PHAR1921: PHARMACEUTICS AND PHARMACY PRACTICE

MODULE 1: PHARMACEUTICS

1.0 PHARMACEUTICAL DOSAGE FORMS

LEARNING OBJECTIVES

- Understand, and be able to use, pharmacy terms relating to the formulation and use of different dosage forms.
- Describe the major types of dosage forms.
- Understand the reasons why a medicine is supplied as a particular type of dosage form.
- Understand the identifying markings and naming conventions used for different dosage forms.
- List general advantages and disadvantages of different dosage forms.

Pharmaceutical Dosage Form: medicine containing an **active pharmaceutical ingredient** and **excipients** to deliver a **specific dose of drug** in a specific manner to patients. Important for accurate dosage delivery, protection of drug substance, improved patient compliance, controlled drug release, targeted drug delivery and versatility in administration.

- ➔ Active Pharmaceutical Ingredient (API): actual drug molecule (can contain more than one)
- ➔ Excipients: pharmacologically inactive ingredients used to enhance the performance of a medicine

Classification of Dosage Forms:

- ➔ Site/route of administration (e.g. injection vs oral)
- ➔ Physical appearance (e.g. tablet vs capsule)
- ➔ Composition or special features (e.g. slow release or controlled release)
- ➔ Type of action (e.g. local vs system)

Types of dosage forms:

Oral Solid dosage forms: identified by form, shape, colour, markings and scoring.

- **Tablets**: Solid, compressed units containing the drug and excipients that disintegrate when in contact with saliva, stomach or intestinal fluids (includes sublingual wafers)
  - disintegration → dissolution → absorption → action
  - Effervescent tablets: rapid action by dissolving or disintegrate → moisture sensitive, harder to manufacture and store. Disintegration and dissolution occurs simultaneously.
- **Capsules**: Gelatin-enclosed drugs in powder, granule, or liquid form.
- **Lozenges**: Syrup-sugar based → must be heat resistant, designed to be sucked
- **Powders and granules**: can be taken by mouth, often mixed with water or another liquid (e.g. osmolax)
- **Gum:** fast acting application such as nicotine replacement therapy

Ingredients of Solid Oral Dosage Form: API, bulking agents (give tablet size e.g. lactose), binding agents (hold API and excipients), lubricants, glidants (powder flow e.g. talc), disintegrant, dyes to colour.

- ➔ Advantages: convenience of use, accurate dosage, cost effective
- ➔ Disadvantages: swallowing difficulties, variable absorption, delayed onset of action

Liquid and Semi-Solid dosage forms:

- Suspensions: Solid drug particles dispersed in a liquid medium.
  - Elixirs: liquid solutions of suspensions that contain a medicinal substance dissolved in a solvent
- Syrups, tonics (water based)

Advantages: suitable for all ages, add sweet taking excipients, dosage flexibility

Disadvantages: inaccurate dose when measuring, solubility

- **Solutions:** Homogeneous mixtures of the drug in a liquid medium.
  - **Injectables**: Sterile preparations for administration via injection, must be sterile and isotonic. There are four types: intramuscular (muscle 90 degrees), subcutaneous (subcutaneous tissue), intravenous

(vein) and intradermal (between dermis and epidermis). Types of needles include hypodermic needle + syringe, bifurcated needle, microneedle and nanoneedles.

- Advantages: systemic or localised drug delivery, rapid action
- Disadvantages: pain/swelling/discomfort for patients, injuries, administered by medical staff

Topical Dosage Forms: designed for application to body surfaces such as skin, eyes or mucous membranes to exert a local effect at the site of application. This includes creams, ointments, lotions, pastes, patches, implants, paints, liniments, solutions, gels, irrigation, powders, foams and shampoos.

- **Ocular dosage forms:** isotonic ointments or aqueous solutions administered to eye for localised effects → conjunctivitis, glaucoma, eye irritation, anaesthesia
  - In situ gels: liquid formation that under gelation upon contact with ocular surface
  - Ocular Inserts: solid/semi-solid devices placed on conjunctival sac
  - Drug-eluting contact lenses

  Advantages: easy use, localised treatment and prevention of systemic side effects
  Disadvantages: dose inaccuracy, need sterility and isotonicity, local irritation/allergic reactions
- **Dermal Dosage forms:** designed for application directly to the skin to exert a local effect
  - Creams: viscous, semisolid preparations for external application (either water or oil miscible)
    - Emulsions: Mixtures of two immiscible liquids stabilised by an emulsifying agent.
  - Lotions: liquids/semi-solid formulations containing aqueous, ethanolic or emulsified vehicles possessing antiseptic, analgesic, soothing or protective properties.
  - Ointment: Semisolid, fatty preparations, usually solutions or dispersions for application to the skin or mucous membranes →> emollient, protective properties
  - Dermal patches: Adhesive patches that deliver medication through the skin for systemic or local effects → fast acting or sustained/slow release
  - Dermal implants: Used for slow release of drugs over extended periods, placed under the skin via a needle (e.g. contraception)

  Advantages: easy application, non-sterile
  Disadvantages: inaccurate dose, not all drug absorbed through the skin

Respiratory/Pulmonary Dosage Forms: drugs delivered to the lungs by solid particles or liquid droplets, used for localised treatment (asthma, COPD) or systemic delivery (anaesthetics pre-surgery)

- Pressurised metered dose inhaler: holds micro ionised drug suspension or solution, high vapour pressure propellant supplies energy for dispersion
  - Spacer: improves drug delivery, decreases oral deposition, enhanced particle size distribution, reduced coordination requirement, consistent dosing, reduced propellant impact
- Nebulisers: medical device that converts liquid medication into a fine mist or aerosol (gaseous suspensions) for inhalation
  - Jet: compressed air to aerosolized medication
  - Ultrasonic: high frequency sound waves to create mist
  - Mesh: tiny holes to push medicine through

  Advantages: fast action, lower dosage, efficient absorption
  Disadvantages: inconsistent delivery, local side effects, device dependency, limited drug types

Suppository Dosage Forms: solid dosage form designed for insertion into body cavities → designed to dissolve or melt, deliver locally or systemically, cone/torpedo shaped. This includes rectal, vaginal (pessaries), urethra bougies, nasal and ear cones.
Advantages: unconscious/vomiting patients, avoid gastric irritation, quick onset
Disadvantages: erratic absorption, patient acceptability