

Classifying Routes of Administration

➤ Where effects are seen

➤ *Systemic*

➤ *Local*

➤ Access to blood

➤ *Intra-vascular*

➤ *Extra-vascular*

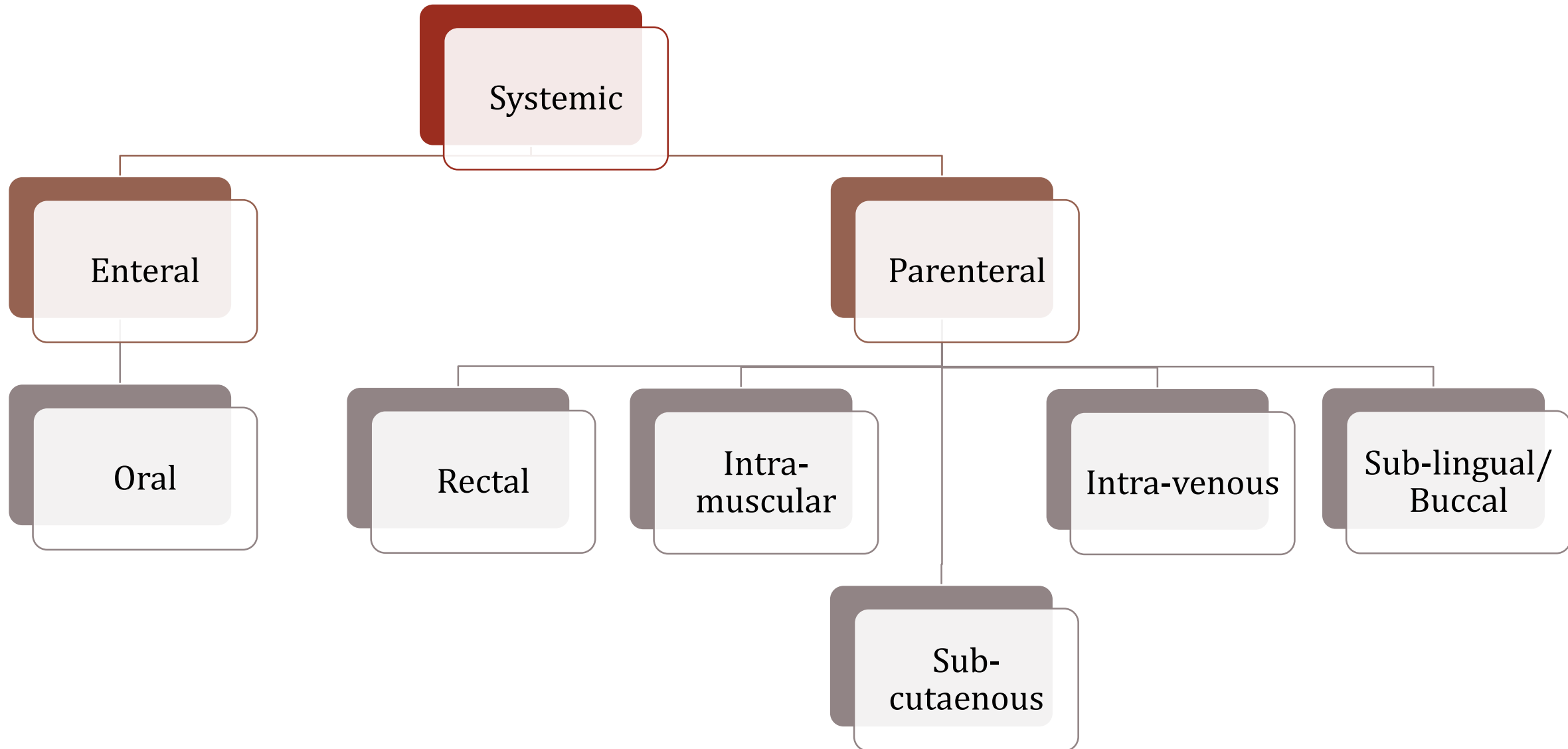
➤ Location at which substance is applied

➤ Target of action

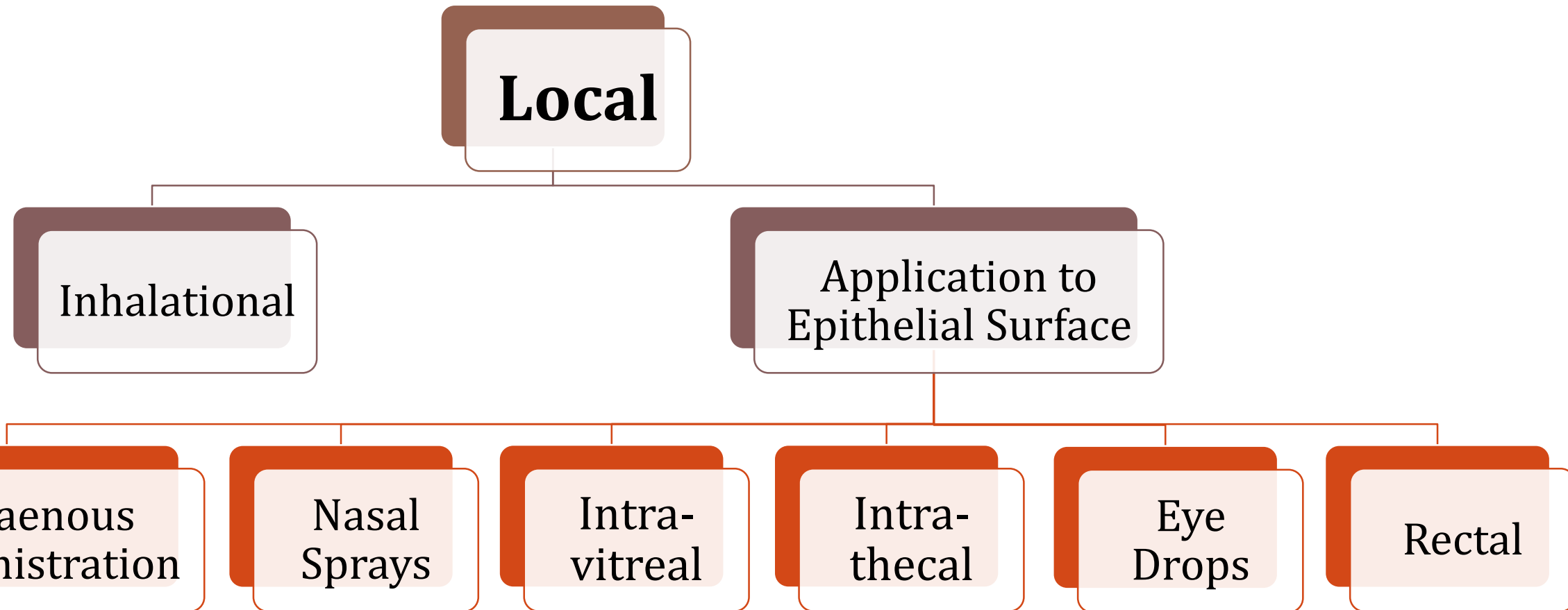


**Fundamental
Reason: Bioavailability**

Route of administration on the basis of exposure of body



Route of administration on the basis of exposure of body



Oral Administration

- Absorption mainly takes place from the intestine.
- Drugs administered orally that act locally:
 - *Vancomycin, Mesalazine and Olsalazine*
- Factors Affecting Absorption on Oral Administration:
 - *Physiological*
 - *Drug related*



Oral Administration of Drugs



ADVANTAGES

- Safe
- Convenient
- Economical
- Usually good absorption
- No need for sterilization

DISADVANTAGES

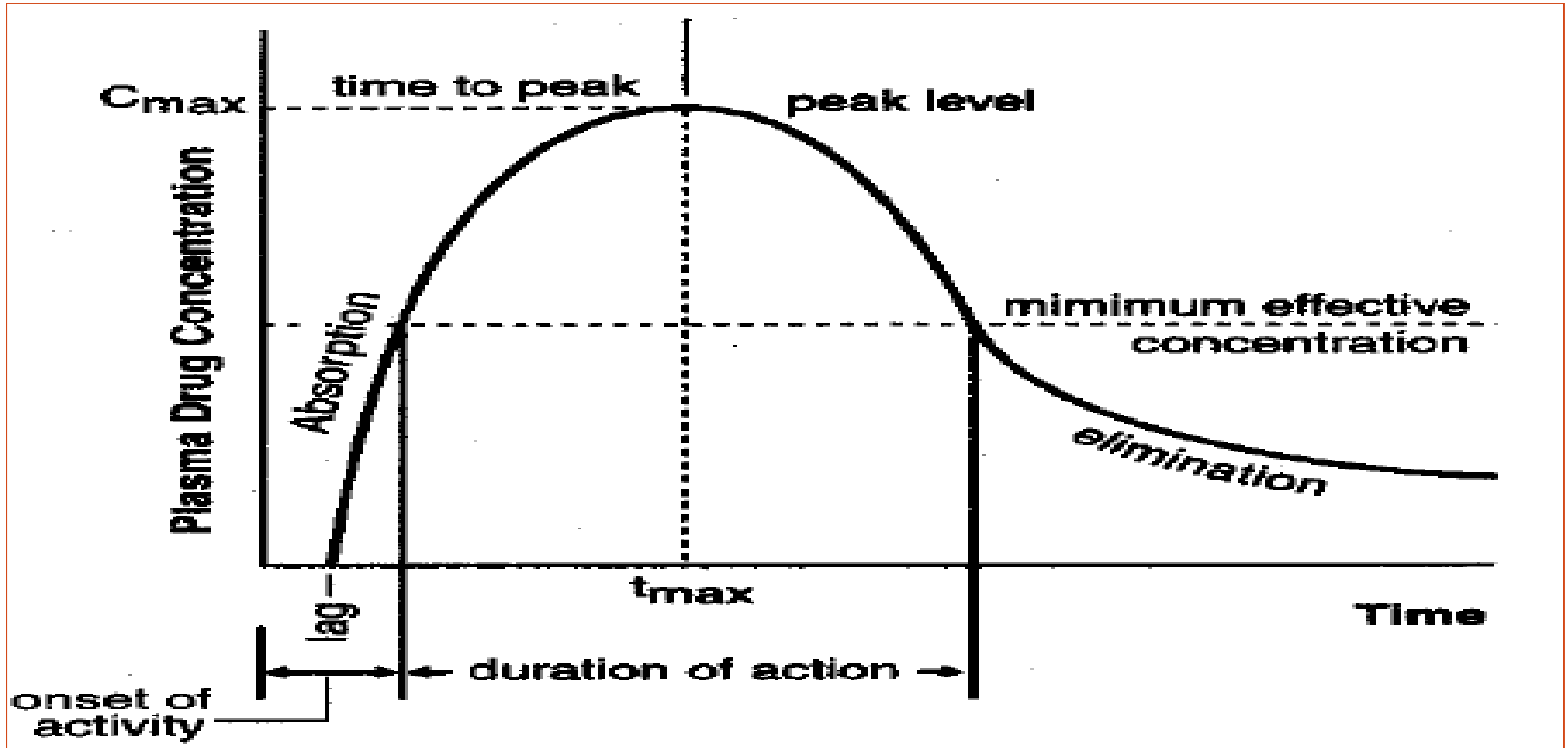
- Cannot be used uncompliant patients
- Irritable and unpalatable drugs
- Local degradation
- Slow absorption and action
- First-pass effect
- Interactions

Bioavailability and Bioequivalence



BIOAVAILABILITY

- Indicates the fraction (F) of an orally administered dose that reaches the systemic circulation as intact drug
- Depends on:
 - *Drug preparation*
 - *Host factors*
- Bioavailability of the same preparation can vary.



Bioavailability and Bioequivalence



BIOEQUIVALENCE

- Bioavailability + rate of absorption = Bioequivalence
- Includes:
 - *Maximum concentration achieved C_{max}*
 - *Time taken from dosing to reach maximum concentration, t_{max}*
 - *Area Under Curve $AUC_{0-\infty}$*
- Values of each parameters must be between 80% and 125%

Rectal Administration of Drugs

- Drugs that are administered rectally as a suppository.
- Can serve as local as well as systemic route of administration of drugs.
- Unreliable absorption
- Preferable in patients who are vomiting, post-operative, difficult to establish intravenous access (child having seizures)



Rectal Administration of Drugs



ADVANTAGES

- Used in children
- Little or no first pass effect
- Used in vomiting or unconscious
- Higher concentrations rapidly achieved

DISADVANTAGES

- Inconvenient
- Absorption is slow and erratic
- Irritation or inflammation of rectal mucosa can occur

Sublingual and Buccal Administration of Drugs



- When rapid response is required
- Drug unstable at gastric pH
- Drug rapidly metabolised by the liver
- Absorbed drugs directly reach systemic circulation, bypassing portal circulation, hence escapes first pass metabolism.

Sublingual and Buccal Administration of Drugs



ADVANTAGES

- Drug absorption is quick
- Quick termination
- First-pass avoided
- Can be self administered
- Economical

DISADVANTAGES

- Unpalatable & bitter drugs
- Irritation of oral mucosa
- Large quantities not given
- Few drugs are absorbed

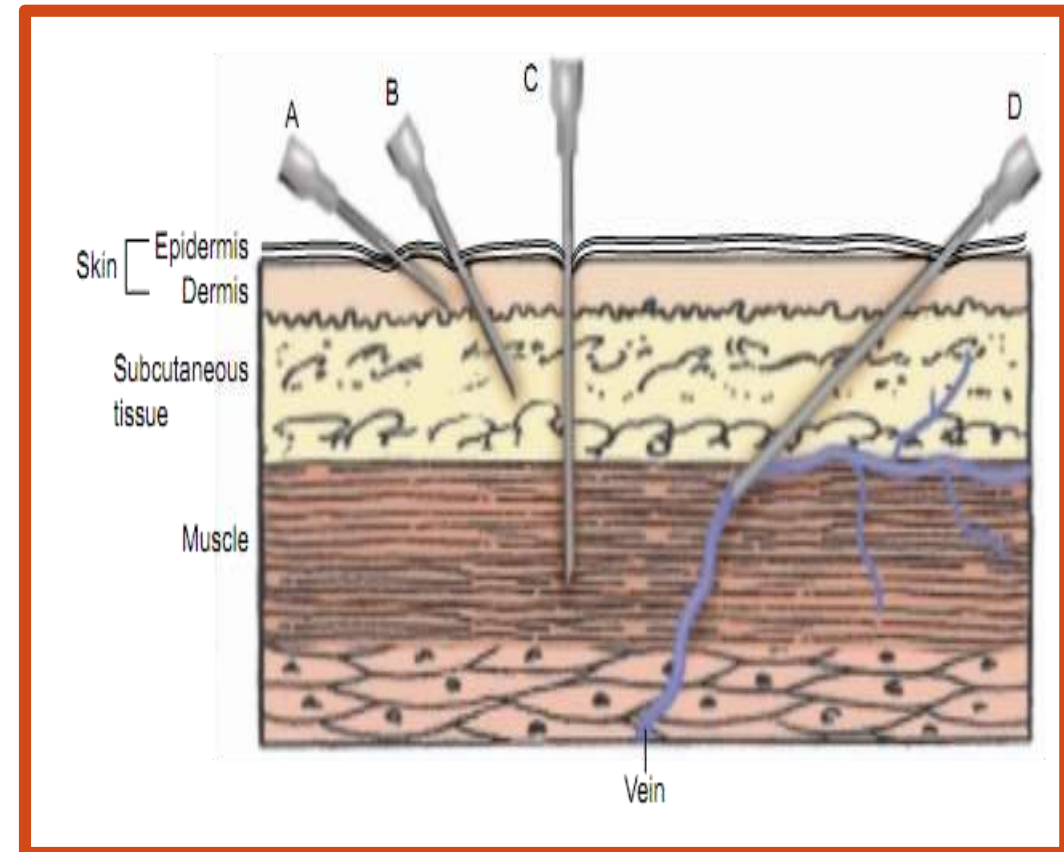
Parenteral Route of Drug Administration

A) Intradermal

B) Subcutaneous (SC)

C) Intramuscular (IM)

D) Intravascular (IV)



Intravenous Administration of Drugs



- Fastest route of administration of drugs
- Peak concentration reaching tissues depends on rate of administration
- Bolus dosing
- Infusion dosing



Intravenous Administration of Drugs



ADVANTAGES

Most common route for drugs not absorbed orally.

Avoids first-pass metabolism; absorption bypassed

Permits a rapid effect and a maximal degree of control over the circulating levels of the drug. Titration of dose with response.

Large quantities can be given

DISADVANTAGES

Cannot be easily removed

May induce hemolysis or cause other adverse reactions by the too-rapid delivery of high concentrations of drug

Thrombophlebitis of vein and necrosis of adjoining tissue if extravasation occurs

Intramuscular and Subcutaneous Administration of Drugs

- Large skeletal muscle are used for intra-muscular administration
- Subcutaneous Administration: drug is deposited in loose subcutaneous tissue
- Faster absorption than oral administration
- Rate limiting factors:
 - *Diffusion through the tissue*
 - *Removal by local blood flow*



Intramuscular Administration of Drugs

ADVANTAGES

- Absorption reasonably uniform
- Rapid onset of action
- Mild irritants can be given
- First pass avoided, Gastric factors avoided

DISADVANTAGES

- Only up to 10ml drug given
- Local pain and abscess, infection
- Expensive
- Nerve damage
- Local hematoma can occur in anticoagulant treated pt.

Subcutaneous Administration of Drugs

ADVANTAGES

- Less blood supply: slow absorption
- Depot preparation can be used
- Risk associated with intravascular injection avoided

DISADVANTAGES

- Should be avoided in shock patient
- Only small volume can be injected

Transdermal Route of Drug Administration



- Achieves systemic effects by application of drugs to the skin
- Rate of absorption determined by drug factors and site of application
- Slow effect (prolonged drug action)
- First pass effect avoided
- Absorption- increase by oily base, occlusive dressing, rubbing preparation

Local Route of Drug Administration

Routes of Drug Administration for MBBS 1st Year

Local Application: Application to Epithelial Surface

Cutaenous Adminstration:

Usually absorption poor over intact skin.

Advantages:

Steady rate of drug delivery

Pre Systemic metabolism avoided

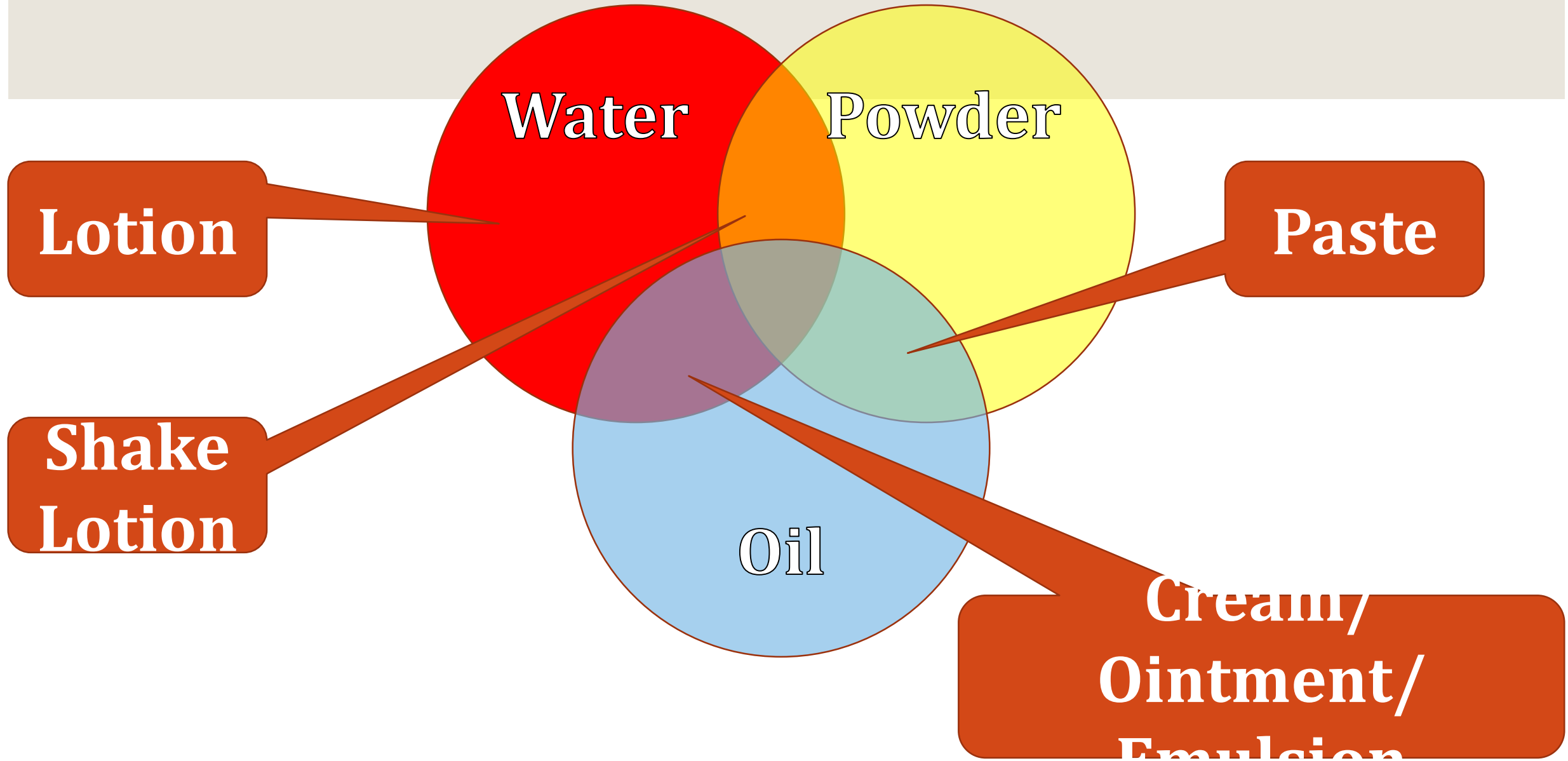
Disadvantages:

Only applicable for Lipid soluble drugs

Relatively Expensive



Different Formulations of Topical Preparation



Local Application: Application to Epithelial Surface

- Eye/Ear Drops:
- Eye Drops: Absorption through conjunctival sac epithelium
- Ear Drops: Absorption through epithelial lining of External ear
- Relatively brief contact time with absorbing surface
- Sterile; require aseptic handling
- Desirable for local effects: lacks systemic reactions.



Administration By Inhalation

- Systemic Administration of drugs
 - *Large surface area and large blood flow: rapid exchange of drugs, possible to adjust plasma levels rapidly*
 - *Nasal Sprays*
- Local Administration of drugs

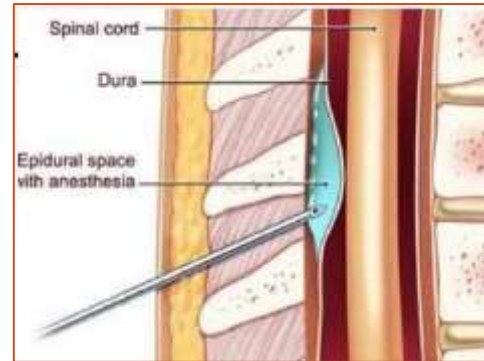
Local Application: Application to Epithelial Surface



Intrathecal and Intravitreal Administration of Drugs

Intrathecal administration

- Injection into sub-arachnoid space
- Minimises systemic adverse effects



Intravitreal administration

- Administered by Ophthalmologist
- Ranibizumab for wet age-related macular degeneration.



Topical Therapy: Pros and Cons

Advantages

Delivery onto the target organ at an optimal concentration

Rapid onset of action

Systemic effects are less

Disadvantages

Time consuming

Depends largely on patient's compliance and patience

More expensive

Other Topical Preparations

Medicated plaster,
dressings, strips

Suppository

Douche

Medicated Vaginal Rings

Intra-uterine devices

Intra-nasal drug delivery

Inhaled Drug Delivery

Dosage forms for Various Topical Routes

- Mouth and pharynx: Paints, lozenges, mouth washes, gargles.
- Anal canal: As ointment, suppositories.
- Gastrointestinal tract: As non-absorbable drugs given orally e.g. aluminium hydroxide, kaolin, neomycin.
- Bronchi and lungs: As inhalations, aerosols (nebulised solution or fine powder)- e.g. salbutamol, cromolyn sodium

Dosage forms for Various Topical Routes

- Eyes, ears and nose: As drops, ointments, irrigation, nasal spray.
- Urethra: As jellies e.g. lidocaine, irrigating solutions.
- Vagina: As pessaries, vaginal tablets, inserts, cream, powders, douches

That will be all for today!

➤ Any Queries?

➤ Thank you!