



## ROUTES OF DRUG ADMINISTRATION

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### ABSTRACT

The route of administration is the way through which the dosage form is administered into the body for treatment of various diseases and disorders. Various routes of administrations play a marked role in the bioavailability of the active drug in the body. In present review these routes are included with their advantages and limitations. This is an attempt for the initials of field to familiarize with the routes of administrations with their significances.

**KEYWORDS** Route, Bioavailability, Drug.

### Definition:-

A route of administration in pharmacy is the path by which a drug is taken into the body.

(1)

### Classification:-

The various routes of administrations are classified into following categories:-

#### 1. Systemic Route

| A) Enteral route | (b) Parenteral route |
|------------------|----------------------|
| 1. Oral          | 1. Intravascular     |
| 2. Sublingual    | 2. Intramuscular     |
| 3. Rectum        | 3. Subcutaneous      |
|                  | 4. Inhalation        |

#### 2. Local Route

##### 1. Systemic Route: -

In Systemic route the drug reaches to the systemic circulation (Blood). So that it is called systemic route.

**Systemic Route is again classified into two classes:-**

##### (A) Enteral Route: -

In this route the drug is placed in the Gastrointestinal Tract and then it absorbs to the blood.

This route is further classified into three classes:

### (1) Oral Route: -

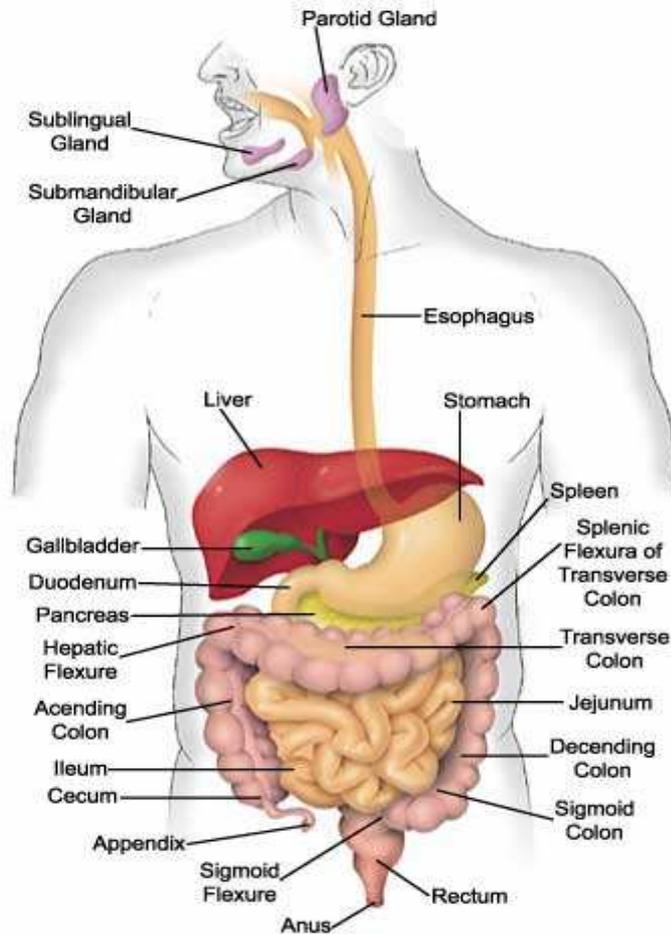
In this route the drug is placed in the mouth and Swallowed. It is also called per oral (p.o.)

#### Advantages of Oral Route

- **Convenient** - Can be self-administered, pain free, easy to take
- **Absorption** - Takes place along the whole length of the gastro intestinal tract
- **Cheap** - Compared to most other parenteral routes

#### Disadvantages of Oral Route

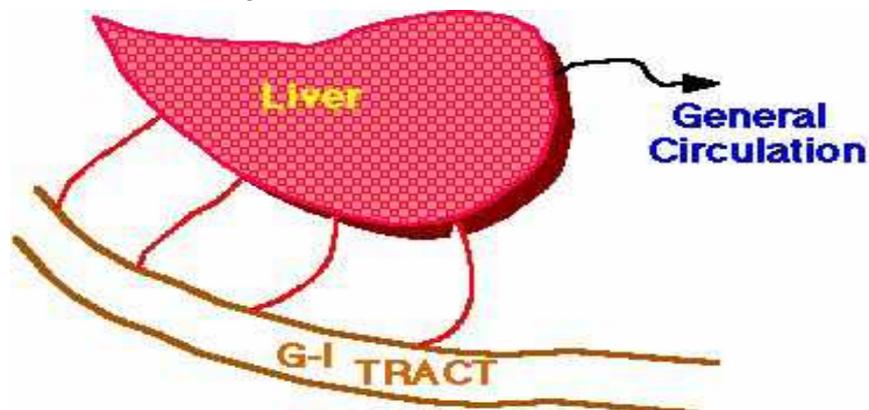
- Sometimes inefficient - only part of the drug may be absorbed
- First-pass effect - drugs absorbed orally are initially transported to the liver via the portal vein
- Irritation to gastric mucosa - nausea and vomiting
- Destruction of drugs by gastric acid and digestive juices
- Effect too slow for emergencies
- Unpleasant taste of some drugs
- Unable to use in unconscious patient



### First-pass effect:-

This is effect which occurs with oral route of administration. 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. <sup>(2, 3, 4 and 5)</sup>



**Figure 2 First Pass Effect**

### Examples of drugs which undergo marked First Pass Effect:-

- Imipramine,
- Propranolol,
- Lidocaine.<sup>(1)</sup>

### Examples:-

The example of dosage forms which are used by oral route include

1. Tablet
2. Capsules
3. Syrups etc.

### Sublingual/Buccal route: -

In this route of administration the drug is placed under the tongue. And it is taken without the use of water. When it is placed under the tongue it disintegrates there and then absorption occurs in mouth. The tablets are small in size which is to be used through the sublingual route.<sup>(6)</sup> Example of Sublingual tablet is Nitroglycerine tablets

### Buccal Route

In this route of administration the drug is kept in the buccal cavity where it disintegrates and absorption occurs in the mouth.<sup>(7)</sup>

### Advantages

Advantages of Sublingual and Buccal Route of Administration are:-

- **Rapid absorption:-** It absorbs in the mouth so that its absorption
- **Drug stability:** - As in this route the drug does not go to the stomach so it is not destroyed by the enzymes and acids present in the stomach so that it is stable.
- **Avoid first-pass effect.**

### Disadvantages

Disadvantages of Sublingual and Buccal Route of Administration are:-

- **Inconvenient:** - In this route the drug is kept in the mouth so it is inconvenient.
- **Small Doses:** - Small size is required to keep the drug in the mouth.
- **Unpleasant taste of some drugs:** - The drugs having unpleasant taste can cause problem because the drug is kept in the mouth.



Figure 3 Sublingual Route



Figure 4 Buccal Route

**Rectal Route: -**

Many drugs that are administered orally can also be administered rectally as a suppository. In this form, a drug is mixed with a waxy substance that dissolves or liquefies after it is inserted into the rectum. Because the rectum's wall is thin and its blood supply rich, the drug is readily absorbed. A suppository is prescribed for people who cannot take a drug orally because they have nausea, cannot swallow, or have restrictions on eating, as is required after many surgical operations. Drugs that are irritating in suppository form may have to be given by injection.<sup>(8)</sup>

**Vaginal Route:**

Some drugs may be administered vaginally to women as a solution, tablet, cream, gel, suppository, or ring. The drug is slowly absorbed through the vaginal wall. This route is often used to give estrogen to women at menopause, because the drug helps prevent thinning of the vaginal wall, an effect of menopause (see menopause: hormone therapy).<sup>(9)</sup>

**Urethral Route:-**

Some drugs are given through the urethra. This route is called urethral route of drug administration.<sup>(10)</sup>

**Advantages:-**

Advantages of rectal/urethral/vaginal route are as follows:-

**1. Unconscious patients and children:-**

If the patient is unconscious then it is not possible to give the drug orally. So in this situation the drug can be given through rectal/urethral/vaginal route.

2. If patient is having nauseous or vomiting

**Disadvantages:-**

1. May cause irritation

2. Absorption may be variable.

**Examples:-**

1. Suppositories
2. Vaginal Bogies
3. Urethral Bogies

**Parenteral Routes:-**

In this route of administration the drug does not pass through the gastrointestinal tract. It directly reaches to the blood.<sup>(11)</sup>

It can further be classified into two classes:-

1. With injections:- in this class the drugs are administered with the use of injections
  - e.g. Intravascular,
  - Intramuscular,
  - Subcutaneous
2. Without injections: - in this class the drugs are administered without use of injections.
  - e.g. Inhalations.

**With Injections:-****1. Intravascular:-**

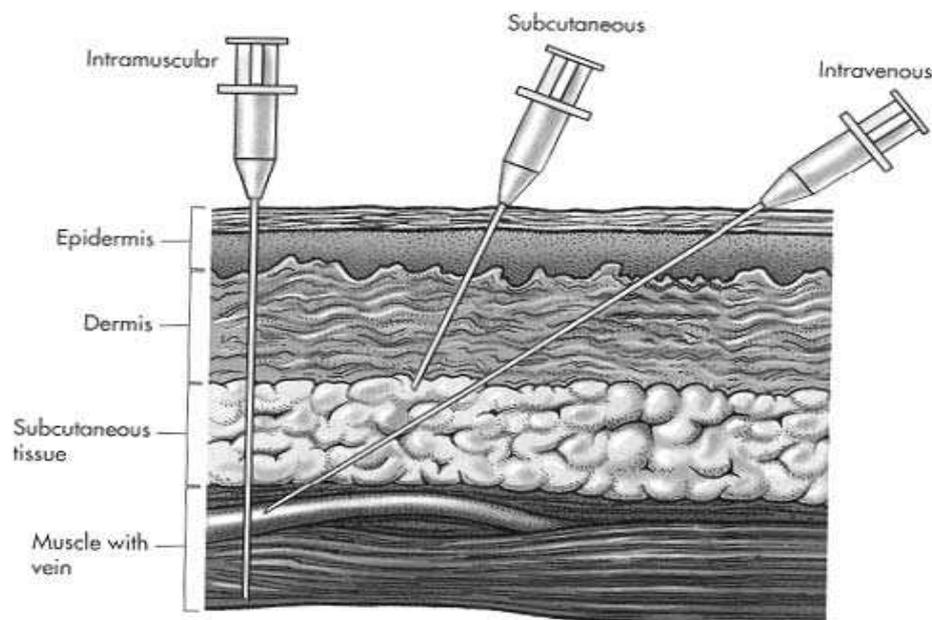
In this route of administration the drug is directly taken into the blood with the help of injection. Absorption phase is bypassed.

**Advantages:-**

1. Precise, accurate and almost immediate onset of action
2. Large quantities can be given, fairly pain free
3. Can be given to unconscious patients.
4. Quick action
5. Drugs having unpleasant taste can be given.

**Disadvantages:-**

1. Pain at the site of injection.
2. Greater risk of adverse effects
  - A. High concentration attained rapidly
  - b. Risk of embolism



**Figure 5 Injectable Route of Administration**

## 2. Intramuscular:-

In this route of administration the drug is given into the muscles with the help of injection. Drug once reaches to the muscles, absorbs into the blood.

1. Very rapid absorption of drugs in aqueous solution
2. Depot and slow release preparations
3. Pain at injection sites for certain drugs

## 3. Subcutaneous:-

In this route of administration the drug is given into the subcutaneous layer with the help of injection. Drug once reaches to the subcutaneous layer crosses the membrane and absorbs into the blood.

## Without Injections:-

In this class the drug is administered to the blood without going to the gastrointestinal tract. In this class the drug is not administered with the help of injections<sup>(1)</sup>

In this administration the drug is administered in the gaseous form.

## Advantages:-

1. Rapid onset of action due to rapid access to circulation.
2. Pain not occurs because injection is not used.

## Examples:-

1. Inhalers
2. Aerosols

## Local/Topical Route of Drug Administration

In this route the drug is applied on the skin and mucous membrane for the local action.<sup>(12)</sup>

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



**Figure 6 Topical route of drug administration**

### Examples

1. Creams
2. Lotions
3. Gels etc.

### Onset of Action-

The length of time needed for a medicine to give its action. This time varies for different types of routes of administrations.<sup>(13)</sup>

Onset of action of different routes is as follows:-

- Intravenous 30-60 seconds
- Intraosseous 30-60 seconds
- Inhalation 2-3 minutes
- Sublingual 3-5 minutes
- Intramuscular 10-20 minutes
- Subcutaneous 15-30 minutes
- Rectal 5-30 minutes
- Oral 30-90 minutes
- Topical/transdermal (topical)  
variable (minutes to hours)

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