

ROUTES OF DRUG ADMINISTRATION

Route

A. Local routes

1. Topical
2. Deeper tissues.
3. Arterial supply.

Systemic Routes

1. Oral
2. Parenteral
3. Sublingual
4. Rectal
5. Inhalational
6. Nasal

Which route to select?

Factors governing choice of route :

- Site of desired action.
- Drug related factors.
 - Physical properties
 - Chemical properties
 - Rate & extent of absorption.
- Patient factors.
 - Effect of digestive juices.
 - First pass metabolism
 - Availability of dosage needed
 - Condition of patient
 - Rapidity of response needed

A. Local Routes

- localized lesions
- feasible site
- Minimal systemic absorption
- high concentrations at desired site.

① Topical

- External applications to the surface - localized action.

• Skin/Mucosa - lotion, cream, ointment.

• Eye/Ear - Drops

• Oropharynx - lozenges.

• Vagina - pessary.

• Rectum - Suppository.

• GI Mucosa - Vancomycin, Sucralfate.

• Bronchi - Salbutamol, Cromolyn sodium.

② Deeper tissues

Deep areas approached through syringe, needle.

• Intra articular injection
eg: Hydrocortisone acetate.

• Intrathecal injection.
eg: Lidocaine.

• Retrobulbar injection.
eg: Hydrocortisone acetate.

3. Arterial supply
could intra arterial injections.

- contras media - angiography
- Anticancer drugs for limb malignancies - Brachial / femoral artery.

B. Systemic Route

Intended to be
→ absorbed into the blood stream

- distributed all over, including the site of action through circulation

① Oral route

oldest & most common dosage forms:

Solid :- tablets, capsules, powders.

liquid - syrups, elixirs, mixtures.

• Advantages of oral route

- Safer
- more convenient
- does not need assistance
- non invasive
- need not be sterile
- cheaper

• Disadvantages

- slower action - not suitable for emergencies

→ Unpalatable drugs - difficult to administer

- Nausea, Vomiting
- not suitable for unconscious / vomiting patient
- variable, erratic absorption
- Destroyed by digestive juices.
- First pass metabolism

② Sublingual / Buccal

- Tablet placed under the tongue
- Coughed and spread over buccal mucosa.

• Advantages

- Rapid absorption
- liver is bypassed
- can spit out the drug after desired action.

• Disadvantages

- Only lipid soluble and non-irritating drugs can be so administered

eg: GTN, Buprenorphine, Desamino - oxytocin.

③ Rectal

- Drugs put in rectum.
- eg: Suppository - paracetamol.

• Advantages

- Unpalatable drugs can be given
- 50% - External hemorrhoidal vein - bypass liver.

(2)

→ can be used in unconscious patient

→ Recurrent vomiting.

• Disadvantages

→ Irritant drugs - rectal inflammation.

→ Absorption → slow, irregular and unpredictable.

→ Inconvenient, embarrassing

Drugs - GTN, Nitroline, Eskadiol, Fentanyl etc.

• Advantages

→ slow and steady absorption

→ smooth, plasma conc. of drug without fluctuations

→ bypasses 1st pass metabolism

→ duration 1-3 days.

→ Minimal inter-individual variations

→ More convenient.

④ Cutaneous

→ Highly lipid soluble drug.

→ Applied over skin

→ slow and prolonged absorption

lubbing, occlusive dressing, oily base.

→ Transdermal drug delivery systems.

• Disadvantages

→ local irritation

→ Expensive

→ slow onset of action

⑤ Inhalation

→ Volatile liquids, gases

→ Absorption from alveolar surface

eg: general anaesthetics.

→ Rapid action.

→ Controlled administration.

→ Amount to moment adjustment possible.

→ Bypasses 1st pass metabolism.

→ Irritant vapours - inflammation of respiratory tract.

Nasal.

→ absorption through mucous membrane of nose.

Nasal spray - GnRH agonists, Desmopressin

- drug is delivered at the skin surface by diffusion for percutaneous absorption into the circulation.

- Rate of drug delivery < speeded rate of absorption from the skin

Sites - Chest, Abdomen, Upper arm, lower back.

- Bypass liver
- convenient

⑥ Parenteral

- Par - Beyond
- Enteral - Intestinal
- Administration by injection

in Intravenous
Intramuscular
Subcutaneous
Intradermal

Advantages

- rapid onset → suitable in emergencies.
- No gastric irritation.
- Can be used in unconscious, uncooperative / vomiting patients.
- Bypasses 1st pass metabolism

Disadvantages:

- preparation needs to be sterile
- costly
- Invasive, painful
- presence of antihyposens person is needed
- Tissue injury
- Risky

Intravenous

- Bolus / slow infusion
- superficial veins
- drug directly reaches bloodstream.
- Immediate effect

- Thrombophlebitis of injected vein
- Nerve of adjoining nerve
- Extravasation
- Only aqueous solutions
- Not suspensions.
- Bioavailability - 100%

Advantages

- rapid action
- potent drugs
- large volume
- titration of dose with response.

Disadvantages

- Thrombophlebitis
- Air embolism
- Extravasation - Nerve
- Risky

Intramuscular

- Drug is injected into one of the large skeletal muscle
- Deltoid, Triceps, Gluteus maximus etc.
- Absorbed from muscle vasculature
- Less painful.
- Self infection is impractical
- deep penetration needed

eg: Streptomycin, vit K.

- Depot preparations (only ~~solid~~ solution, aqueous)

Suspensions can be given

- Avoid in anticoagulant patients - local hematomata

Subcutaneous

- Deposited in ~~loose~~ loose subcutaneous tissue
- less vascular
- slower absorption, compared to intramuscular
- only small volumes
- self infection possible
- Avoid in shock patients

eg: Insulin, heparin

Special forms -

Dermogel, pellets, implants

Dermogel

- gun like device
- Micro fine orifice
- High velocity jet of drug solution.
- deposited in subcutaneous tissue.
- Mass inoculation of vaccines

Pellets

- drug in form of solid pellet
- introduced with a trocar and cannula.

eg: Testosterone, DOCA.

Implants

- Biodegradable / Non biodegradable
- Drugs packed in tubes / capsules
- Implanted under the skin
- eg: Norplant → non biodegradable.

Intradermal Injection

Drugs injected into skin raising a bleb.

eg: BCG vaccination, sensitivity testing