

## ***ROUTES OF DRUG ADMINISTRATION***

It is the path by which a drug, fluid, poison or other substance is brought into contact with the body.

### ***Classification***

Routes of administration can broadly be divided into:

#### ***LOCAL                      SYSTEMIC***

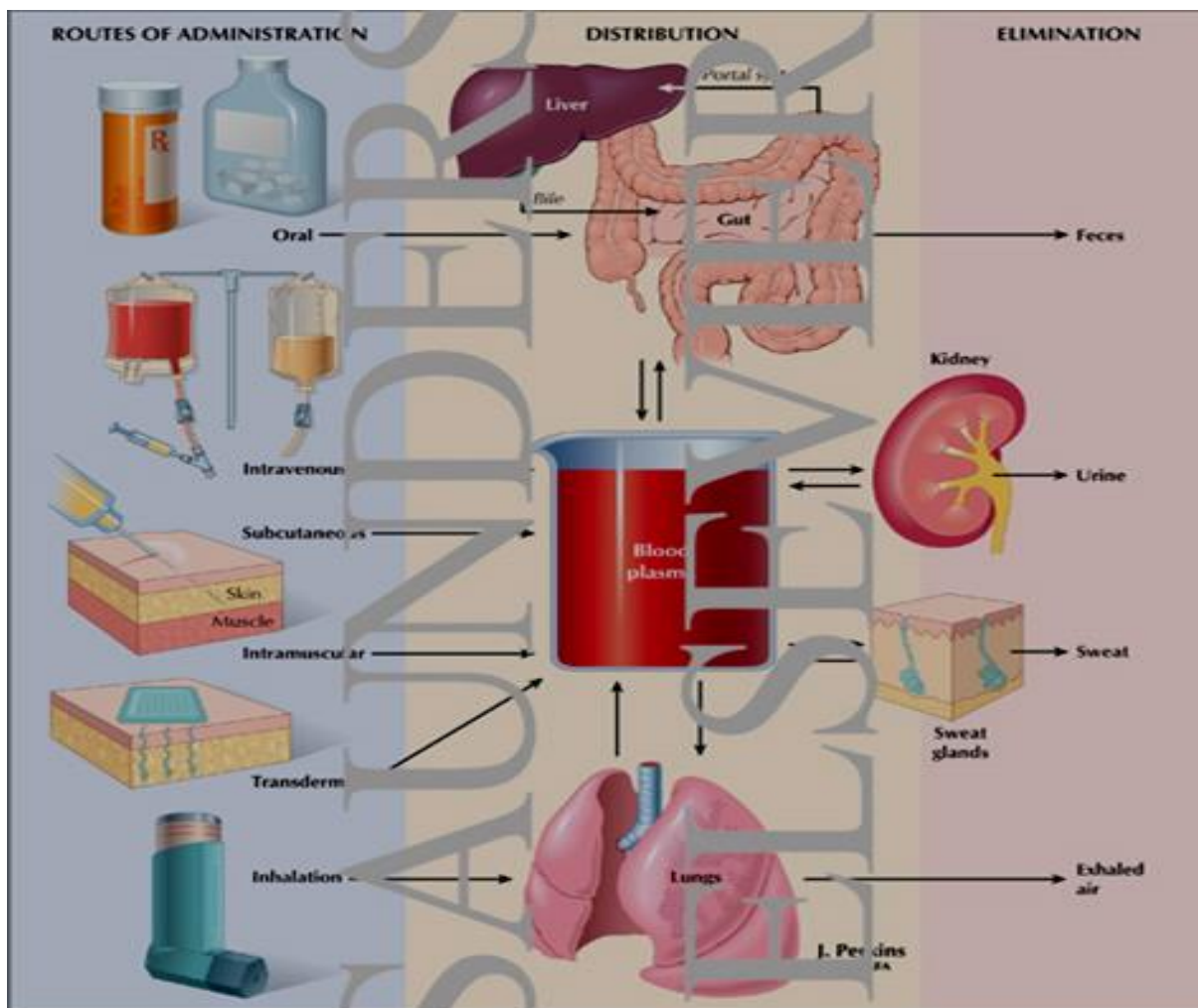
***Topical:*** Drugs are applied topically to the skin or mucous membranes, mainly for local action.

***Oral:*** used for systemic (non-local) effect, substance is given via the digestive tract.

***Parenteral:*** A drug administered parenterally is one injected via a hollow needle into the body at various sites and to varying depth.

***Rectal:*** Drugs given through the rectum by suppositories or enema.

***Inhalation:*** The lungs provide an excellent surface for absorption when the drug is delivered in gaseous, aerosol or ultrafine solid particle form.



## Topical route:

### **Skin**

**Dermal** – cream, ointment (local action)

**Transdermal**- absorption of drug through skin (i.e systemic action)

- I. stable blood levels (controlled drug delivery system)
- II. No first pass metabolism
- III. Drug must be potent or patch becomes too large

### **Mucosal membranes**

Eye drops (into the conjunctiva)

Ear drops

Intranasal route (into the nose)

## Oral route:

By swallowing.

- It is intended for systemic effects resulting from drug absorption through the various epithelia and mucosa of the gastrointestinal tract.

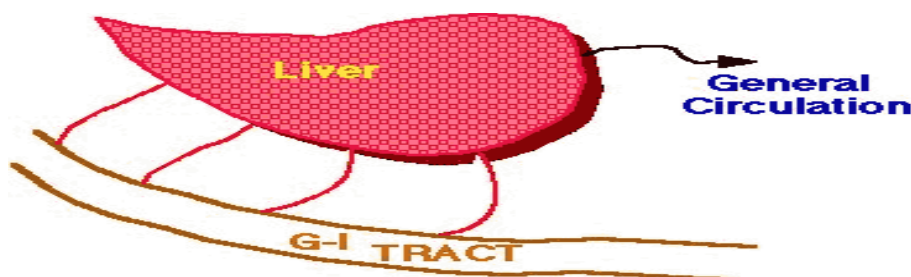
### **Advantages:**

- **Convenient** - portable, no pain, easy to take.
- **Cheap** - no need to sterilize, compact, multi-dose bottles, automated machines produce tablets in large quantities.
- **Variety** - tablets, capsules, suspensions, mixtures.

### **Disadvantages:**

- **1- Sometimes inefficient** - low solubility drugs may suffer poor availability  
**e.g., Griseofulvin**
- **2- First-pass effect** - drugs absorbed orally are transported to the general circulation via the liver. Thus, drugs which are extensively metabolized will be metabolized in the liver during absorption. e.g. **propranolol**

First pass effect



### **First pass effect (Cont.):**

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 lower the bioavailability of the drug (the rate and extent of the drug reaching systemic circulation).

**3- Food** - Food and G-I motility can affect drug absorption.

Often patient instructions include a direction to take with food or take on an empty stomach.

- Absorption is slower with food (milk and milk products) for **tetracyclines** and **penicillin's**, etc. However, for **propranolol** bioavailability is higher after food, and for **griseofulvin** absorption is higher after a fatty meal.

**4- Sometimes may have adverse reactions** – e.g., Antibiotics may kill normal gut flora and allow overgrowth of fungal varieties. Thus, antifungal agent may be included with an antibiotic.

**5- Not suitable for unconscious patient** - Patient must be able to swallow solid dosage forms. Liquids may be given by tube.

**6-** May cause irritation to gastric mucosa, nausea and vomiting.

**7-** Effect too slow for emergencies.

### **Buccal/Sublingual route:**

Some drugs are taken as smaller tablets which are held in the mouth (buccal tablet) or under the tongue (sublingual tablet).

Buccal tablets are often harder tablets [4-hour disintegration time], designed to dissolve slowly.

E.g Nitroglycerin, as a softer sublingual tablet [2 min disintegration time], may be used for the rapid relief of angina.

#### ***Advantages***

1- Avoid hepatic first pass - The liver is by-passed thus there is no loss of drug by first pass effect for buccal administration. Bioavailability is higher.

2- Rapid absorption - Because of the good blood supply to the area, absorption is usually quite rapid.

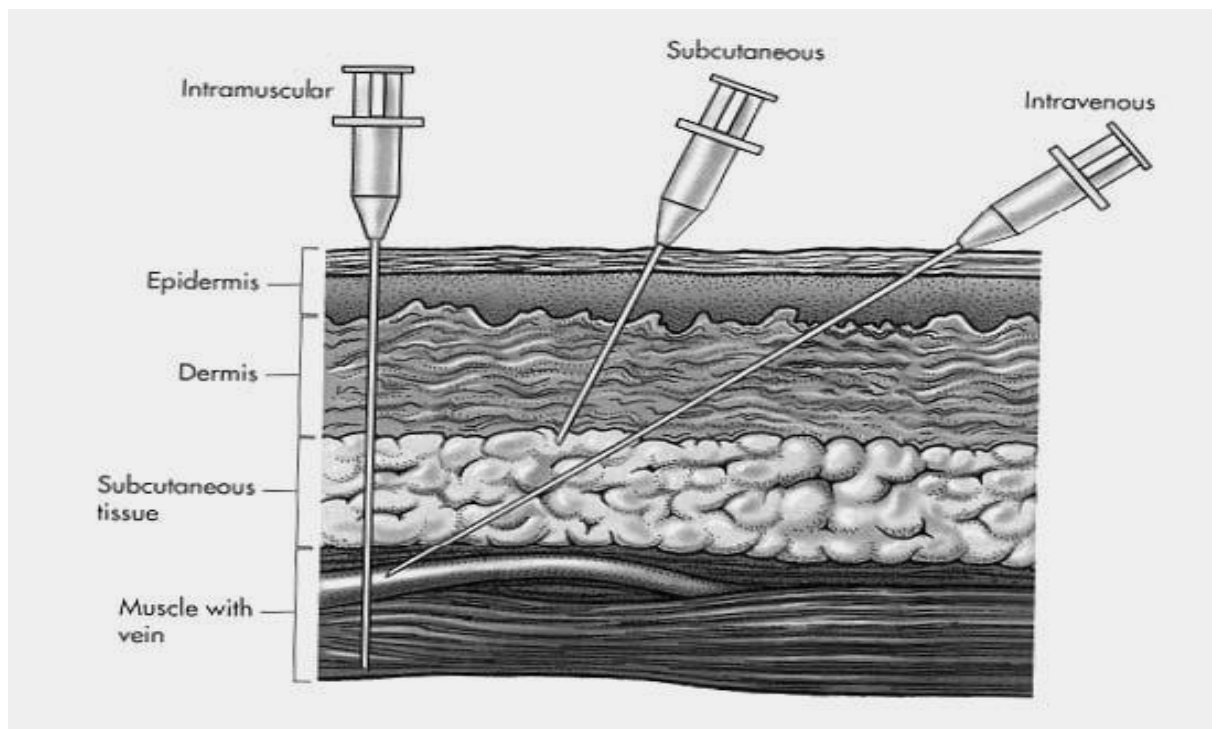
3- Drug stability - pH in mouth relatively neutral (gf. stomach - acidic). Thus, a drug may be more stable.

#### ***Disadvantages***

1- Holding the dose in the mouth is inconvenient.

2- Small doses only can be accommodated easily.

## Parenteral route:



### **Intravascular (IV, IA):**

placing a drug directly into blood stream.

May be - Intravenous (into a vein) or - intraarterial (into an artery).

#### *Advantages*

precise, accurate and immediate onset of action, 100% bioavailability.

#### *Disadvantages*

risk of embolism.

high concentrations attained rapidly leading to greater risk of adverse effects.

**Intramuscular** :(into the skeletal muscle).

#### *Advantages*

suitable for injection of drug in aqueous solution (rapid action) and drug in suspension or emulsion (sustained release).

#### *Disadvantages*

Pain at injection sites for certain drugs.

**Subcutaneous** (under the skin), e.g., [insulin](#).

**Intradermal**, (into the skin itself) is used for skin testing some allergens.

**Intrathecal** (into the spinal canal) is most commonly used for spinal anesthesia.

**Intraperitoneal**, (infusion or injection into the peritoneum) e.g., peritoneal dialysis in case of renal insufficiency.

### **Rectal route:**

Most commonly by suppository or enema.

#### *Advantages*

By-pass liver - Some of the veins draining the rectum lead directly to the general circulation, thus by-passing the liver.

Reduced first-pass effect.

Useful - This route may be most useful for patients unable to take drugs orally (unconscious patients) or with younger children.

- if patient is nauseous or vomiting

#### *Disadvantages*

Erratic absorption - Absorption is often incomplete and erratic.

Not well accepted.

### **Inhalation route:**

Used for gaseous and volatile agents and aerosols.

Solids and liquids are excluded if larger than 20 microns. The particles impact in the mouth and throat. Smaller than 0.5 micron, they aren't retained.

#### *Advantages*

Large surface area

thin membranes separate alveoli from circulation

high blood flow

As result of that a rapid onset of action due to rapid access to circulation.

#### *Disadvantages*

Most addictive route of administration because it hits the brain so quickly.

Difficulties in regulating the exact amount of dosage.

Sometimes patient having difficulties in giving themselves a drug by inhaler.