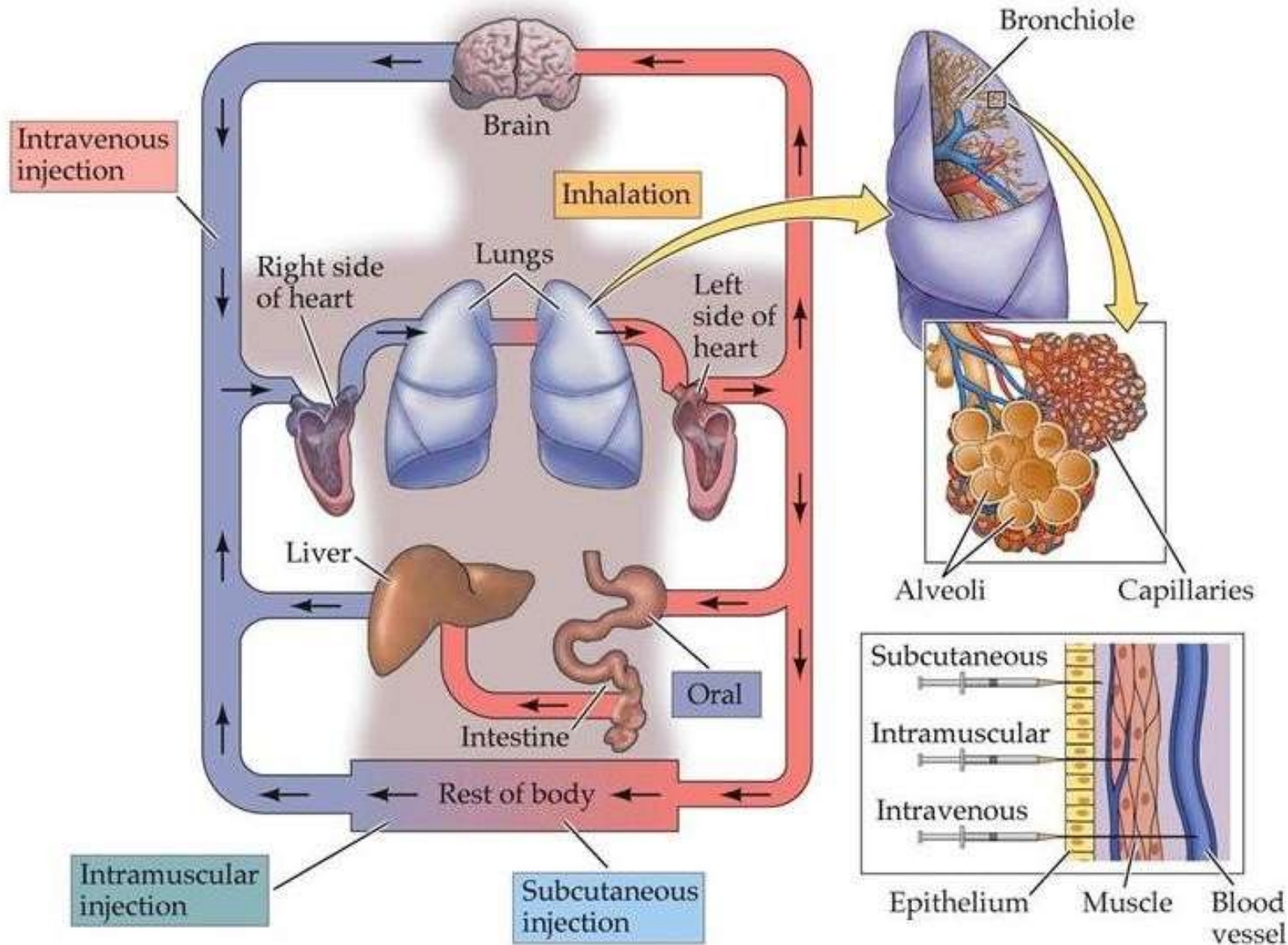


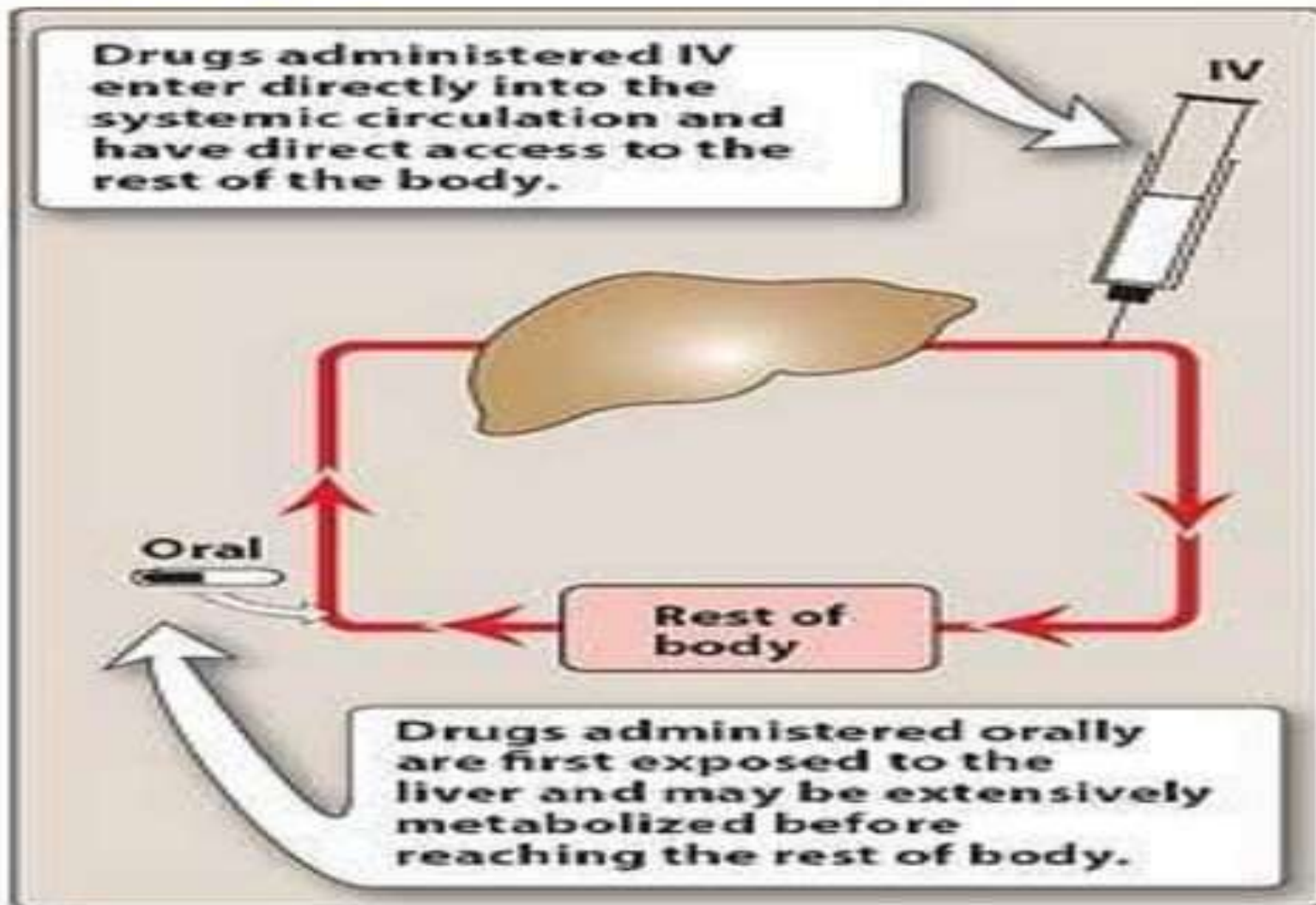
Routes of administration

Routes of administration



Systemic Routes

Parenteral



First-pass metabolism can occur with orally administered drugs.

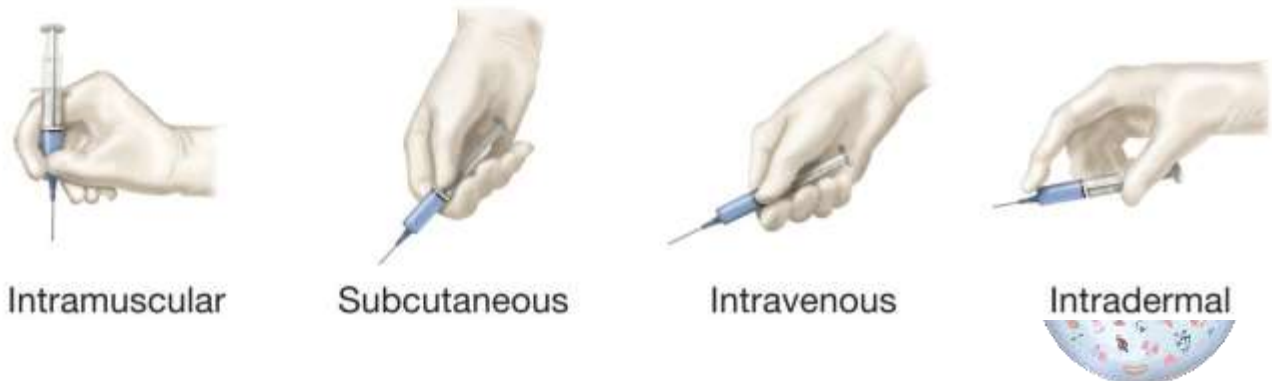
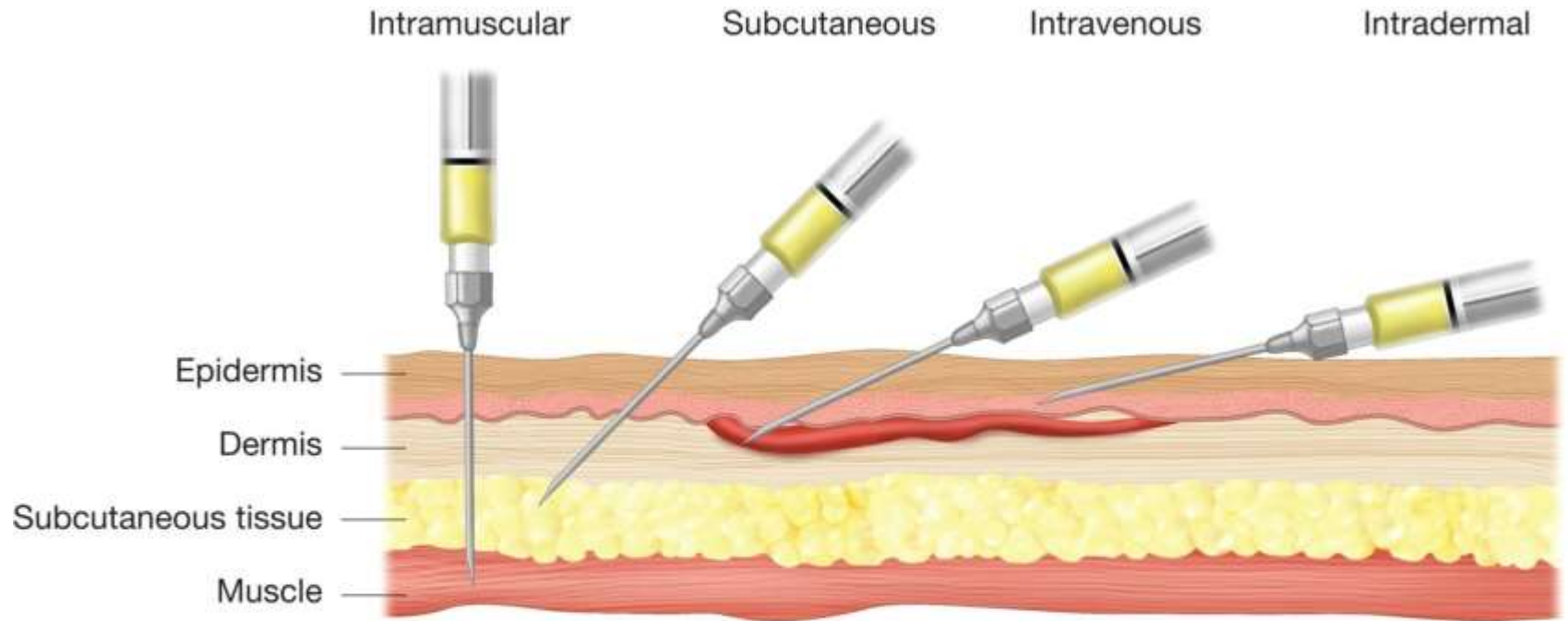
Parenteral Route

- Advantages
 - Unconscious, unco-operative patient
 - Patients with vomiting and diarrhoea
 - Drugs irritating stomach
 - Avoid FPM, drug modification by GIT juices or liver enzymes
 - Rapid action
 - Accuracy of dose
- Disadvantages
 - Inconvenient
 - No self medication
 - Liable to cause infection
 - Injury to arteries/nerves
 - expensive

Inhalation Route

- Produce rapid effects
- Drugs directly to the left side of the heart
- May produce cardiac toxicity
- By pressurised metered aerosols – Salbutamol, beclomethasone in bronchial asthma
- Dry powders from inhalers – Salbutamol
- Oxygen or compressed air driven nebulised solution
- Gases- General anaesthetics

Parenteral Route - Injections



Intradermal

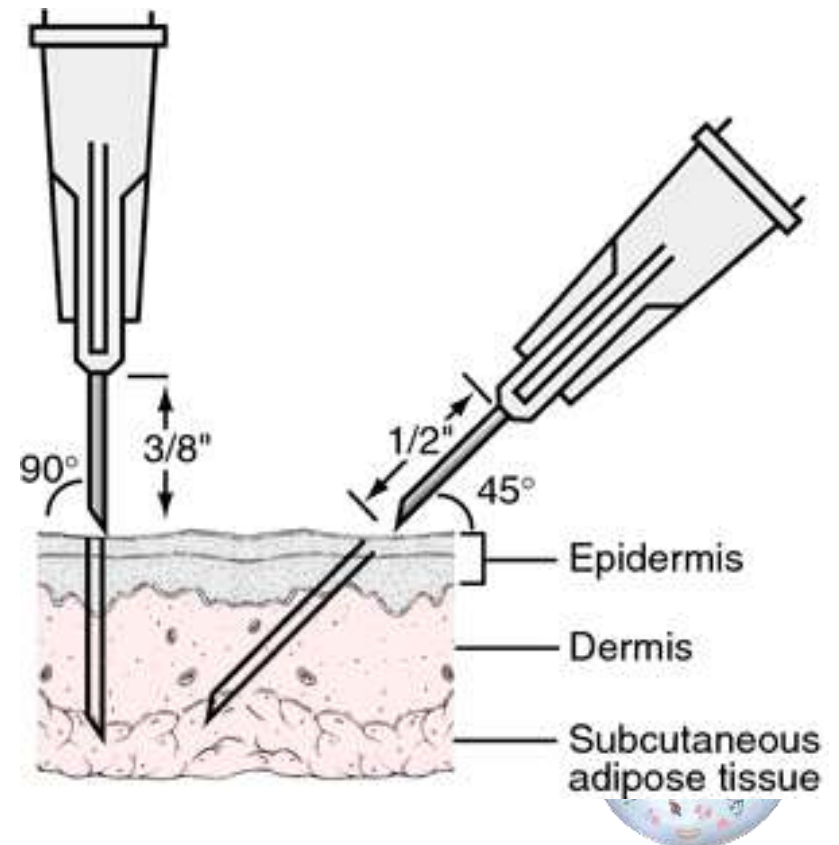
- BCG vaccine
- Given to the layers of skin, Painful
- Small quantity can be administered
- Employed for testing drug sensitivity



Injecting medication into intradermal site on inside of wrist, wheal appears where medication is deposited right under skin.

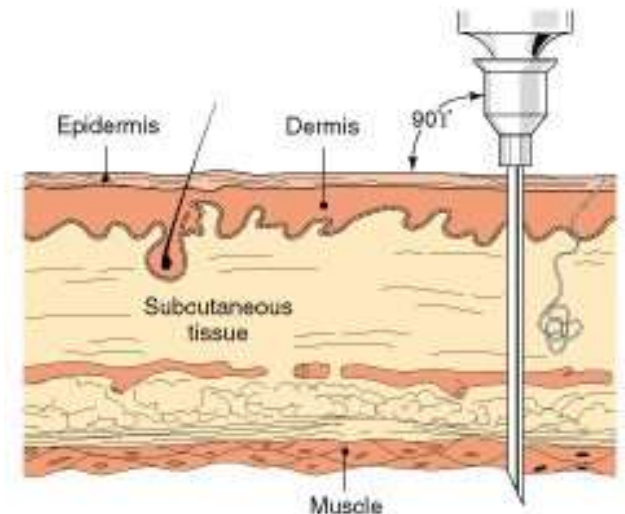
Subcutaneous

- Commonest – insulin
- s.c. drug implants depot therapy - Sex hormone implants
- Only non irritant substances
- Absorption slower than i.m.
- Unreliable in shock



Intramuscular

- Soluble substances, mild irritants, suspensions, colloids
- Rate of absorption – Reasonably uniform, rapid onset
- Volume should not exceed 10 ml
- Diazepam, hydrocortisone, phenytoin, digoxin
- May cause local pain or necrosis - Quinine, paraldehyde
- Care to avoid nerve damage
- Child – to the lateral thigh



Intramuscular Route(IM)

Advantages

- Absorption reasonably uniform
- Rapid onset of action for drugs in aqueous solution.
- Mild irritants can be given
- Repository and slow release preparations
- First pass avoided
- Gastric factors can be avoided

Disadvantages

- Only up to 10ml drug given
- Local pain and abscess
- Expensive
- Infection
- Nerve damage

Intravenous

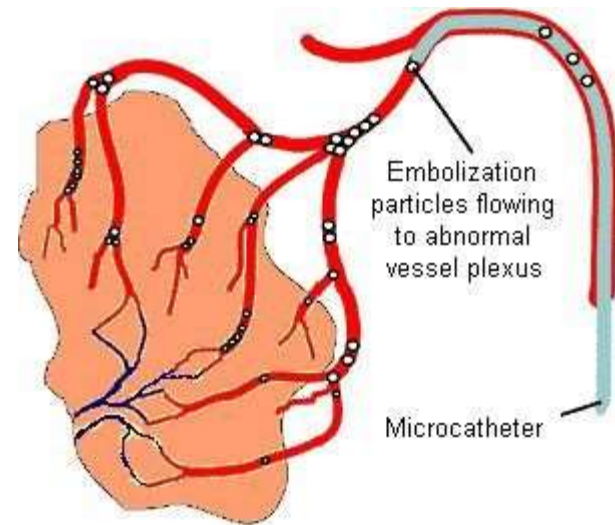
- Directly into the vein and rapid action
- Desired blood conc obtained rapidly with well defined dose
- Precautions:
 - Needle position should be ensured
 - Irritating solutions – Piggybacking into a running i.v. drip
- Disadvantages:
 - Local irritation can lead to phlebitis
 - No Self medication
 - Extravasation – severe irritation, sloughing

Intravenous

- Drug may be injected:
 - As a bolus (Furosemide)
 - Over 5-10 min (Aminophylline in 10-20 ml of isotonic glucose/saline)
 - In an infusion 50-100 ml
- Infusion is employed:
 - To slow the administration of drug to avoid toxicity – Morphine
 - To maintain a constant plasma level – insulin/ dopamine
 - To administer larger volume – Fluid in shock / dehydration

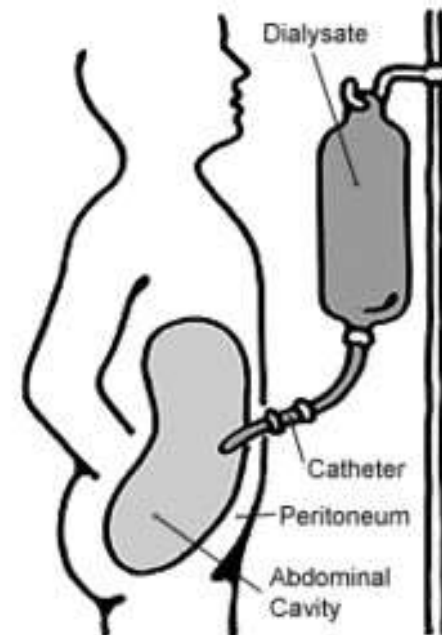
Intra-arterial route

- Into artery
- Used in diagnostic studies – Angiogram, embolization therapy
- Antimalignancy compounds – localised malignancies



Intraperitoneal route

- Large surface area for absorption
- Infants – giving fluids
- Peritoneal dialysis

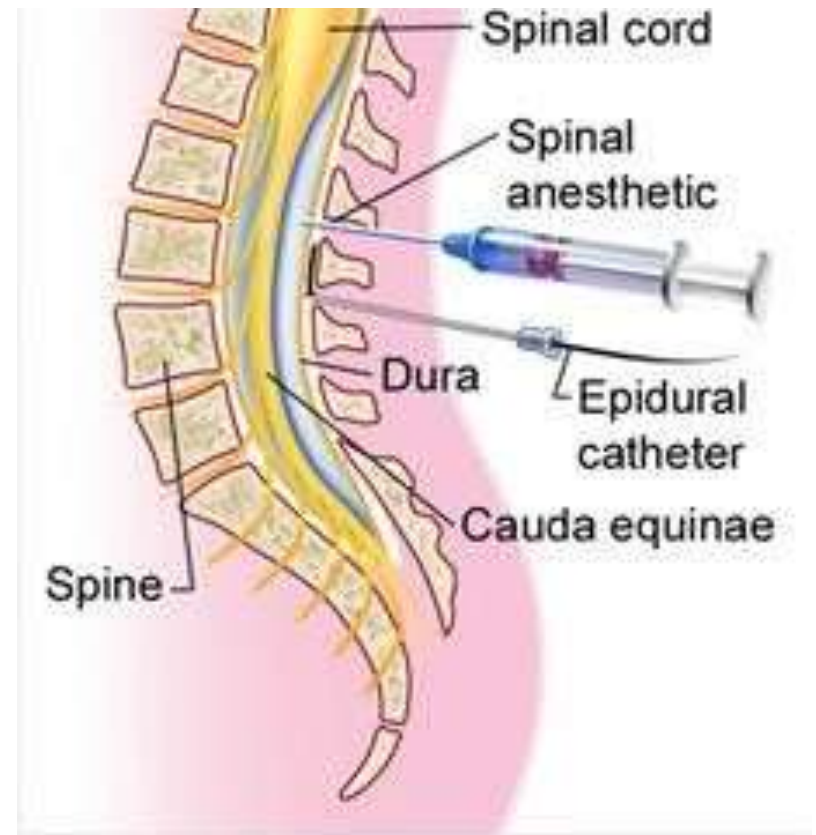


Intrathecal

- Into sub-arachnoid spaces
- Drugs act directly on CNS
- Strict aseptic precautions
- Antibiotics
- Antimalignancy compounds

Epidural/ Extradural

- Over the dura mater
- Lignocaine



Intraosseous

- Into bone marrow of iliac crest or tibia
- Rapid absorption
- Adrenaline in severe shock with sudden cardiac arrest



Intra articular

- Directly into a joint
- Hydrocortisone acetate in RA
- High local conc of drug



Inhalation

1. Aerosols (gaseous & volatile agents)-lungs
2. Rapid onset of action due to rapid access to circulation
 - A. Large surface area
 - B. Thin membranes separates alveoli from circulation
 - C. High blood flow



Inhalation cont'd

Respiratory system. Except for IN, risk hypoxia.

- Intranasal (snorting) Snuff, cocaine may be partly oral via post-nasal dripping. Fairly fast to brain, local damage to septum. Some of the volatile gases also appear to cross nasal membranes.
- Smoke (Solids in air suspension, vapors) absorbed across lung alveoli: Nicotine, opium, THC, freebase and crack cocaine, crystal meth. Particles or vapors dissolve in lung fluids, then diffuse. Longer action than volatile gases. Tissue damage from particles, tars, CO.
- Volatile gases: Some anaesthetics (nitrous oxide, ether).
- Lung-based transfer may get drug to brain in as little as five seconds.

Topical

- **Mucosal membranes** (eye drops, nasal drops, antiseptic, sunscreen, callous removal etc.)
- **Skin**
 - A. Dermal - rubbing in of oil or ointment (local action)
 - B. Transdermal - absorption of drug through skin (systemic action)
 - i. Stable blood levels
 - ii. No first pass metabolism
 - iii. Drug must be potent or patch becomes too large

Routes of administration

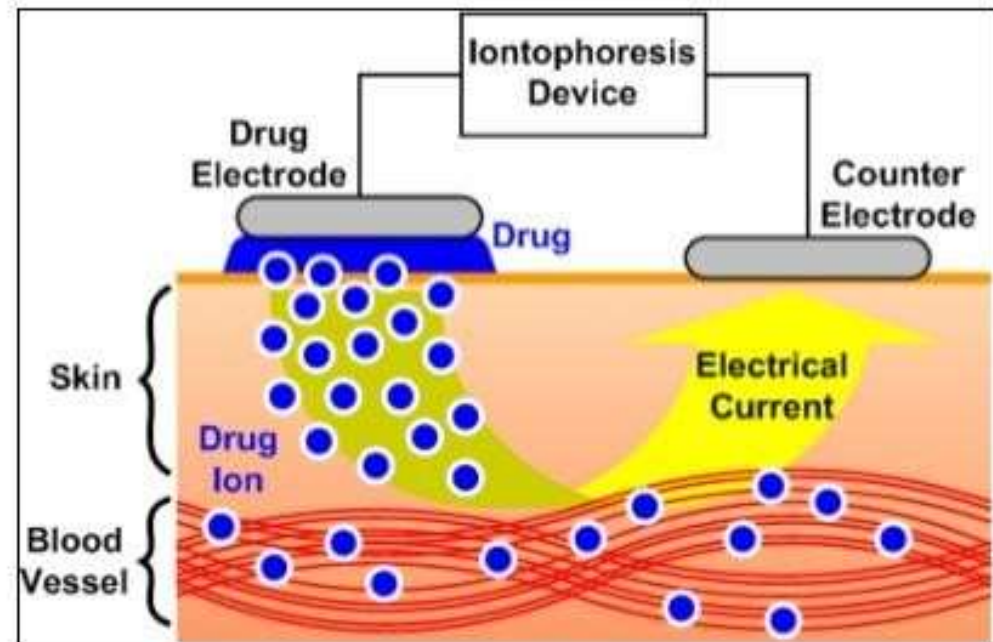
Time of onset

- ✓ Intravenous 30-60 seconds
- ✓ Intraosseous 30-60 seconds
- ✓ Endotracheal 2-3 minutes
- ✓ Inhalation 2-3 minutes
- ✓ Sublingual 3-5 minutes
- ✓ Intramuscular 10-20 minutes
- ✓ Subcutaneous 15-30 minutes
- ✓ Rectal 5-30 minutes
- ✓ Ingestion 30-90 minutes
- ✓ Transdermal (topical) variable (minutes to hours)

III. Transcutaneous

- **Iontophoresis**

- Galvanic current allows the penetration of drugs applied into the skin into the deeper tissues
- Anode Iontophoresis: for +ve compounds
- Catode Iontophoresis: for –ve compounds
- Eg. salicylates



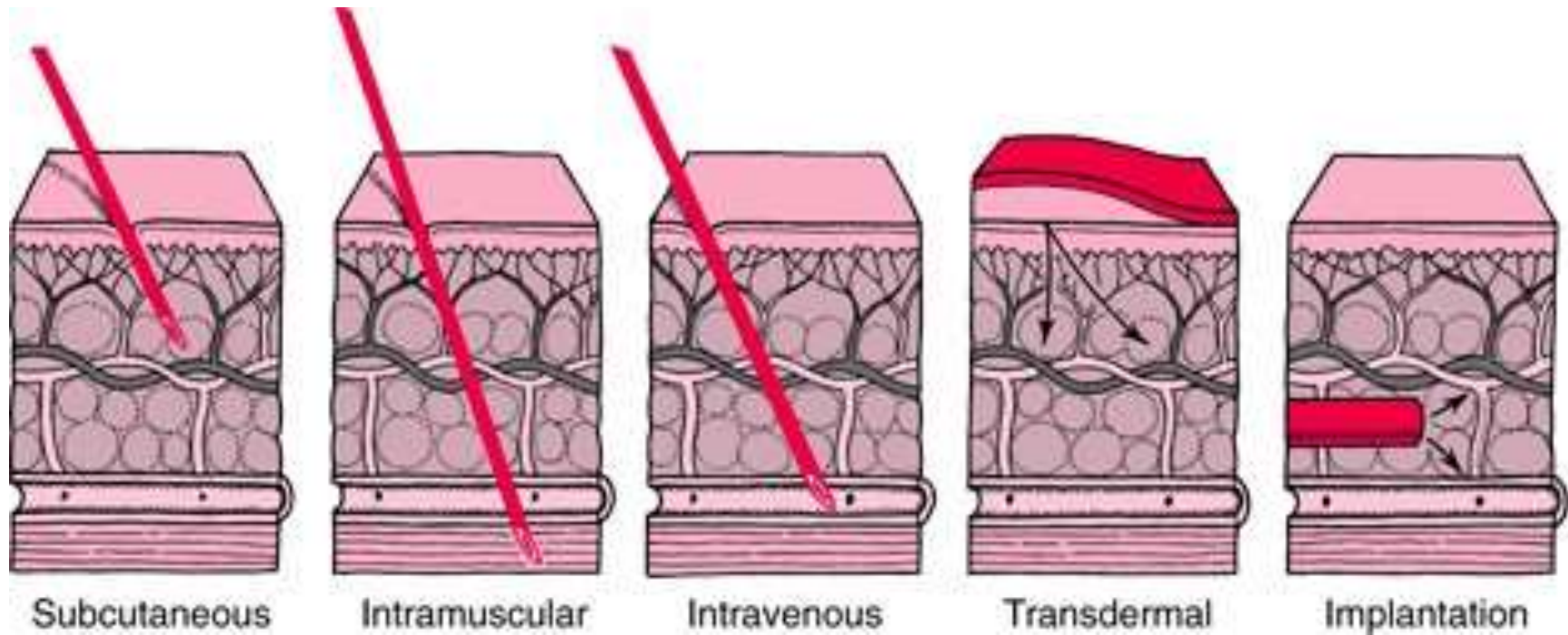
III. Transcutaneous

- **Inunction**
 - Rubbed into the skin
 - NG ointment in Angina Pectoris
- **Jet injection**
 - High velocity jet produced through a micro fine orifice
 - No needle
 - Insulin
- **Adhesive unit**
 - Deliver the drug slowly
 - Scopolamine for motion sickness

IV. Transmucosal

- **Sublingual**
 - NG in angina pectoris
 - Buprenorphine as analgesic
- **Transnasal**
 - GnRH, calcitonin
- **Transrectal**
 - Indomethacin in RA
 - Diazepam in SE
- **Endotracheal**
 - Adrenaline, atropine, diazepam, lignocaine

Various Routes



Enteral Routes

- **Enteral** - drug placed directly in the GI tract:
 - **sublingual** - placed under the tongue
 - **Oral** - swallowing (p.o., per os)
 - **Rectal** - absorption through the rectum

Oral Route

ADVANTAGES

- ✓ Safe
- ✓ Convenient
- ✓ Economical
- ✓ Usually good absorption
- ✓ Can be self administered

DISADVANTAGES

- ✓ Slow absorption → slow action
- ✓ Irritable and unpalatable drugs
- ✓ Un co-operative & unconscious pts.
- ✓ Some drugs destroyed
- ✓ First-pass effect



Sublingual Route

ADVANTAGES

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

DISADVANTAGES

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



Rectal Route

ADVANTAGES

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

DISADVANTAGES

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

Vaginal Routes

- Drug may be administered locally in the vagina in the form of pessaries.
E.g. Antifungal vaginal pessaries

First-pass Effect

- The first-pass effect is the term used for the hepatic metabolism of a pharmacological agent when it is absorbed from the gut and delivered to the liver via the portal circulation.
- The greater the first-pass effect, the less the agent will reach the systemic circulation when the agent is administered orally.

First-pass Effect cont'd...

