INTRODUCTION TO DOSAGE FORMS
Dosage forms are the means by which drug molecules / APIs are delivered to sites of action within the body to produce optimum desired effects and minimum adverse effect.
NEED OF DOSAGE FORMS

- Provide safe and convenient delivery of accurate dosage.
  Example – Tablets, capsules, syrups
- Protection of a drug substances from atmospheric oxygen or moisture.
  Example – Coated capsules, sealed ampules
- Protection of a drug substances from gastric acid after oral administration.
  Example – Enteric coated tablets
- Conceal bitter taste, or odor of a drug substances.
  Example – Capsules, coated tablets, flavored syrups
- Provide liquid preparation of drug that insoluble or unstable in the desired vehicle. Example – Suspension
- Provide liquid dosage forms of substances soluble in desired vehicle. Example – Solution
- Provide optional drug action from topical administration sites.
  Example – Ointment, cream, ear and nasal preparations
- Provide for insertion of a drug into one of the body’s orifices.
  Example – Rectal and vaginal suppositories
- Provide extended drug action through controlled release mechanisms.
  Example – Controlled release tablets, capsules, suspensions
- Provide for the placement of drugs within body tissues.
  Example – Implants
- Provide for the optimal drug action through inhalation therapy.
  Example – Inhalants
CLASSIFICATION OF DOSAGE FORMS

Based on Route of Administration

- Oral
- Parenteral
- Topical
- Transdermal
- Respiratory/Inhaled
- Ophthalmic
- Rectal
- Vaginal
- Otic

Based on Physical Form

- Solid
- Semi-solid
- Liquid
- Gases
Based on Route of Administration

<table>
<thead>
<tr>
<th>Enteral Route</th>
<th>Parenteral (injections &amp; infusions)</th>
<th>Topical Route</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oral</strong></td>
<td>Tablets, Capsules, Syrups, Suspension, Emulsion etc. Dry Powder Inhaler (DPI), pressurized Metered Dose Inhaler (pMDI) – Nebulizer, Vaporizer</td>
<td><strong>Dermal</strong> Ointment, Liniment, Paste, Cream, Lotion, Lip balm, Medicated shampoo, Dermal patch</td>
</tr>
<tr>
<td>Sub-lingual &amp; Buccal</td>
<td>Orally Disintegrating Tablet (ODT), Lozenges, Chewing tablets, Mouthwash, Toothpaste, Ointment, Oral spray</td>
<td><strong>Mucosal</strong> Ear drops, Eye drops, Nasal spray, Ointment, Hydrogel, Nanosphere suspension, Mucoadhesive microdisc (microsphere tablet)</td>
</tr>
<tr>
<td>Rectal &amp; Vaginal</td>
<td>Ointment, Suppository, Enema, Nutrient enema</td>
<td><strong>Percutaneous</strong> Transdermal patch etc</td>
</tr>
</tbody>
</table>
## Based on Physical Form

### Solid Dosage Forms

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaped</td>
<td>Tablets, Capsules, Implants, Transdermal patches</td>
</tr>
<tr>
<td>Unshaped</td>
<td>Powders for external/internal use</td>
</tr>
</tbody>
</table>

### Semi-solid Dosage Forms

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaped</td>
<td>Suppositories (for rectal administration)</td>
</tr>
<tr>
<td></td>
<td>Pessaries (vaginal suppositories)</td>
</tr>
<tr>
<td>Unshaped</td>
<td>Gels, Creams, Ointments, Pastes</td>
</tr>
</tbody>
</table>

### Liquid Dosage Forms

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monophasic</td>
<td>Solutions (syrups, spirits, elixirs, tinctures)</td>
</tr>
<tr>
<td>Biphasic</td>
<td>Emulsions, Suspension</td>
</tr>
<tr>
<td>External Solutions</td>
<td>Lotions, Liniments, Collodions etc</td>
</tr>
</tbody>
</table>

### Gaseous Dosage Forms

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicinal Gases</td>
<td>Aerosols: Inhalation/volatile anesthetics</td>
</tr>
<tr>
<td>Aerodispersions</td>
<td>Antiasthmatics sprays</td>
</tr>
</tbody>
</table>
CLASSIFICATION OF SOLIDS

SOLID ORAL DOSAGE FORMS

- Tablets
- Capsules
- Powder
- Granules
Monophasic Liquid Dosage Forms

Liquid for External administration
- Liquids used in Mouth
  - Gargles
  - Mouthwashes
  - Throat paints
- Liquid applied to the skin
  - Lotions
  - Liniments
  - Collodions
  - Paints
- Liquids instilled into Body Cavities
  - Eye Drops
  - Ear Drops
  - Nasal Drops
  - Douches
  - Enemas

Liquid for Internal administration
- Syrups
- Mixtures
- Elixirs
- Linctuses

CLASSIFICATION OF LIQUIDS
Biphasic Liquid Dosage Forms

Solids in Liquid
- Oral
  - SUSPENSION
- Parenteral
- External
- LOTION

Liquid in Liquid
- Oral
  - EMULSION
- External
  - LINIMENTS
SEMI-SOLID DOSAGE FORMS

Cream

Paste

SEMI-SOLID

Gel

Ointment
INHALED DOSAGE FORMS

Inhalation

Lung
- Gases
  - Vapors
    - Medical gases
  - Liquids
    - Solution
      - Suspension
        - Emulsion
    - Aerosols
    - Solids
      - DPIs

Nose
- Liquids
- Aerosols
- Solids
  - Semi-solids
    - Gels
  - Powders for inhalation
- MDIs
- MDIs
- Other pressure systems
RECTAL & VAGINAL DOSAGE FORMS

Suppository

RECTAL & VAGINAL

Pessaries

Enema
1 - TABLET

- A tablet is unit dose of one or more medicament. Prepare by compression or mould method.

- Common excipients used in tablet are:
  - **Diluents** – Provide bulkiness of tablet.
  - **Disintegrants** – To ensure that the tablet breaks up in the digestive tract.
  - **Binder** – Important for granulation of powder.
  - **Glidants and Lubricants** – Provide good flow and ensure efficient tabletting.
  - **Sweeteners and Flavors** – To mask the taste of APIs.
  - **Pigments** – To mask uncoated tablets visually attractive.

- A coating may be applied to mask taste, smooth tablet for easy swallow, extending shelf life, and prevent gastric degradation of drug.
2 - BUCCAL AND SUBLINGUAL TABLET

- **Buccal tablets** placing between the gum and the cheek.
- **Sublingual tablets** placing under the tongue.
- Medicaments of both systems rapidly dissolve in mouth and absorbed through the mucous membrane of mouth.
- Drug reaches in systemic circulation without affecting by gastric juices and metabolizing enzymes of the liver.
- Examples – **Vasodilators, Steroidal hormones.**
3 - EFFERVESCENT TABLET

- Effervescent tablets are uncoated and generally contain acid substances (citric and tartaric acids) and carbonates or bicarbonates, which react rapidly in presence of water and release carbon dioxide.

- They are intended to be dissolved or dispersed in water before use, it provide:
  - Tablet immediately dissolve or dispersed
  - Pleasant taste of carbonated drink

4 - CHEWABLE TABLET

- They are tablets that chewed prior to swallowing.
- They are designed for administration to children e.g. vitamin products.
5 - CAPSULES

- Solid unit dosage form that contain a solid, semi-solid, and liquid fill and a gelatin shell.
- Common excipients used in capsules are:
  - **Gelatin** – Commonly used as gelling agent.
  - **Plasticizers** – To ensure elasticity or mechanical stability.
  - **Additional Additives** – Preservative, coloring and opacifying agents.
- They are mainly two types are:
  - **Hard gelatin capsules** used for dry powder ingredients.
  - **Soft gelatin capsules** used for semi-solid and for active ingredients that are dissolved or suspended in oil.
6 - LOZENGE

- It is a solid preparation used to medicate the mouth and throat for the slow administration of indigestion or cough remedies.
- It consisting of sugar and gum, the latter giving strength and cohesiveness to the lozenge and facilitating slow release of the medicament.

7 - PASTILLES

- It is a solid medicated pill or candy preparation designed to dissolve slowly in the mouth.
- They are softer than lozenge and their base are glycerol, gelatin, acacia and sugar.
8 - DENTAL CONES

- A tablet from intended to be placed in the empty socket following a tooth extraction, for preventing the local multiplication of pathogenic bacteria associated with tooth extractions.
- These tablets contain an excipients like – lactose, sodium bicarbonate, and sodium chloride etc.
- Cones may contain an antibiotic or antiseptic.

9 - PILLS

- It is a solid oral dosage form which consists of spherical masses prepared from one or more APIs with inert excipients.
- Pills are now rarely used.
10 – ORAL GRANULES

- They are consisting of solid, dry aggregates of powder particles with irregular shape often supplied in single-dose sachets.
- Some granules are placed under the tongue and swallowed with water and other are intended to be dissolved in water before taking.
- Effervescent granules evolve carbon dioxide when added to water.

11 – ORAL POWDER

- Bulk Powders are multi dose preparations consisting of solid, loose, dry particles of varying degrees of fineness.
- Contain one or more active ingredients, with or without excipients and, if necessary, coloring matter and flavoring substances.
- Usually contain non-potent medicaments such as antacids since the patient measures a dose by volume using a 5 ml medicine spoon.
LIQUID DOSAGE FORMS

1 – ORAL SOLUTION
➢ Oral solutions are clear Liquid preparations for oral use containing one or more active ingredients dissolved in a suitable vehicle.

2 – ORAL EMULSION
➢ Oral emulsions are stabilized oil-in-water dispersions, either or both phases of which may contain dissolved solids either oil is dispersed in finely divided form in water or vice versa.

3 – ORAL SUSPENSION
➢ Biphasic liquid preparations for oral use containing one or more active ingredients suspended in a suitable vehicle. It sediment which is readily dispersed on shaking to give a uniform suspension which remains sufficiently stable to enable the correct dose to be delivered.
4 – SYRUP

- It is a concentrated aqueous solution of a sugar, usually sucrose to which medicaments are added.
- Flavored syrups are a convenient form of masking disagreeable tastes.

5 – ELIXIR

- It is pleasantly flavored clear liquid oral preparation of potent or nauseous drugs.
- The vehicle may contain a high proportion of ethanol or sucrose together with antimicrobial preservatives which confers the stability of the preparation.

6 – MOUTHWASHES

- These are similar to gargles but are used for oral hygiene and to treat infections of the mouth.
7 – LINCTUSES

- It is viscous, liquid oral preparations that are usually prescribed for the relief of cough. It contain high proportion of syrup and glycerol which have a demulcent effect on the membranes of the throat.

- The dose volume is small (5ml) and, to prolong the demulcent action, they should be taken undiluted.

8 – ORAL DROPS

- Oral drops are liquid preparations for oral use that are intended to be administered in small volumes with the aid of a suitable measuring device.

- They may be solutions, suspensions or emulsions.
9 – GARGLES

- They are prepared in a concentrated solution with directions for the patient to dilute with warm water before use.
- They are aqueous solutions used in the prevention or treatment of throat infections.

10 – LOTIONS

- It is mono-phasic liquid preparations (aqueous) for external application without friction either dabbed on the skin or applied on a suitable dressing and covered with a water proof dressing to reduce evaporation.

11 – NASAL DROPS & SPRAYS

- Drugs in aqueous solution may be instilled into the nose from a dropper or from a plastic squeeze bottle.
- Used for local effect, e.g. antihistamine, decongestant.
11 – COLLODION

- Collodion is a solution of nitro cellulose in ether or acetone, some times with the addition of alcohols.
- As the solvent evaporates, it dries to a celluloid-like film.
- It is highly flammable.
- **Compound Wart Remover** consists of acetic acid and salicylic acid in an acetone collodion base used in treatment of warts by Keratolysis.

12 – PAINTS

- Paints are mono-phasic liquids for application to the skin or mucous membranes.
- **Skin paints** contain volatile solvent that evaporates quickly to leave a dry resinous film of medicament.
- **Throat paints** are more viscous due to a high content of glycerol that designed to prolong contact of the medicament with the affected site.
An injection is an infusion method of putting liquid into the body, usually with a hollow needle and a syringe which is pierced through the skin.

**Intravenous Injection**
- It is a liquid administered directly into the bloodstream via a vein.
- It is advantageous when a rapid onset of action is needed.

**Intramuscular Injection**
- It is the injection of APIs directly into a muscle.
- Intramuscular injections are often given in the deltoid, vastus lateralis, ventrogluteal and dorsogluteal muscles.

**Subcutaneous Injection**
- It is injecting into the subcutis, the layer of skin directly below the dermis and epidermis.
- It is highly effective in administering vaccines and insulin.
1 – OINTMENTS

- Ointments are semi-solid, greasy preparations for application to the skin, rectum or nasal mucosa.
- Base is usually anhydrous and immiscible with skin secretions.
- Ointments may be used as emollients or dissolved medicaments to the skin.

2 – GELS

- In gel a liquid phase is constrained within a 3-D polymeric matrix (consisting of natural or synthetic gum) having a high degree of physical or chemical cross-linking.
- It is used for medication, lubrication and some miscellaneous applications like carrier for sppermicidal agents to be used intra vaginally.
3 – CREAMS

**Oil-in-water (O/W)**
- It composed of small droplets of oil dispersed in a continuous aqueous phase.
- Less greasy and more easily washed off using water.

**Water-in-oil (W/O)**
- It composed of small droplets of water dispersed in a continuous oily phase.
- More difficult to handle but used for hydrophobic drug preparation.
- Reduces water loss from the stratum corneum maintain moisture of skin.
4 – PASTES

- Pastes are basically ointments into which a high percentage of insoluble solid has been added.
- The extra ordinary amount of particulate matter stiffens the system.
- It provide less heating and penetration than ointment.
- It make good protective barrier when placed on the skin, the solid they contain can absorb and thereby neutralize certain noxious chemicals before they ever reach the skin.

- **Greasy Pastes**
  - Leaser’s paste

- **Non-greasy Paste**
  - Bassorin paste
1 – INHALER

- Inhalers are solutions, suspensions or emulsion of drugs in a mixture of inert propellants.

- Release of a dose of the medicament under pressure in an aerosol dispenser in the form of droplets of 50 um diameter or less from the container through a spring loaded valve incorporating a metering device.

- It is commonly used in the treatment of asthma and other respiratory problems.
2 – NEBULIZER OR ATOMIZER

- It is commonly used in treating asthma, and other respiratory diseases.
- It is a device used to administer medication in forms of a liquid mist to the air ways.
- It pumps air or oxygen through a liquid medicine to turn it into a vapor, which is then inhaled by the patient.
- Generally prefer to inhalers for patients, due to advantages such as:
  1- Cheaper
  2  More portable
  3  Less risk of side effects.
- For that reason, are usually reserved only for serious cases of respiratory disease or severe attacks.
1 – SUPPOSITORY

- It is a semi solid medicated mass, usually cone shaped, that is inserted either into the rectum, vagina where it melts at body temperature.

2 – ENEMA

- An enema is the procedure of introducing liquids into the rectum and colon via the anus.

**Evacuant Enema**
- Used as a bowel stimulant to treat constipation.
- Their volume up to 2 liters.
- Warmed to body temperature.
- Example - soft soap enema & Magnesium sulphate enema

**Retention Enema**
- Their volume does not exceed 100 ml.
- No warming needed.
- Example – barium enema & nutrient enema.
3 – PESSARY

- Pessaries are solid medicated preparations designed for insertion into the vagina where they melt or dissolve.

**Moulded Pessaries**
- Cone shape and prepared by molded method.

**Compressed Pessaries**
- Prepare by compression as similar manner to oral tablets.
- Available in different shape.

**Vaginal Capsules**
- Prepare same as soft gelatin capsules and various size and shape.
REFERENCES

- www.fda.gov
THANK YOU