ABSORPTION OF DRUGS FROM NON PER OS EXTRA VASCULAR ROUTES

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Introduction[1]

- NON PER OS Means other than oral routes which by passes the GIT and reaches to systemic circulation.
- One of the major advantages of administering drugs by non-invasive transmucosal (& transdermal) routes such as nasal, buccal, rectal, etc. is that greater systemic availability is attainable

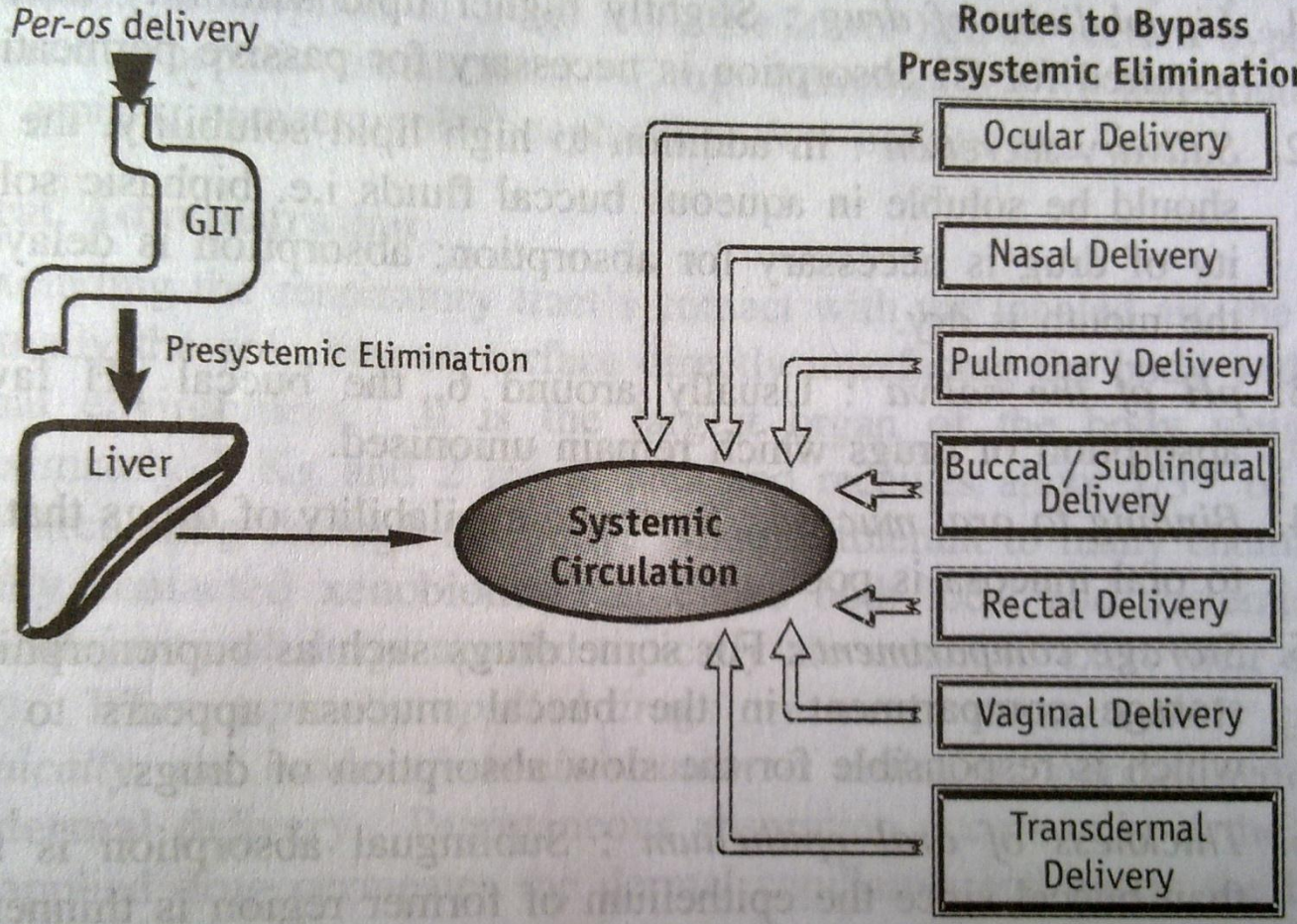

Fig. 2.36 Various transmucosal (including transdermal) non-invasive routes of drug administration to bypass presystemic elimination in GIT/liver

NON PER OS ROUTES[1,2]

- BUCCAL/SUBLINGUAL
- RECTAL
- TOPICAL
- INTRAMASCULAR
- SUBCUTANIOUS
- PULMONARY
- INTRANASAL
- INTRAOCCULAR
- VAGINAL

1. BUCCAL/SUBLINGUAL[1,3]

- **Buccal Route** : The medicament is placed between cheek and the gum.(Glyceryl trinitrate)
- **Sublingual Route** : The drug is placed under the tongue and allowed to dissolve.(Ergotamine)

❖ **Advantages** :-

a) Rapid absorption
b) No first-pass hepatic metabolism
c) No degradation of drugs

❖ **Factors:-**

a) Lipophilicity of drugs
b) Salivary secretion
c) P^H of the saliva
d) Binding to oral mucosa
e) Thickness of oral epithelium

BUCCAL/SUBLINGUAL SITE [2]

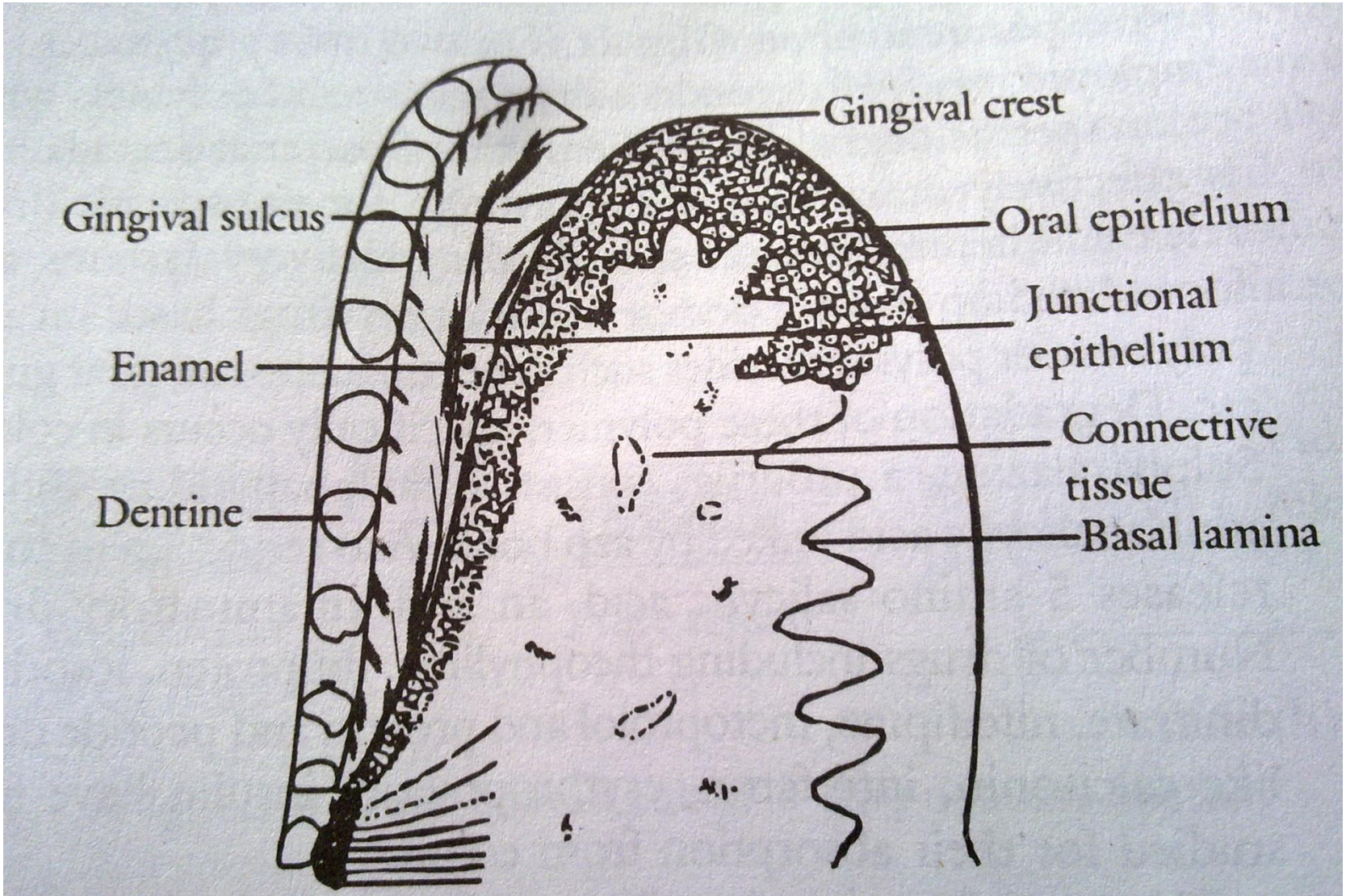

Fig. 1.20. Drug absorption sites from oral cavity

2. RECTAL[1,2]

- The rectal route of administration is still an important route for Children & Old Patients.
- The drug may be administered as solutions(microenemas) or suppositories.

❖ **Advantage :-**

a) Absorption is more rapid

b) Bypasses presystemic hepatic metabolism

❖ **Factors:-**

1. Presence of faecal matter
2. pH of rectal fluid (Around 8)
3. Drug Irritability
4. Surface area

3. TOPICAL[1,2]

- Skin is largest organ of the body. Skin is commonly employed as a site of drug administration for local as well as systemic effect.
- Liquid dosage forms such as Liniments,Lotions,Sprays.
- Semisolids like Ointments,Creams,Pastes,Gels ,etc are conventional drug forms for topical drug delivery

❖ **Advantages:-**

a) Protect drug from GI & from first pass metabolism
b) Increased patient compliance by reduced dosing frequency
c) Easy to terminate drug therapy by removing transdermal patch

❖ **Factors:-**

a) Skin condition
b) Composition of topical vehicle
c) Application procedure
d) External/environmental factors

TOPICAL SITE[1]

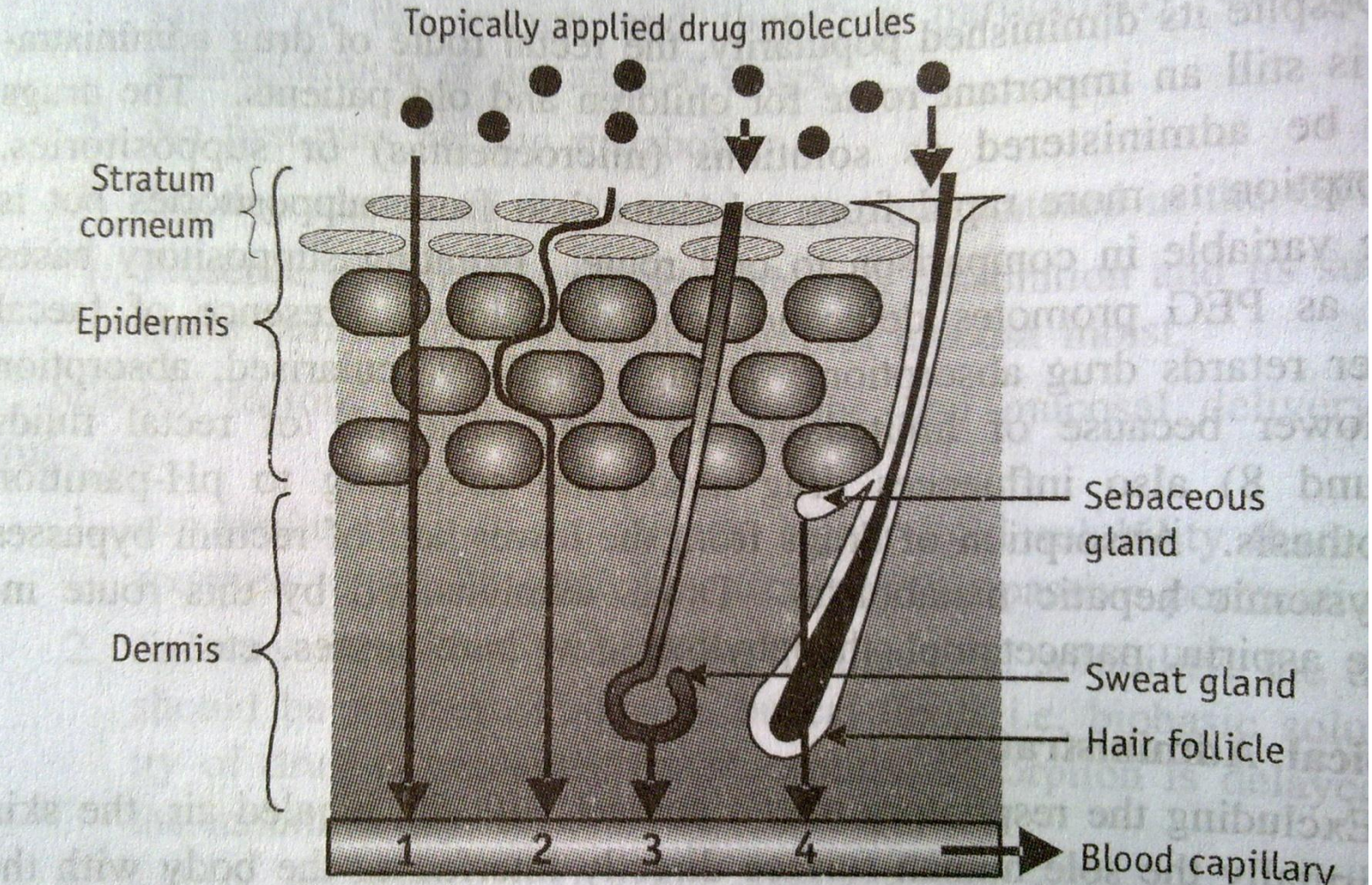

Fig. 2.37 Mechanisms involved in transdermal penetration of drugs. 1. Transcellular, 2. Paracellular, and 3 and 4. Transappendageal

4. INJECTIONS[1,2]

- **Intravenous(IV) Injection**.
  - Drug is directly goes into blood stream
- **Intramuscular(IM) Injection**.
  - Absorption of drugs from I.M. sites is relatively rapid but much slower than I.V. injection.
- **Subcutaneous(SC) Injection.**
  - Absorption is slower than I.M. site due to poor perfusion
- **Intraperitoneal(IP) Injection**.
  - I.P.route is rarely employed in human beings but most widely used in laboratory animals

INJECTIONS CONTINUED.....

- **Factors :-**

a) Vascularity of injection site

b) Lipid solubility & Ionisation of drug

c) Molecular size of the drug

d) Volume of injection/Drug concentration

e) $P^{H,}$ composition & viscosity of injection vehicle

6. PULMONARY[1,2]

- All drugs intended for systemic effect can be administered by inhalation since the large surface area of the alveoli .

- **Advantages:-**

a) Rapid absorption just like exchange of gases between the blood and the inspired air

b) Lipid-soluble drugs are rapidly absorbed by passive diffusion

c) Polar drugs absorbed by pore transport

PULMONARY CONTINUED….

- **Factors:-**

a) Particle size of drug

b) Properties of propeller such as vapour pressure,toxicity,solvent action

c) Effect of drugs and additives on mucous viscosity,mucocilliary clearence

7. INTRANASAL[1]

- The nasal route is becoming increasingly popular for systemic delivery especially of some peptide and protein drugs

- **Advantages:-**

a) Rapid absorption due to rich vasculature and high permeability

b) Drugs from this route reaches the systemic circulation may cross BBB

- **FACTORS:-**

a) Required high lipophilic drugs

b) Smaller molecular weight is required

c) pH of nasal secretion

d) Pathological condition

8. INTRAOCCULAR[2]

- Topical application of drugs to the eyes is mainly meant for local effects such as mydriasis, miosis, anaesthesia or treatment of infections,gloucoma,etc.

❖ **Advantages:-**

a) Lipophilic as well as Hydrophilic drugs are absorbed

b) pH of lachrymal fluid influence absorption of weak electrolytes

❖ **Factors:-**

a) Rate of blinking shows loss of drug

b) Viscosity of drug also affect on absorption

9. VAGINAL[1,2]

- Drugs meant for intravaginal application are ganerally intended to act locally in the treatment of bacterial or fungal infection or prevent conception
- Advantages:-

a) Easy administration

b) Controlled delivery & termination of drug action when desired, with this route

❖SUMMARY OF MECHANISM AND DRUGS ABSORBED FROM VARIOUS NON INVASIVE ROUTES[1]:-

ROUTES	ABSORPTION MECHANISM	DRUG DELIVERED
1.Buccal/Sublingual	Passive diffusion,carriar mediated transport	Nitrites,antianginal,morphine,etc.
2.Rectal	Passive diffusion	Aspirin,Paracetamol,barbiturates,etc.
3.Transdermal	Passive diffusion	Nitroglycerine,lidocaine,etc.
4.Intramuscular	Passive diffusion, endocytosis,pore transport	Phenytoin, digitoxine
5.Subcutaneous	Passive diffusion	Insuline, heparin,etc.
6.Inhalation	Passive diffusion,Pore transport	Salbutamol, cromolyn

ROUTES	ABSORPTION MECHANISM	DRUG DELIVERED
7.Intranasal	Passive diffusion, Pore transport	Phenylpropanolamine, antihistaminics
8.Intraocular	Passive diffusion	Atropine,pilocarpine
9.Vaginal	Passive diffusion	Steroidal drugs & contraceptives

CONCLUSION[1,2]

- ✓ Absorption of drug is rapid
- ✓ Directly reaches the systemic circulation
- ✓ Avoid the GI degradation and/or hepatic metabolism
- ✓ Easy to administered
- ✓ Shows the more bioavailability than oral route

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