The characteristics of the different routes of drug administration

What Are the Different Routes of Administration?

- Oral
- Buccal
- Colonic
- Rectal
- Nasal
- Pulmonary
- Transdermal/ dermal
- Intravenous
- Subcutaneous
- Intramascular

Drug administration may be divided into major categories

Enteral

- Drugs administered by way of the GIT

Parenteral

- Drugs not administered via the GIT and are mostly given by injection (intra-arterial, intrathecal, intramuscular, etc…

Others

- Topical: Drugs applied on the skin to any accessible epithelial membranes.

Application 1 (15 min)
Routes of drug Administration

- Discuss how the ORAL , compared to IV route of administration affects
  - The drug bioavailability
  - The onset of action

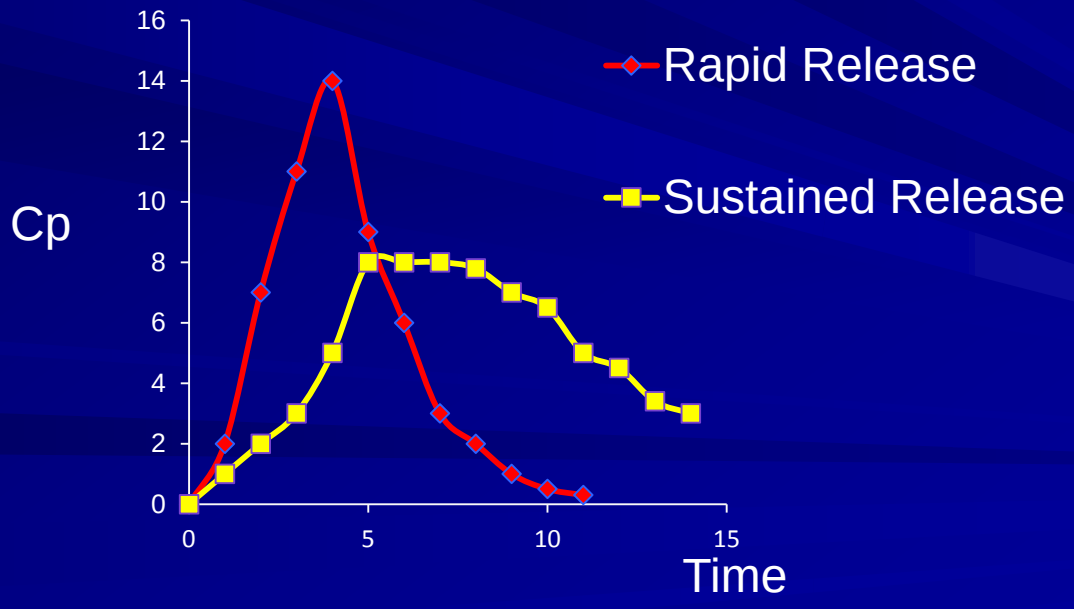
Give examples when possible

Application 2 (15 min) Routes of drug Administration

- In designing a product in a specific route of administration, the following are important (explain with routes of administration examples).
  - Size of dose
  - Anatomic and physiologic characteristics of the administration site (hint: blood flow and membrane permeability).
  - Physicochemical properties of the site (pH, physiological fluids)

Extravascular Administration

- Same drug can be formulated in multiple dosage forms (same route of administration)



Intravenous Injection

- Direct injection into a peripheral vein.
- Volume of injection: 1-100 ml
- IV infusion: large volume of fluid (100-1000ml)

Discuss the following in 10 minutes

- Precision of the dose.
- Onset of action
- Delivery of water insoluble drugs
- Delivery of suspensions

Discuss the following in 10 minutes

- The risks of IV

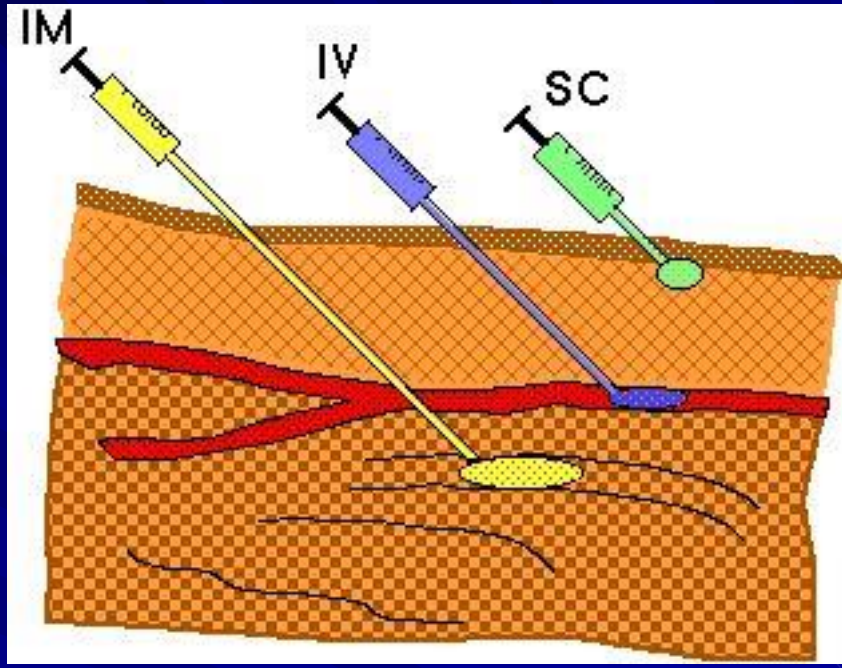
Intra-arterial injection

- Direct injection into the artery.
- Useful in ……?
- More caution is required to avoid overdose.

Can you think of another risk?

Subcutaneous Administration

- Injection into a layer of fat immediately under the Dermis
- Ex. …….-most important drug administered SC.



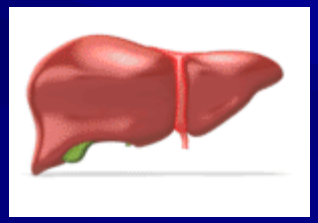
- Useful when (slow/fast?) and continuous absorption is required.
- The formulation must be isotonic and at physiological pH. Why?

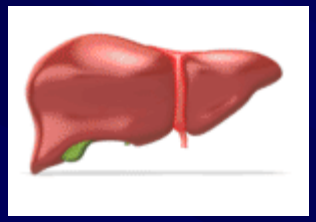
Subcutaneous Administration

- Certain drugs are irritating and can cause severe injection site pain and tissue necrosis, so it is common practice to alternate between injection sites.
- The rate of distribution of the drug is largely dependent on blood flow and can therefore be slowed by including a vasoconstrictor. Warming or vigorous massage of the injection site will increase distribution of medication.
- The rate of drug absorption is controlled by the blood flow and the site of drug administration.

Intramuscular injection

- Injection into the striated muscle fiber under the subcutaneous layer (pain at injection sites for certain drugs).
- Relatively (fast/slow?) rate of achieving therapeutic drug levels but depends on
- Absorption depends on (mention 2 factors)
- How about

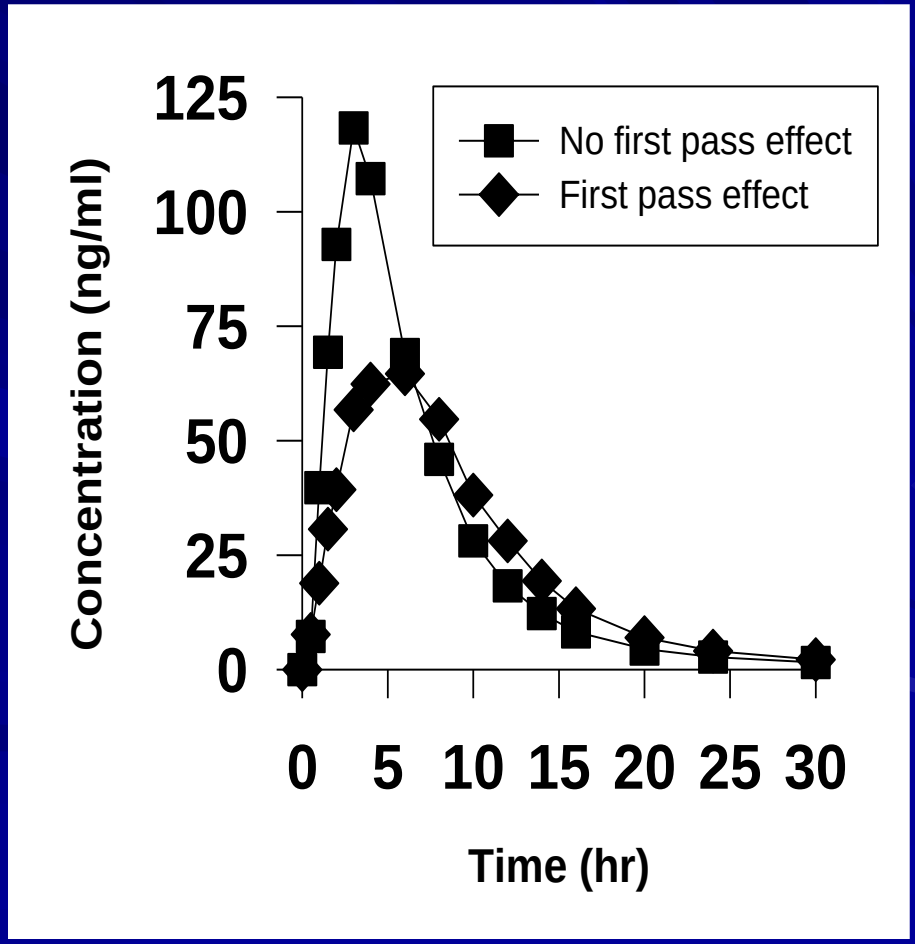




First Pass Metabolism

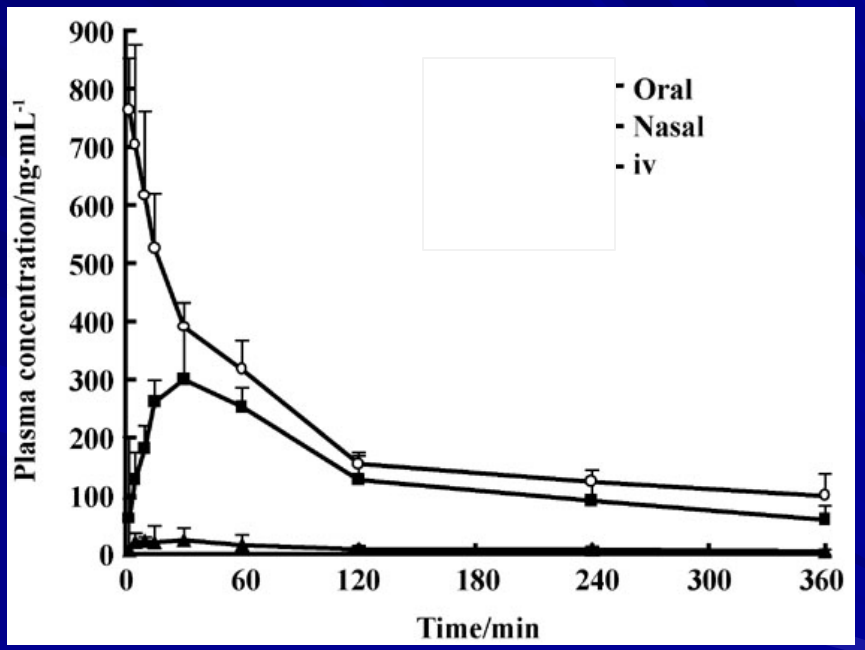
- The net effect of first pass effect is displayed in the following figure

- This figure depicts the effect of first pass metabolism if it was possible to turn the effect off and on.



Case study (Application 3, 10 min)

- **Nimodipine's oral bioavailability is relatively low due to……..**
- Identify the profile corresponding to each of the three routes of administration (oral, nasal, or IV)



Distribution of nimodipine in brain following intranasal administration in rats

Buccal or Sublingual Administration (Application 4, 15 min)

- Buccal: positioning the tablet in the cheek pouch
- Sublingual: positioning the tablet beneath the tongue.

- Discuss the first pass effect

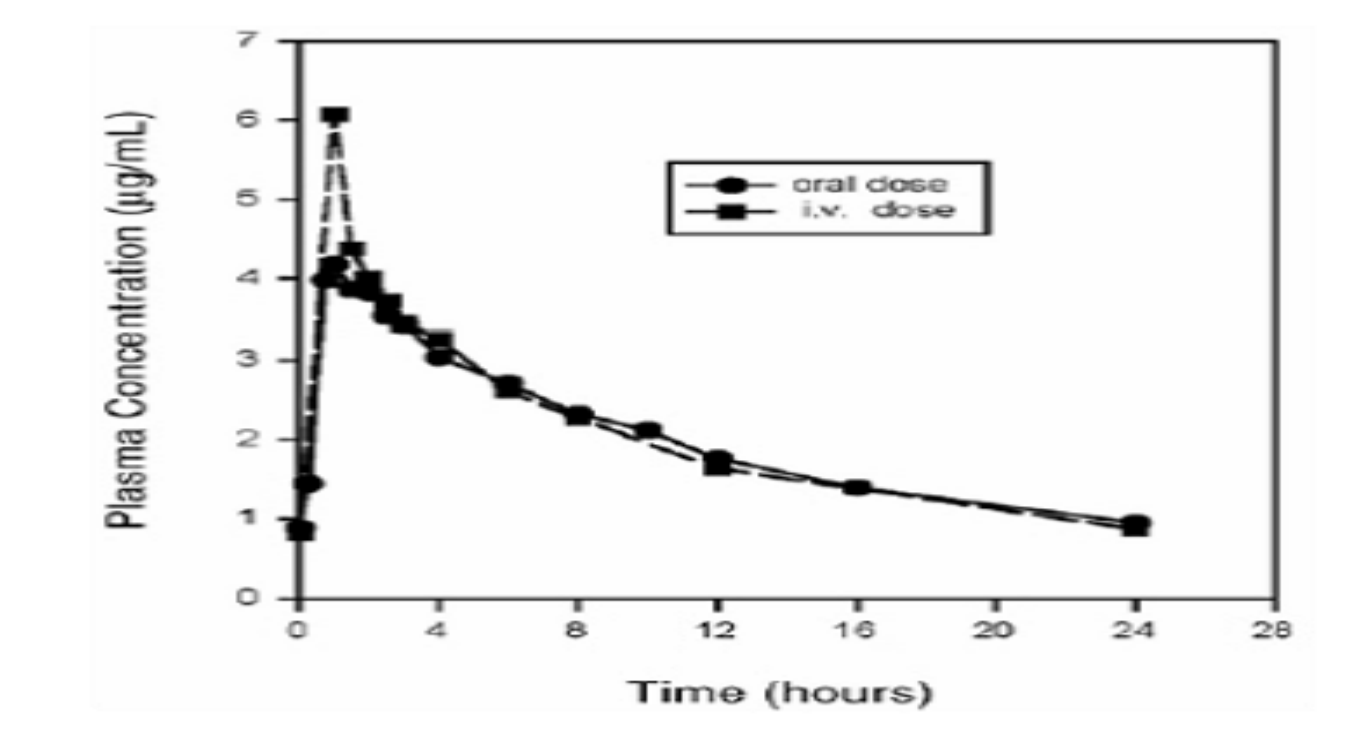
- Is the absorption rapid or slow?

- What are other factors that may affect the bioavailability?
- Can you think of few disadvantages?

Oral Administration Application 5, 15 min

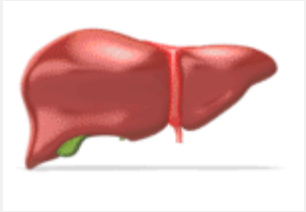
- What are the advantages and disadvantages of oral administration

Application 6, 10 minutes Find the possible errors in the figure



Topical administration

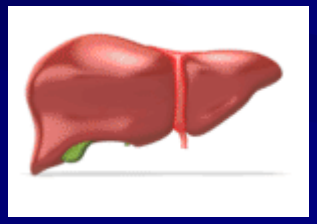
- Dermatological or external use.
- Topical application to any accessible epithelial membranes (rectal lining, vaginal mucosa, nasal mucosa).

Application 7, 5 minutes	**Dermal**	**Transdermal**
Application		
Effect: systemic/ local		
		

Rectal Administration Application 8, 15 min

- Discuss :
  - Which patient would benefit from such dosage form?
  - Are they good for specific drugs?
  - Are they used for systemic, local or both effects?
  - first pass metabolism

Compare Pulmonary with Nasal delivery Application 9, 15 min

- systemic/ local
- onset of action
- drug absorption/ surface area of absorption
- 

Summary

- Comparison is the way to go
  - What can an elderly patient take?
  - What can a child take?
  - Which routes are good for an extensively liver metabolized drugs?