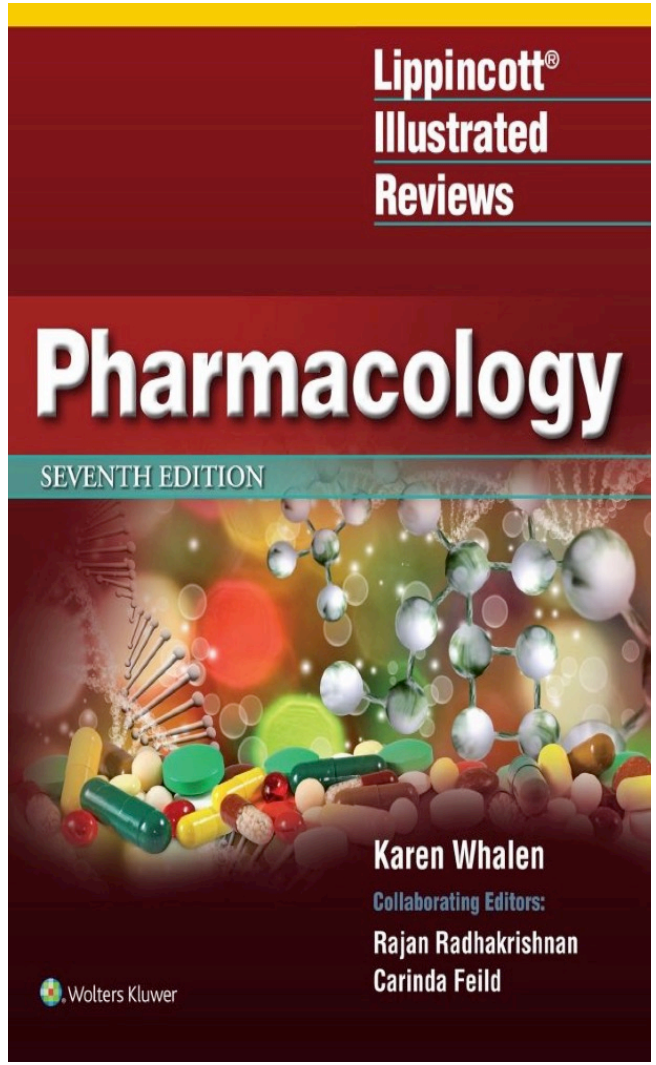
Pharmacology I

3 hrs/week

Ref: Lippincott Illustrated Pharmacology



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PHARMACOLOGY

What is a Drug?

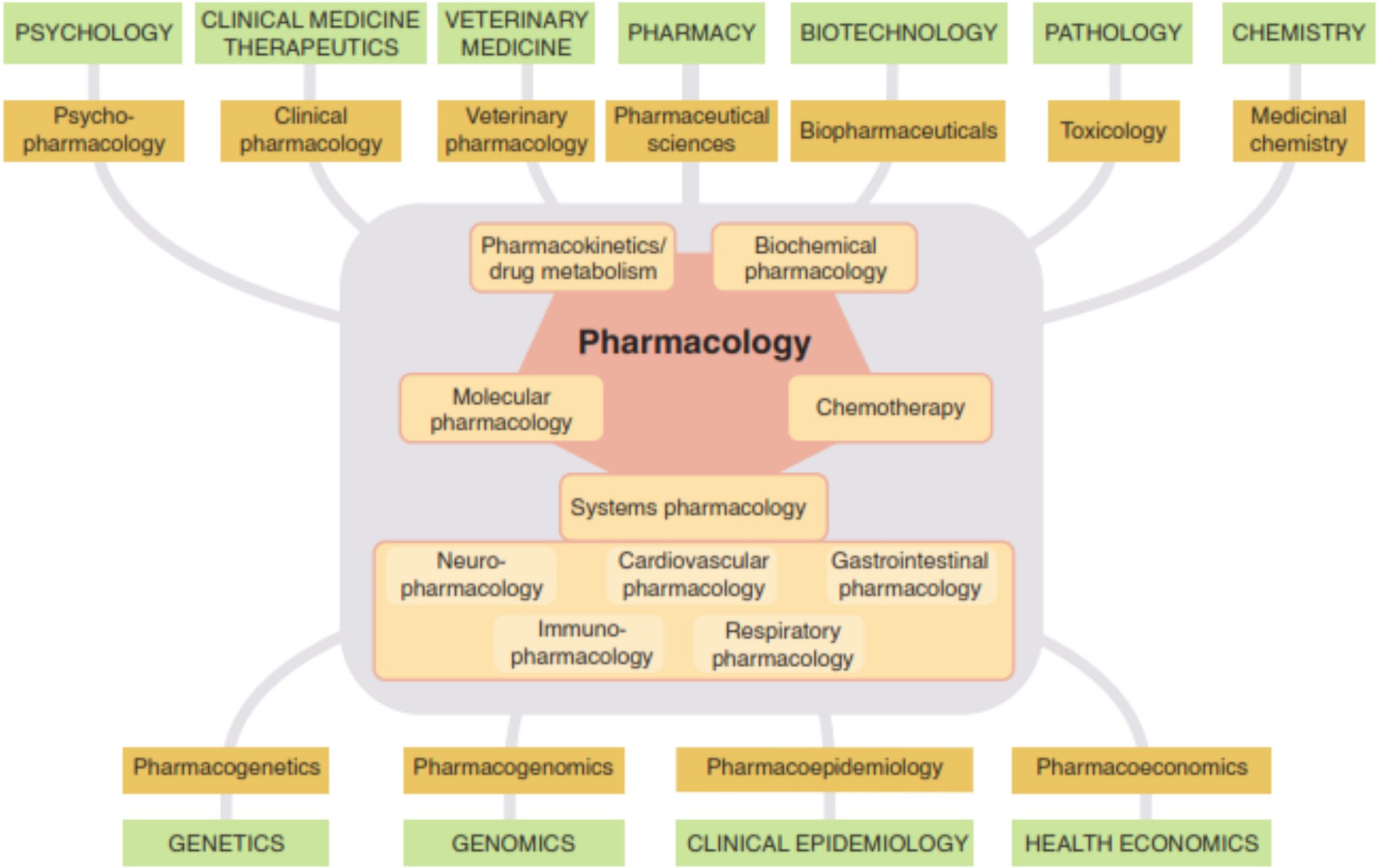
- *A chemical substance of known structure, other than nutrients or essential dietary ingredients, which, when administered to a living organism, produces a biologic effect*

What is a Medicine

- *A chemical preparation, which usually, contains one or more drugs, given intentionally to have a therapeutic effect*

Pharmacology

- *The study of the effects of drugs on the function of living systems*
  - *Clinical pharmacology*
  - *Toxicology*



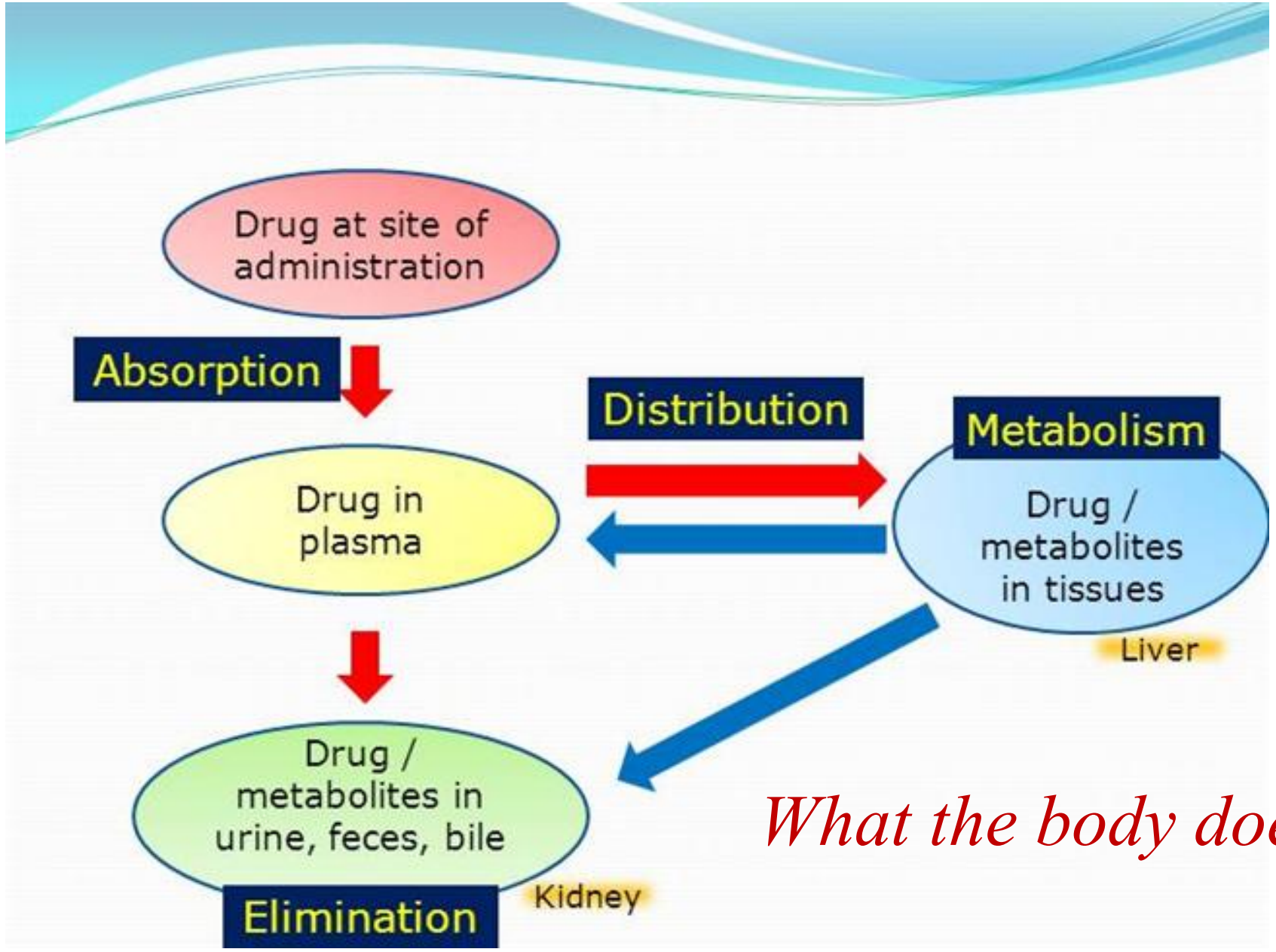
Pharmacology today with its various subdivisions

Interface disciplines (brown boxes) link pharmacology to other mainstream biomedical disciplines (green boxes)

Pharmacology (pharmakon = drug
logos = the study of ***)***

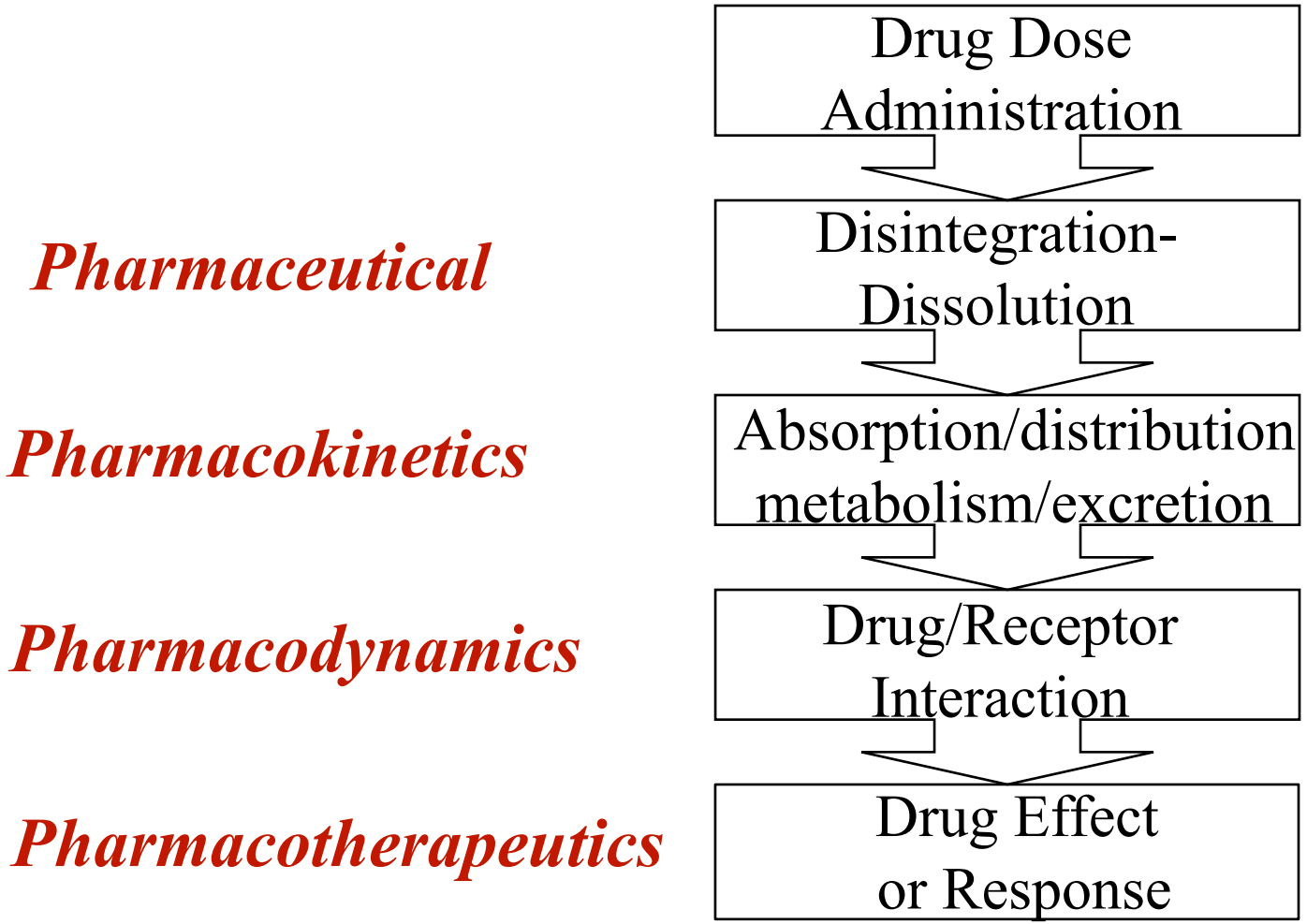
- *Pharmacodynamics:* how drugs, alone and in combination, affect the body (young, old, well, sick).
- *Pharmacokinetics:* absorption, distribution, metabolism, excretion or how the body – well or sick – affects drugs.

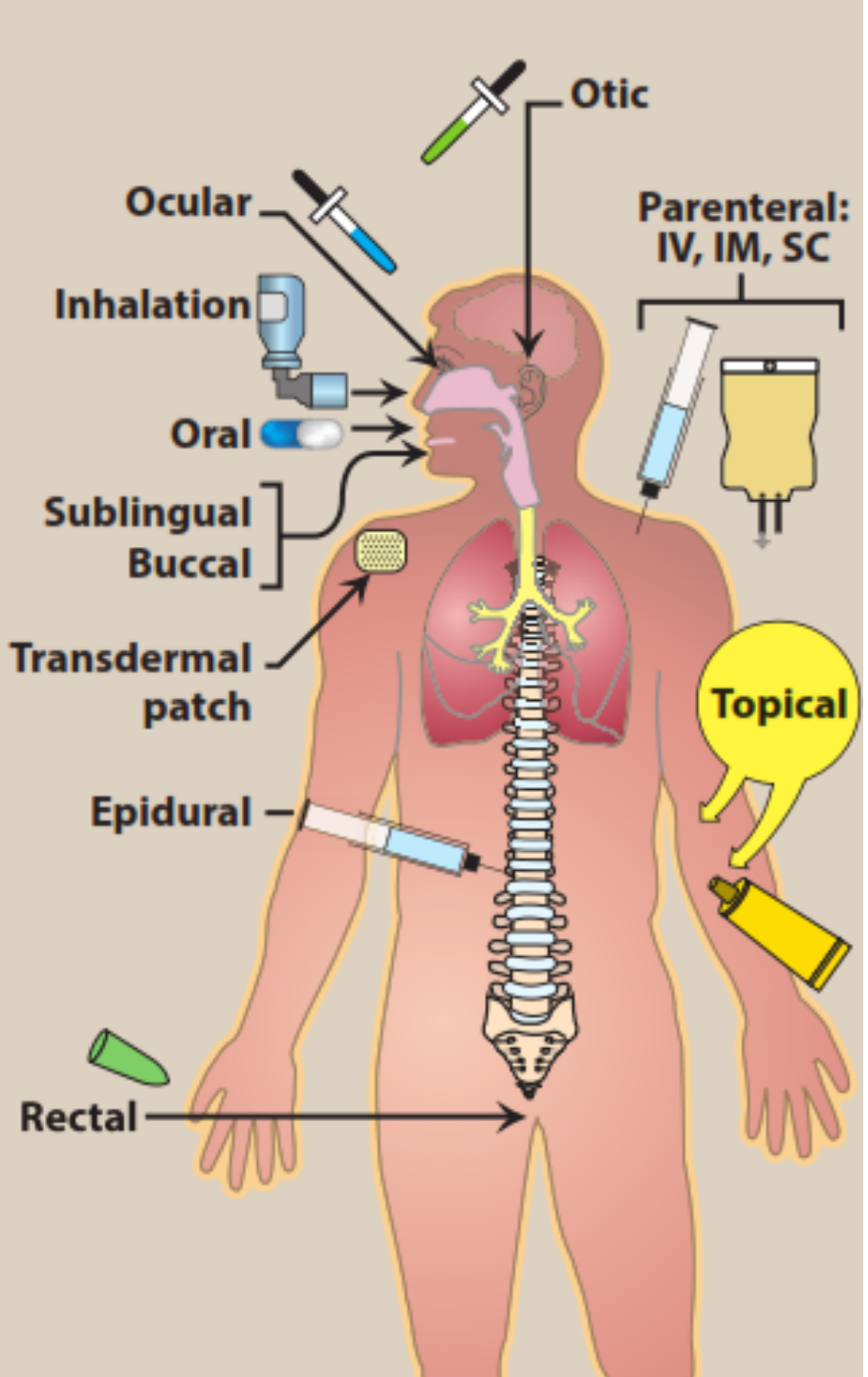
Pharmaokinetics



What the body does to a drug

General Concepts





Routes of Drug Administration

1-Enteral

I- *Oral*

a- *Enteric-coated preparations*

b- *Extended-release preparations*

II- *Sublingual*

2- *Parenteral*

I- *Intravenous (IV)*

II- *Intramuscular (IM)*

III- *Subcutaneous (SC)*

3- *Other*

I- *oral inhalation*

II- *nasal inhalation*

III- *intrathecal / intraventricular*

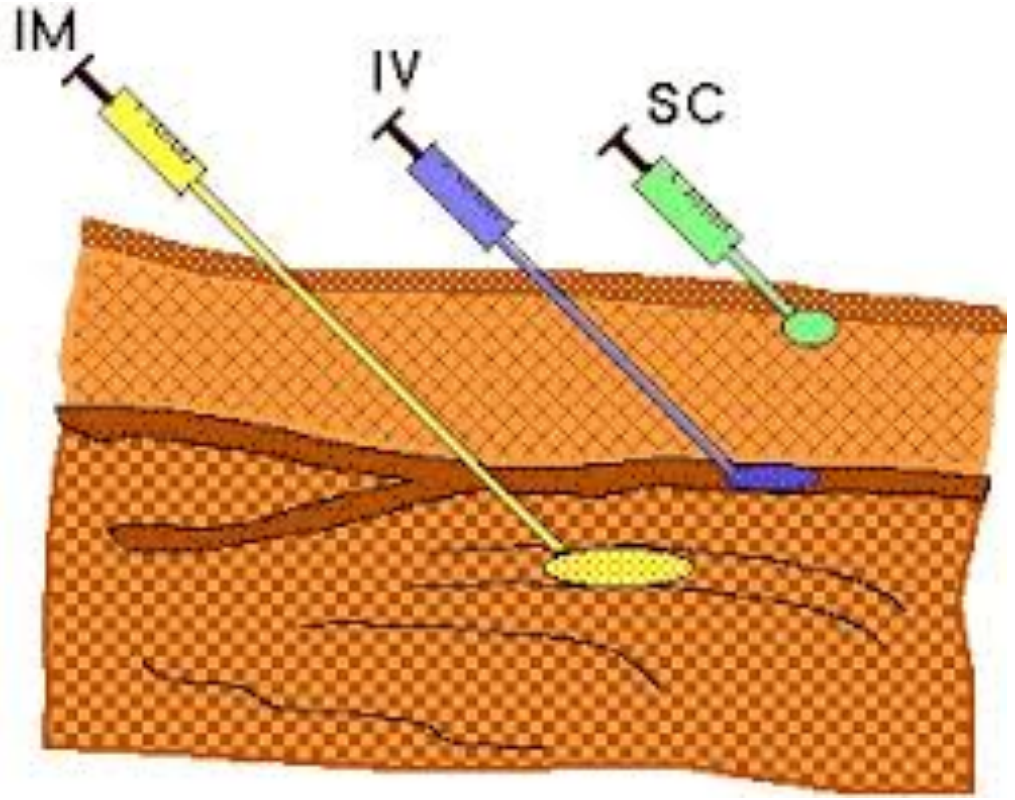
IV- *topical*

V- *transdermal*

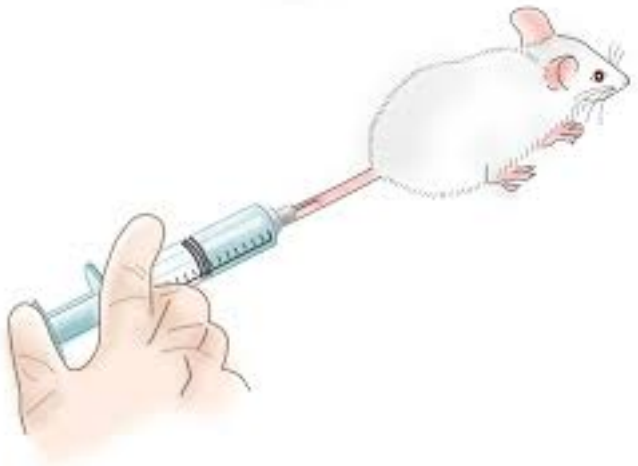
VI- *rectal*

Parenteral Administration:

a- Intravenous administration
b- Intramuscular administration
c-Subcutaneous administration

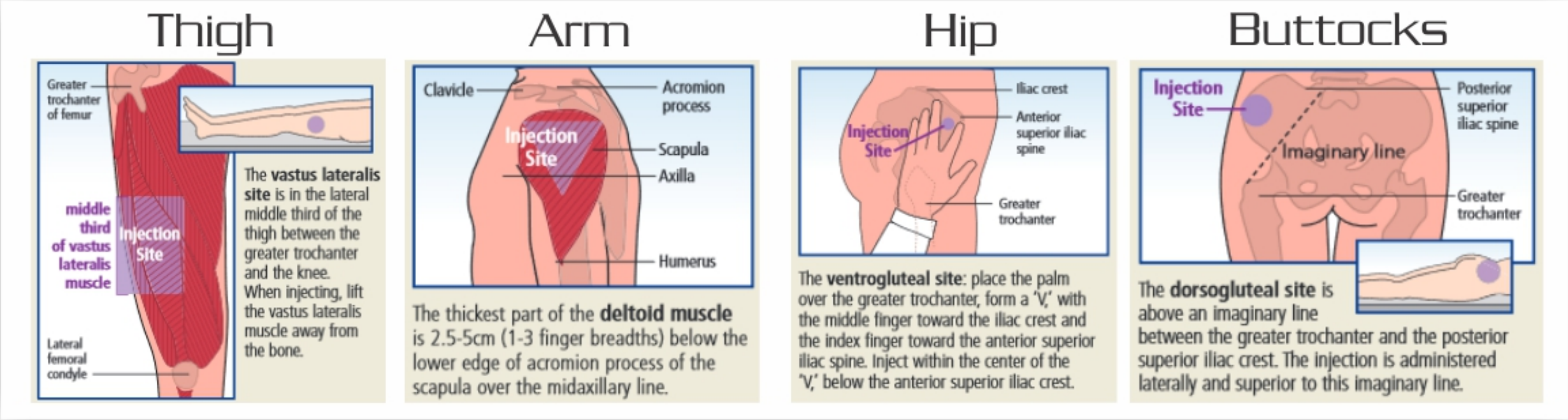


a- Intravenous administration



I- Advantages
II- Disadvantages

b- Intramuscular administration

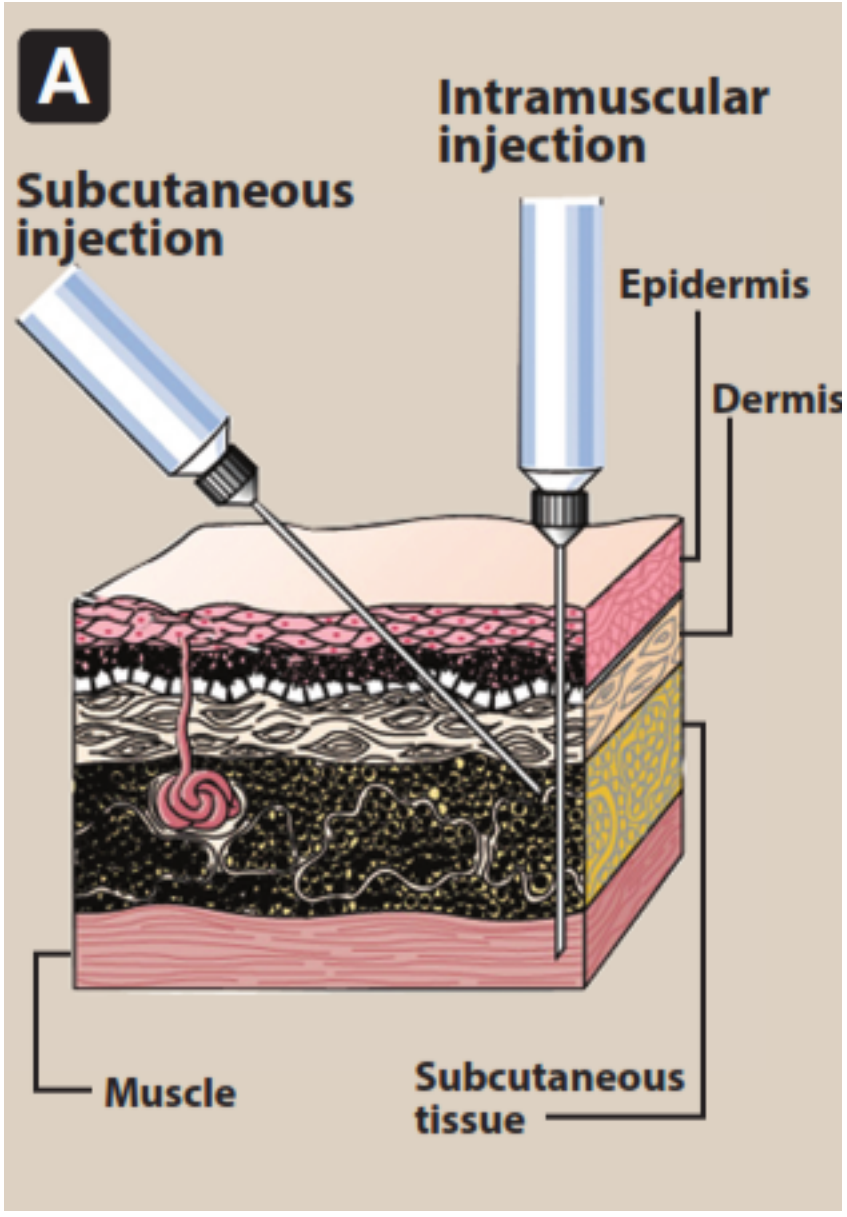


I- aqueous solutions

II-specialized depot preparations

e.g medroxyprogesterone

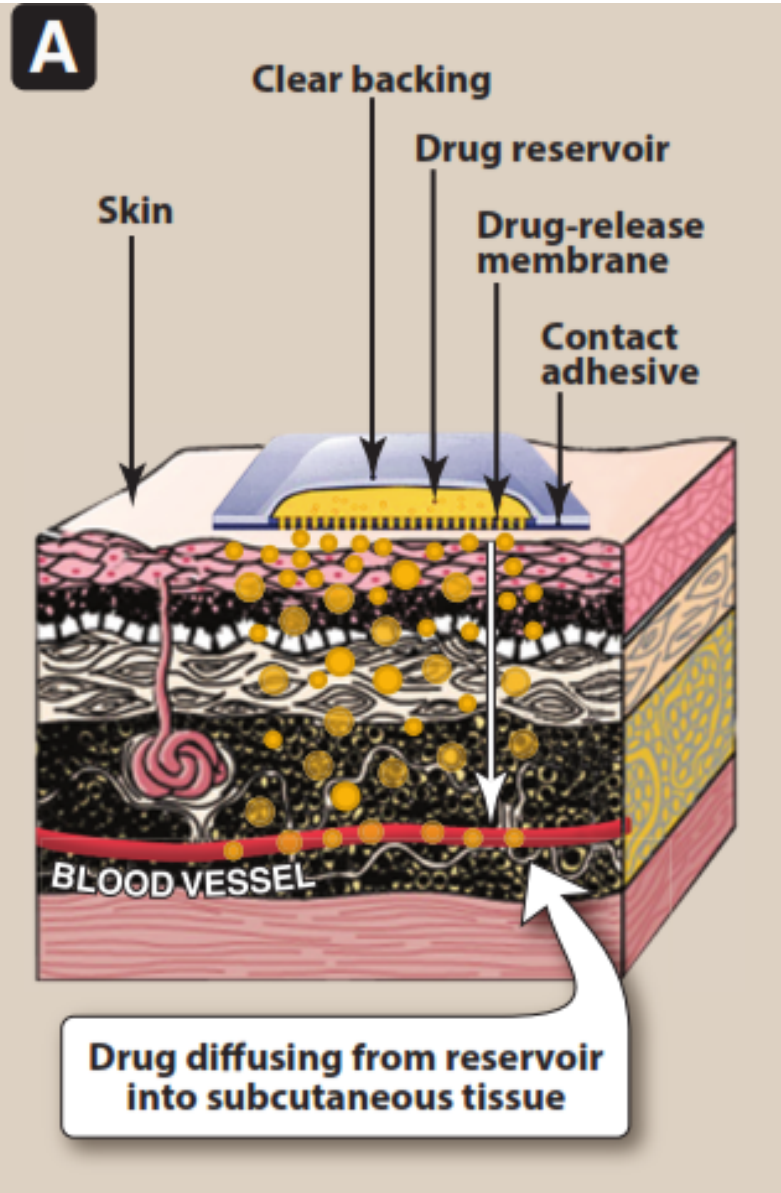
c-Subcutaneous administration

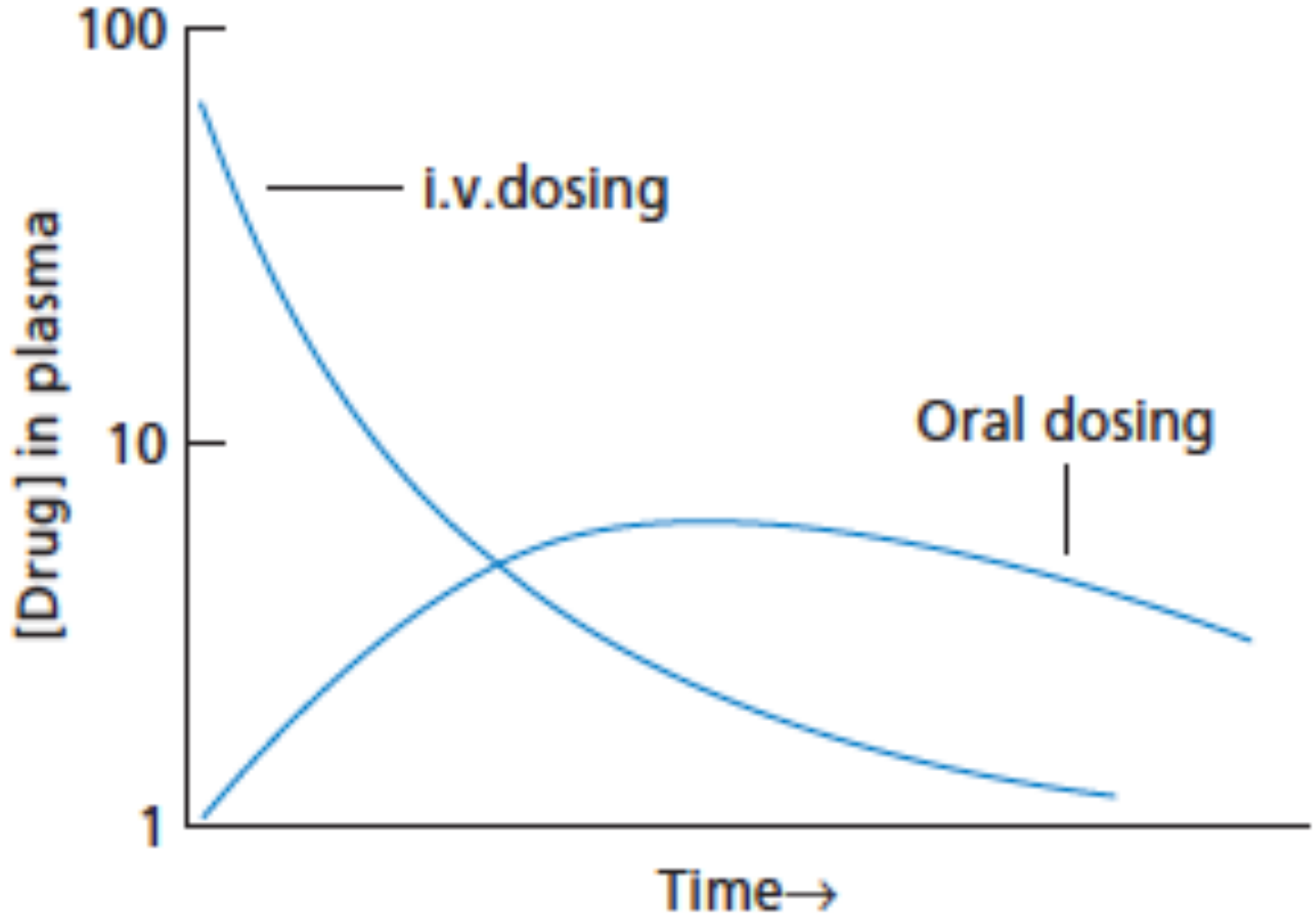


Other Routes

- *Oral inhalation*
- *Nasal Inhalation*
- *Intrathecal / intraventricular*
- *Topical*
- *Transdermal*
- *Rectal*

Transdermal Patch

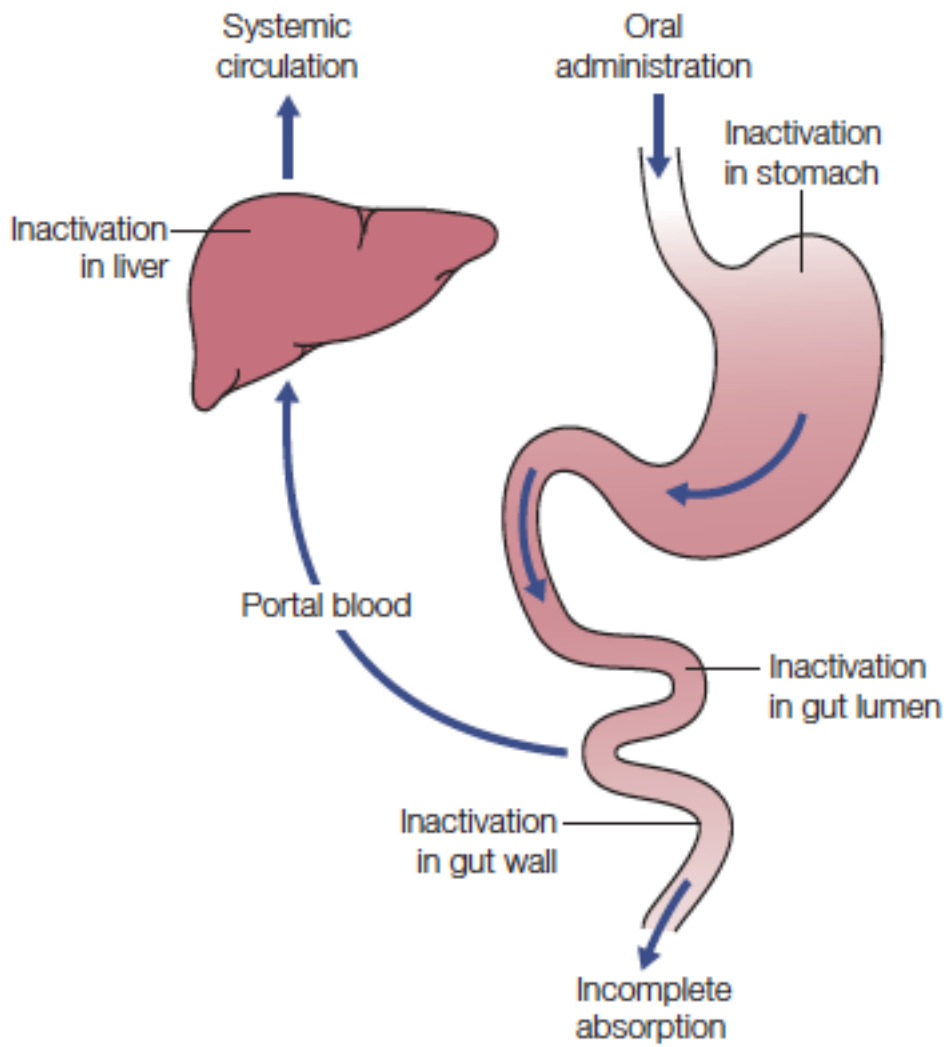



100
10
1
[Drug] in plasma
i.v.dosing
Oral dosing
Time→

ROUTE OF ADMINISTRATION	ABSORPTION PATTERN	ADVANTAGES	DISADVANTAGES
Oral	• Variable; affected by many factors	• Safest and most common, convenient, and economical route of administration	• Limited absorption of some drugs • Food may affect absorption • Patient compliance is necessary • Drugs may be metabolized before systemic absorption
Intravenous	• Absorption not required	• Can have immediate effects • Ideal if dosed in large volumes • Suitable for irritating substances and complex mixtures • Valuable in emergency situations • Dosage titration permissible • Ideal for high molecular weight proteins and peptide drugs	• Unsuitable for oily substances • Bolus injection may result in adverse effects • Most substances must be slowly injected • Strict aseptic techniques needed
Subcutaneous	• Depends on drug diluents: Aqueous solution: prompt Depot preparations: slow and sustained	• Suitable for slow-release drugs • Ideal for some poorly soluble suspensions	• Pain or necrosis if drug is irritating • Unsuitable for drugs administered in large volumes

ROUTE OF ADMINISTRATION	ABSORPTION PATTERN	ADVANTAGES	DISADVANTAGES
Intramuscular	• Depends on drug diluents: Aqueous solution: prompt Depot preparations: slow and sustained	• Suitable if drug volume is moderate • Suitable for oily vehicles and certain irritating substances • Preferable to intravenous if patient must self-administer	• Affects certain lab tests (creatine kinase) • Can be painful • Can cause intramuscular hemorrhage (precluded during anticoagulation therapy)
Transdermal (patch)	• Slow and sustained	• Bypasses the first-pass effect • Convenient and painless • Ideal for drugs that are lipophilic and have poor oral bioavailability • Ideal for drugs that are quickly eliminated from the body	• Some patients are allergic to patches, which can cause irritation • Drug must be highly lipophilic • May cause delayed delivery of drug to pharmacological site of action • Limited to drugs that can be taken in small daily doses
Rectal	• Erratic and variable	• Partially bypasses first-pass effect • Bypasses destruction by stomach acid • Ideal if drug causes vomiting • Ideal in patients who are vomiting, or comatose	• Drugs may irritate the rectal mucosa • Not a well-accepted route

ROUTE OF ADMINISTRATION	ABSORPTION PATTERN	ADVANTAGES	DISADVANTAGES
Inhalation	• Systemic absorption may occur; this is not always desirable	• Absorption is rapid; can have immediate effects • Ideal for gases • Effective for patients with respiratory problems • Dose can be titrated • Localized effect to target lungs: lower doses used compared to that with oral or parenteral administration • Fewer systemic side effects	• Most addictive route (drug can enter the brain quickly) • Patient may have difficulty regulating dose • Some patients may have difficulty using inhalers
Sublingual	• Depends on the drug: Few drugs (for example, *nitroglycerin*) have rapid, direct systemic absorption Most drugs erratically or incompletely absorbed	• Bypasses first-pass effect • Bypasses destruction by stomach acid • Drug stability maintained because the pH of saliva relatively neutral • May cause immediate pharmacological effects	• Limited to certain types of drugs • Limited to drugs that can be taken in small doses • May lose part of the drug dose if swallowed


Systemic circulation
Oral administration
Inactivation in stomach
Inactivation in liver
Portal blood
Inactivation in gut lumen
Inactivation in gut wall
Incomplete absorption

Enterohepatic circulation of drugs.