Oral Route of Drug Administration

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Oral Route

- Oral route is the most convenient route for access to the systemic circulation.
- Dosage form applicable to this route are:
  - Tablets, capsules, solutions, syrups, elixirs, suspensions, lozenges and powders.

The Oral Route

- Drug absorption may take place at any point along the alimentary canal
  - Oral cavity
  - Stomach
  - Small intestine
  - Large intestine
- Limitations of this route
  To be avoided when patient is
  1. Gastrointestinal intolerance: Vomiting and nausea
  2. Convulsion
  3. When Rapid onset is desired in an Emergency
  4. Patients who have difficulty swallowing. e.g Pediatric and geriatric patients.

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The Oral Route

- **Advantages**
  1. Can be self administered.
  2. Economic (cheap to manufacture).
  3. Mostly stable on storage.
  4. Easy to transport.
- **Disadvantages**
  1. Drugs may be subjected to digestive enzymes, pH, first pass metabolism.
  2. Taste may be limiting. Affecting compliance.
  3. Delayed onset.
  4. Poorly soluble drugs may have limited absorption.
  5. Absorption may vary from patient to patient or in the same patient. depending on if food was taken with the drug and the nature of meal.
  6. Drugs that have short absorption window. (only a small part of the GIT is capable of absorbing the drug).
  7. The drug may be susceptible to enzyme degradation in the GIT.

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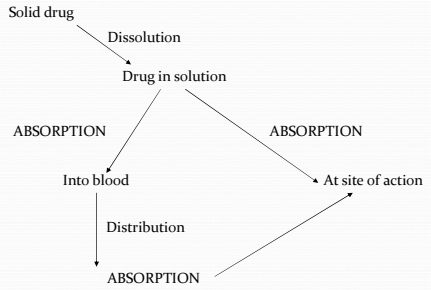
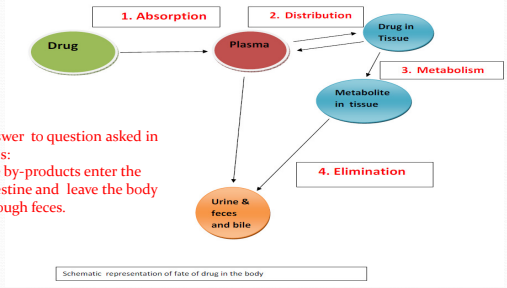
Principles of drug absorption



Fate of Drug after ingestion



Schematic representation of fate of drug in the body

Answer to question asked in class:
Bile by-products enter the intestine and leave the body through feces.

Factors Affecting Drug Absorption

1. Physiological properties
2. Physicochemical properties of the drug molecule e.g lipid solubility.
3. Dosage form characteristics and Formulation Factors (ingredients).

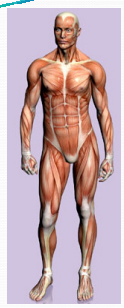
Table 5.3 shows factors influencing absorption.

Physiological properties:

1. Passage of drugs across membranes
   - Active transport.
   - Facilitated diffusion.
   - Passive diffusion.

   } Differences?
2. Gastrointestinal physiology
   - Characteristics of GIT physiology and drug.
   - Gastric emptying time and motility. How does it affect absorption of drugs?
   - Malabsorption or pathologic condition.

Drug Delivery…getting the drug into the body



Pharmacokinetics? **Pharmacodynamics?**

Systemic	drug considered in the body only when it shows up in blood
Topical/local	When applied to the site

What is the concept of bioavailability

What are Prodrugs? Why use them?

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Routes of administration

Oral To be swallowed	**Topical** To be applied to a body surface (skin or mucosa)	**Parenteral** To be injected
For local effect in the GIT	For local effect at the site of application	For local effect at the site of the injection
For systemic effect upon absorption from the GIT	For systemic effect upon absorption into the blood stream	For Systemic effect upon absorption into the bloodstream
	Topical Oral Buccal Sublingual Otic/Aural Nasal Ocular Vaginal Urethral Rectal	IV SC IM ID IP IT

text book chapter 5

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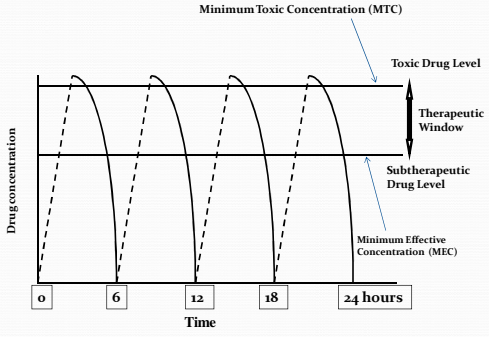
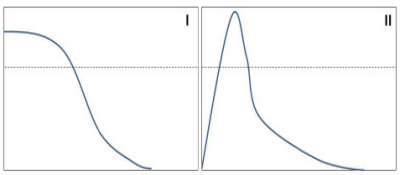
Plasma concentration v/s time



Plasma concentration time profiles



Both profiles resulted from administration of different formulations of the same therapeutic moiety. The horizontal dotted line represents the minimum therapeutic concentration.

What is a Prodrug?

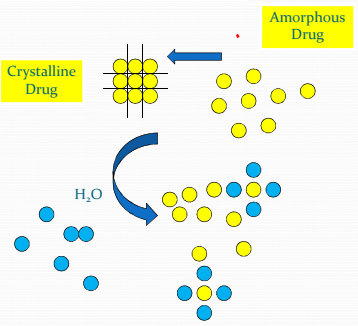
- Inactive Drug —ENZYMES→ **Active drug**

EXAMPLES of Prodrugs

1. Cortisone ___Hydrocortisone
2. Prednisone____Prednisolone
3. _____?_____ Dopamine

- Advantages:
- Enhance absorption
- Reduce side effects
- Target site (specific delivery)
- Increase bioavailability
- Mask taste (enhance palatability)
- Increase the duration of action.

Crystalline and Amorphous forms of Drugs



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Problem #1

- Drug A has a pKa of 3.5. At a gastric pH of 2, what percentage of the drug would exist in the ionized and unionized? Would absorption be expected for this drug in the stomach at pH of 2?

Note : you are asked to calculate the % of ionized and unionized.

Answer to Problem # 1

$$pH = pKa + \log\frac{(ionized)}{(unionized)}$$

$$2 = 3.5 + \log\frac{(ionized)}{(unionized)}$$ Hint : take inverse log to solve

$$-1.5 = \log\frac{(ionized)}{(unionized)}$$

$$0.03162 = \frac{ionized}{unionized}$$

$$(ionized) = 0.03162(unionized)$$

We know (ionized) +(unionized)= 1 Substitute 0.03162(unionized) for ionized

0.03162(unionized)+(unionized)= 1 = 0.03162 X+ X= 1 solve for X, X=unionized

(unionized)= 96.9% and (ionized)= 3.1%

Yes, absorption is expected as the drug exists primarily in the unionized.

Problem #1 Calculating Ratio

Calculating Ratio of $[A^-]/[HA]$

$$pH = pKa + \log\frac{(ionized)}{(unionized)}$$

$$2 = 3.5 + \log\frac{(ionized)}{(unionized)}$$ Hint : take inverse log to solve

$$-1.5 = \log\frac{(ionized)}{(unionized)}$$

$$0.03162 = \frac{ionized}{unionized}$$

Ratio of ionized/ unionized $([A^-]/[HA])$= 0.03162
i.e unionized is more.