designed to be chewed rather than swallowed whole. Common in pediatric and geriatric populations.

Formulation Considerations:

- Pleasant taste and mouthfeel are essential.
- Require flavoring agents, sweeteners (e.g., mannitol, xylitol), and low compression force.

D. Sublingual and Buccal Tablets

- Placed under the tongue (sublingual) or in the cheek pouch (buccal) for rapid systemic absorption.

Formulation Considerations:

- Rapid disintegration and dissolution.
- Avoid first-pass metabolism.
- Include water-soluble drugs and mucoadhesive agents (in buccal tablets).

E. Enteric-Coated Tablets

- These are designed to resist disintegration in the acidic environment of the stomach but disintegrate in the alkaline pH of the intestines.

Formulation Considerations:

- Requires pH-sensitive polymer coatings (e.g., cellulose acetate phthalate).
- Protects acid-labile drugs or prevents gastric irritation.

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