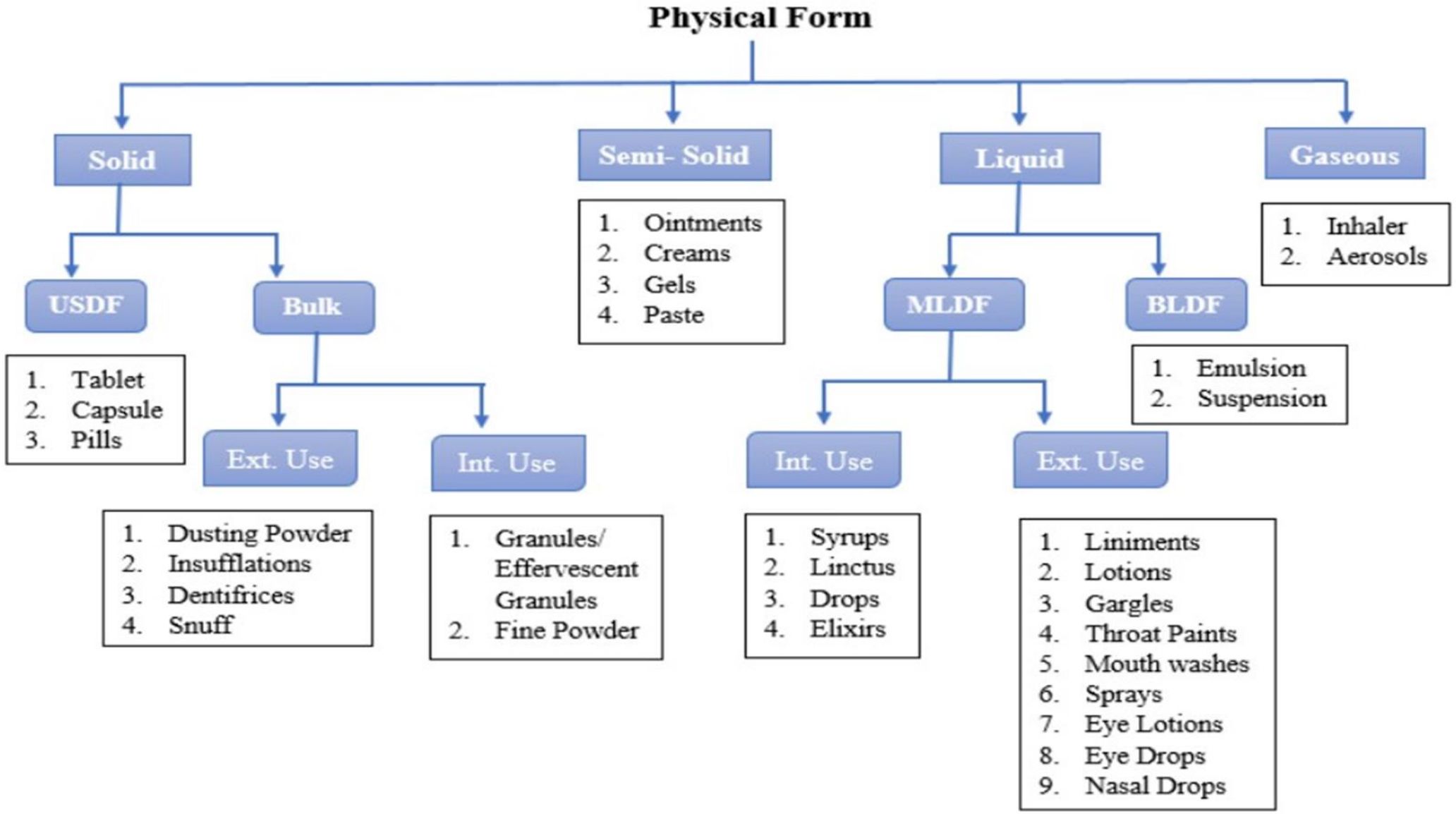
Routes of Drug Administration

By
Assistant Lecture Abdulazeez .M.H

Class III

المحاظرة السابقة



Routes of Administration

- Route of administration is determined by

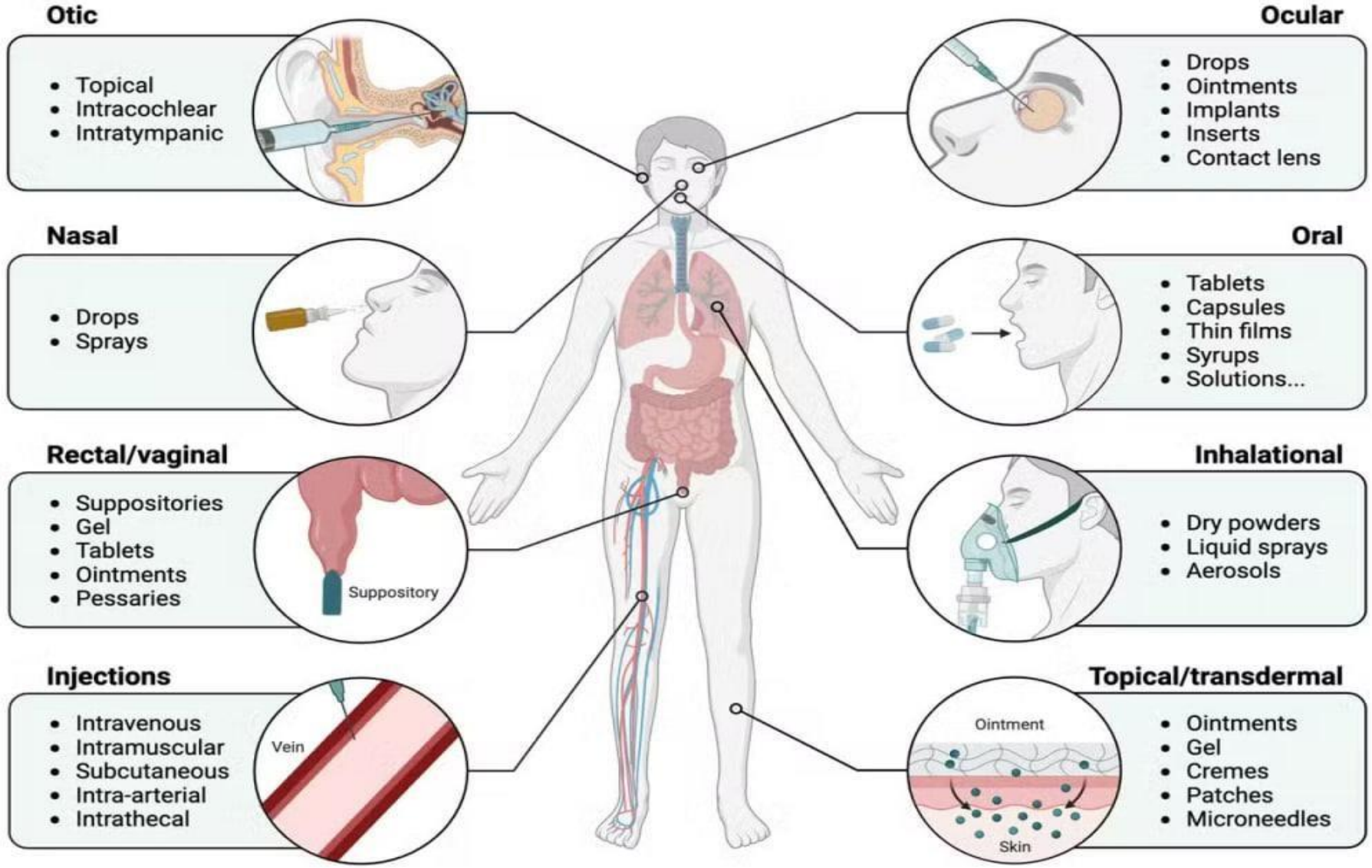
  properties of the drug

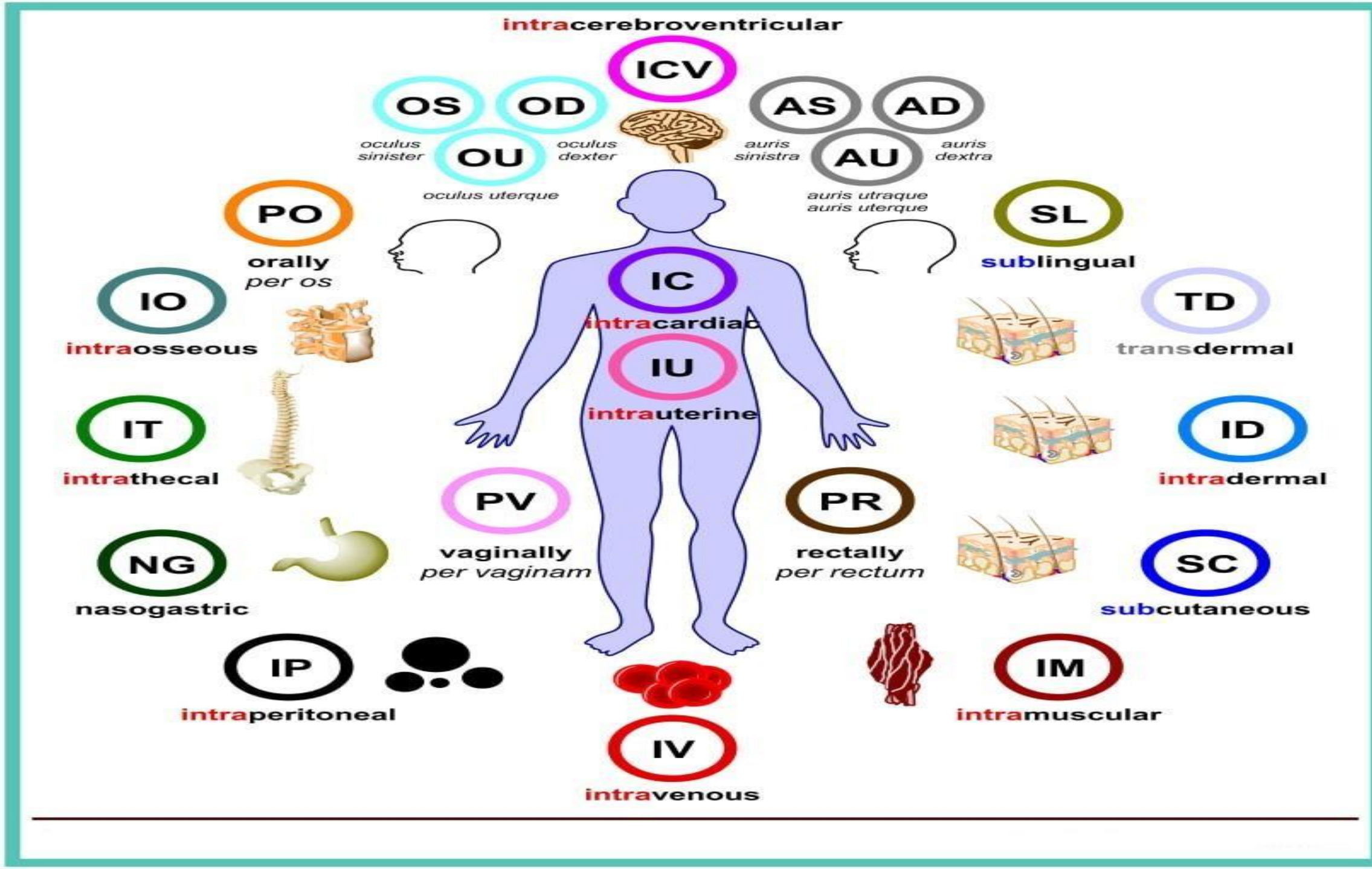
e.g. solubility (water or lipid), ionization

e.g. when we need rapid onset or long treatment regimen.

- *At site of action, the drug pharmacological effect, through which the expected therapeutic effect occurs and also possible side effects.*

Drug Administration Routes




intracerebroventricular
ICV
OS
OD
oculus sinister
oculus dexter
OU
oculus uterque
AS
AD
auris sinistra
auris dextra
AU
auris utraque
auris uterque
PO
orally
per os
SL
sublingual
IO
intraosseous
IC
intracardiac
TD
transdermal
IU
intrauterine
IT
intrathecal
ID
intradermal
PV
vaginally
per vaginam
PR
rectally
per rectum
NG
nasogastric
SC
subcutaneous
IP
intraperitoneal
IM
intramuscular
IV
intravenous

Enteral administration

- The most common, convenient, & economical method
- Swallowed, allowing oral delivery ,
- Placed under the tongue (sublingual)
- Placed between the gums and cheek (buccal)

Advantages

easy self-administered

overcome drug toxicities and/or overdose of oral drugs with antidotes,

However, the pathways of absorption highly complicated, and low gastric pH inactivates some drugs.

Enteral administration

Enteral administration

Oral Dosage Forms

Delayed-release vs. immediate-release medication

What are pills?

What are tablets?

What are caplets?

Smaller than tablets & coated with a film or gelatin coatingcreates a smoother finish .that makes caplets easier to swallow than tablets

?What are two-piece hard capsules

Composed of two cylindrical shells that fit together that encapsulate powders, granules, beads, .tablets and liquids – or a combination of these items

:Most two-piece hard capsules are made of either gelatin (animal-based or plant-based material .Hydroxypropyl-Methyl Cellulose HPMC

Enteral administration

Sublingual (SL) & buccal

Advantages

Easy administration

Rapid absorption: 1 – 3 minutes

Bypass of gastric acidity

Avoidance of first-pass metabolism

- SL tablet
- SL strips
- Multi-purpose SL tablets
- SL drops
- SL Sprays
- SL lozenges

Enteral administration

Oral inhalation

- Rapid delivery of drug across the large surface area of mucous membranes of the respiratory tract and pulmonary epithelium.
- Drug effects are rapid .. almost like IV bolus.

Rectal Route .. e.g.

Suppositories Urethral Route ..

e.g. Urethral Bogies Vaginal

Route .. e.g. Vaginal Bogies

Parenteral administration

Parenteral Routes

The drug does not pass through the gastrointestinal tract. It directly reaches to the blood.

May be classified into:

With injections:

e.g. Intravascular, Intramuscular, Subcutaneous

Without injections

e.g. Inhalations.

Parenteral administration

Intravascular IV: 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

High concentration attained rapidly Risk of embolism

Parenteral administration

Intramuscular (IM)

Drug once reaches the muscles absorbs into the blood.

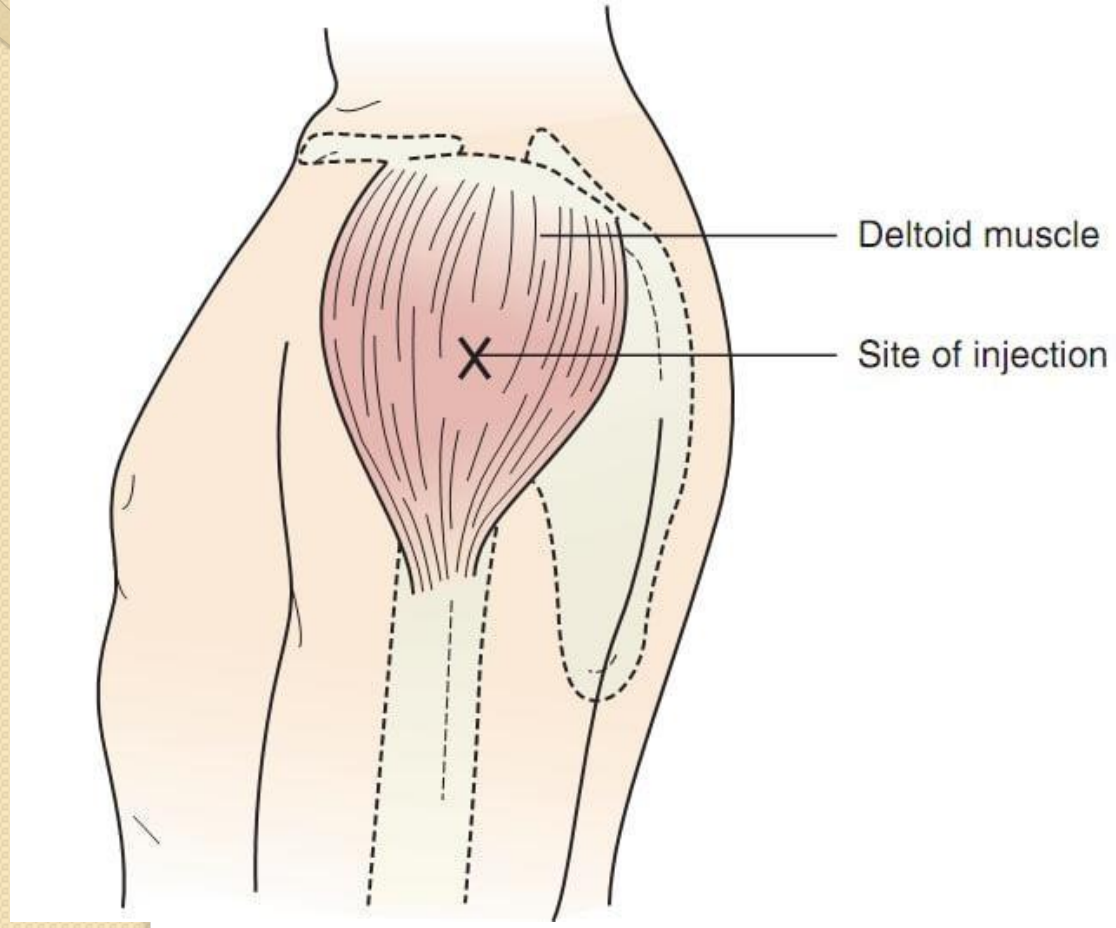
- Very rapid absorption of drugs in aqueous solution
- Depot and slow release preparations
- Pain at injection sites for certain drugs

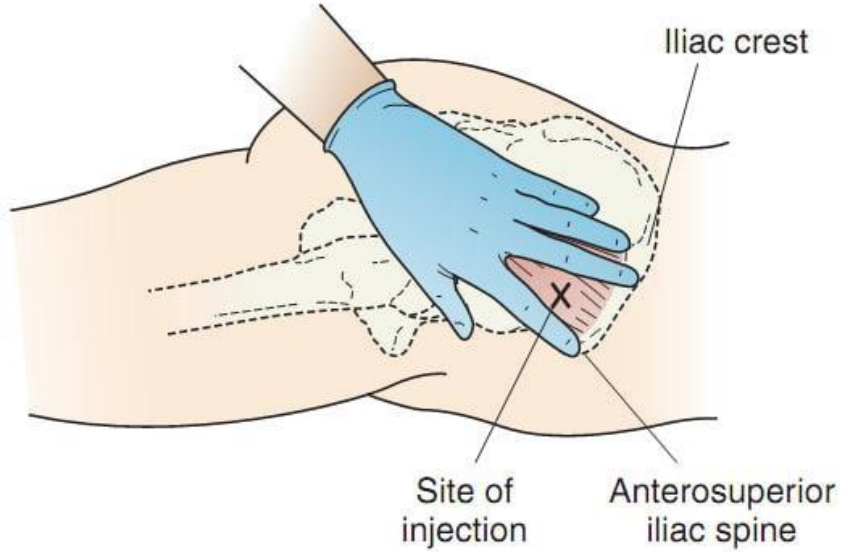
Subcutaneous (SC)

Drug once reaches to the subcutaneous layer crosses the membrane and absorbed into the blood.

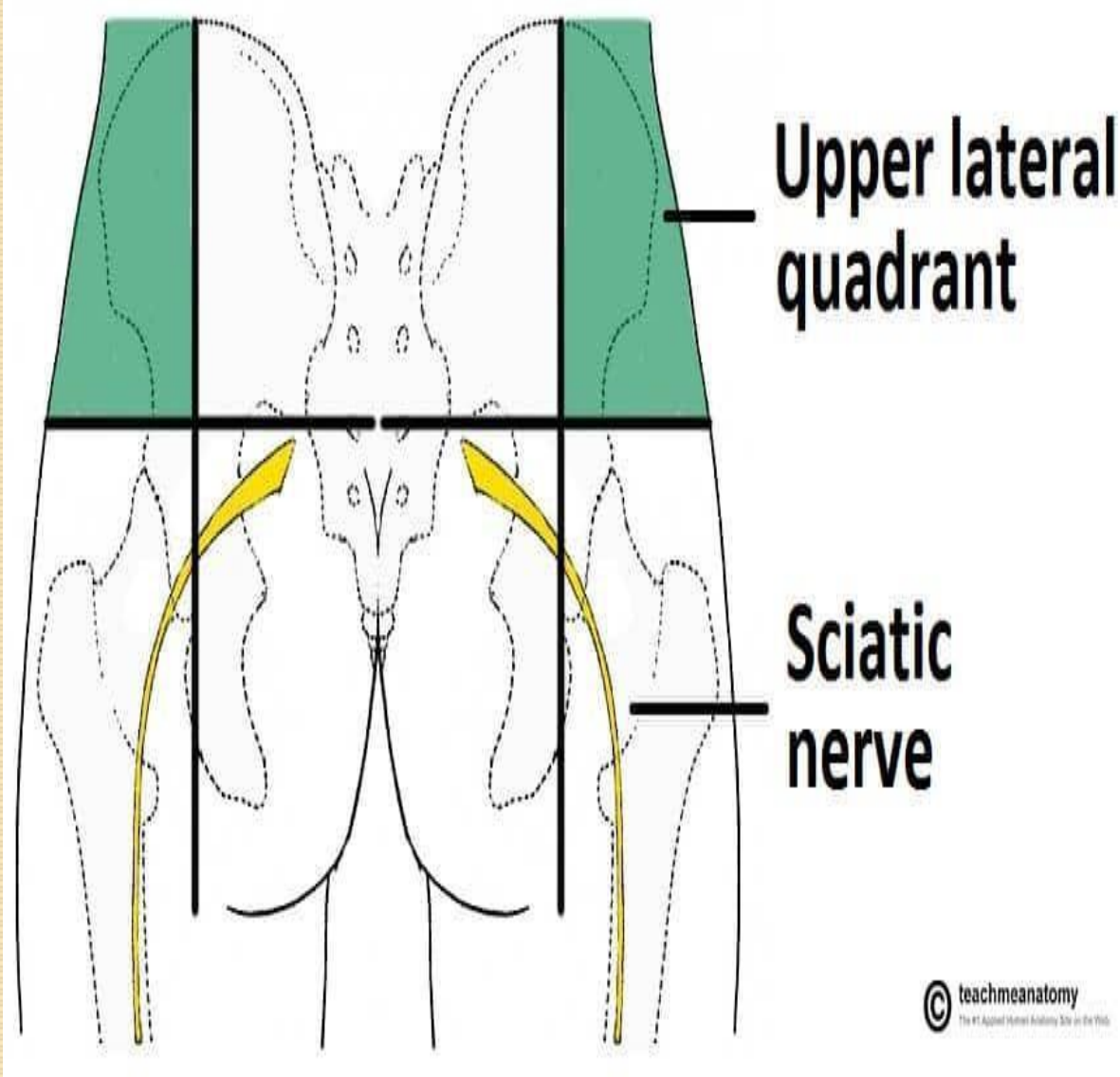
Bypass the GIT.

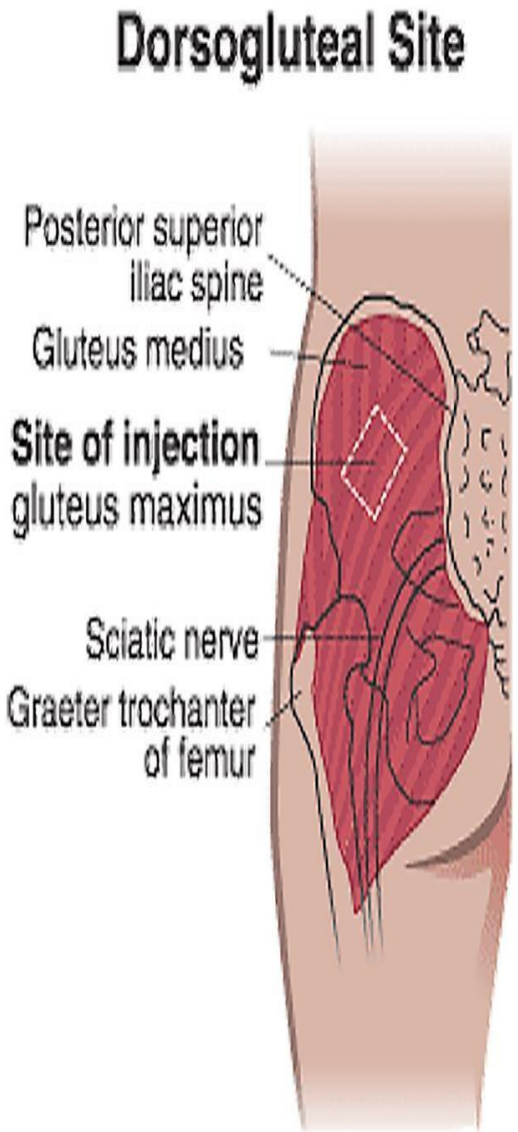
Intramuscular administration

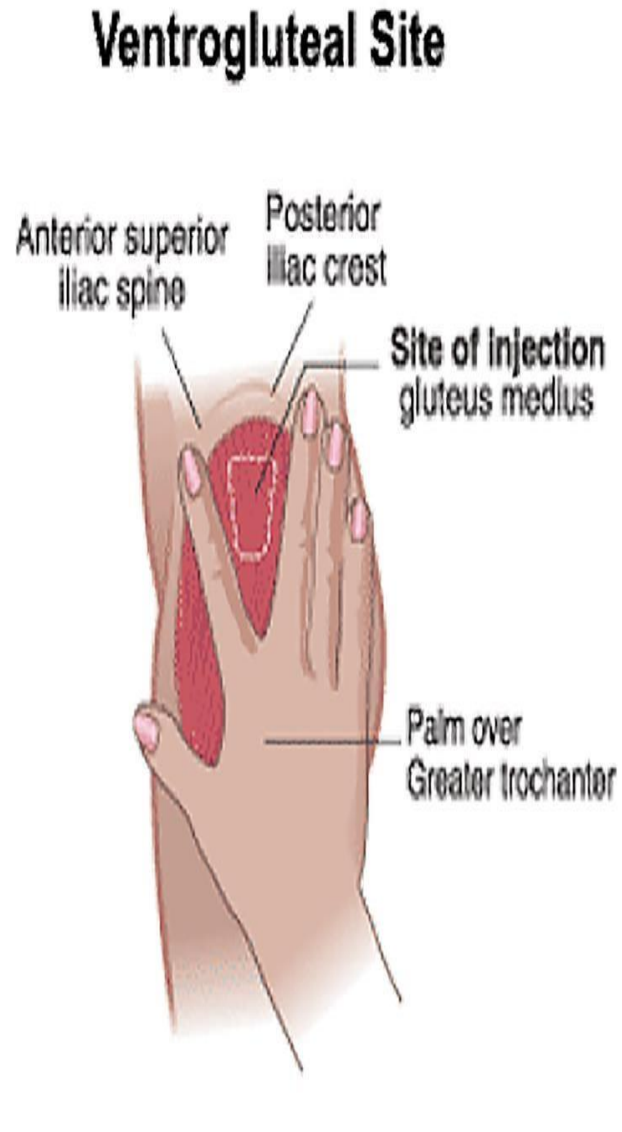




Intramuscular administration







Intramuscular administration

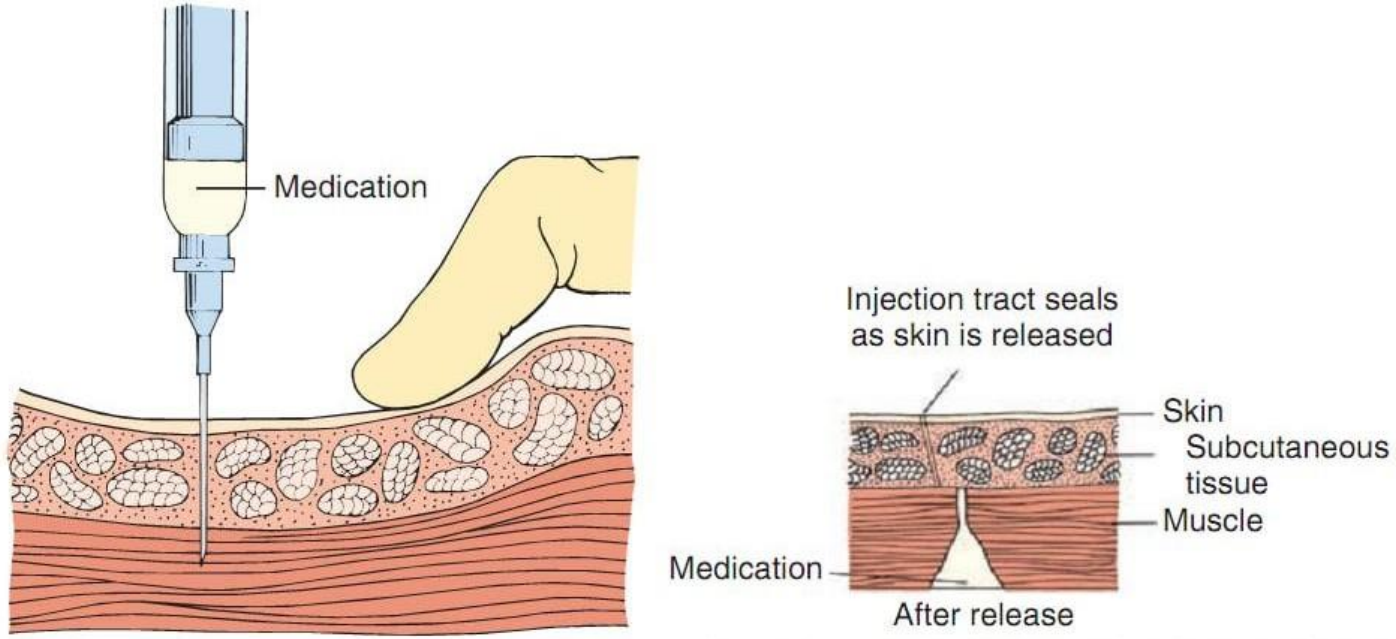


Fig. 9.43 Z-track method for intramuscular injections. (From Perry, A. G., & Potter, P. A. [2014]. *Clinical nursing skills and techniques* [8th ed.]. St. Louis, MO: Mosby.)

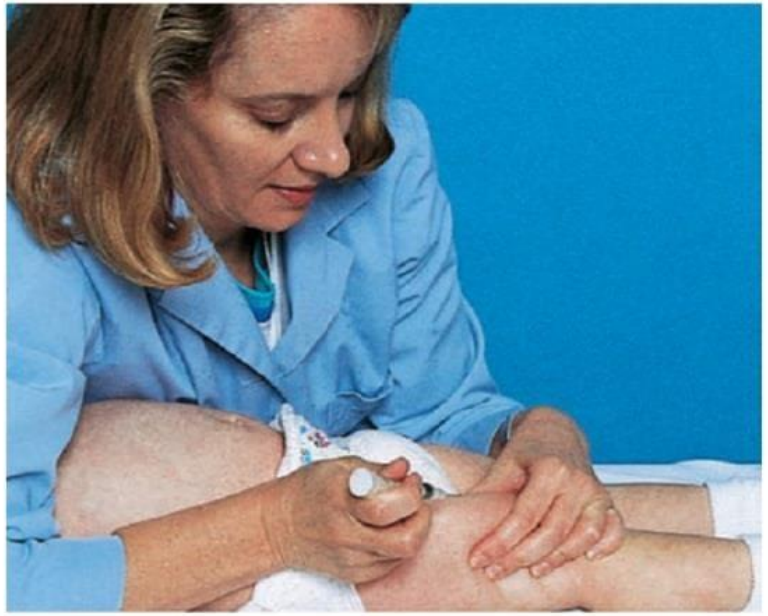


Fig. 9.46 Vastus lateralis intramuscular injection in a small child. The nurse stabilizes the leg before giving the injection.

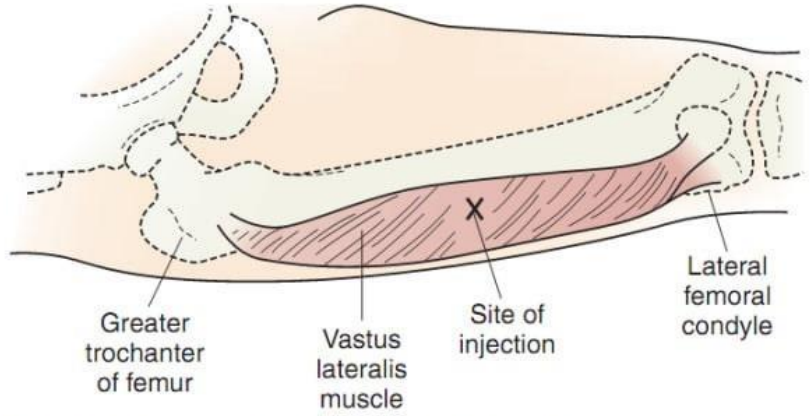


Fig. 9.47 Finding landmarks for a vastus lateralis intramuscular injection.

Subcutaneous administration

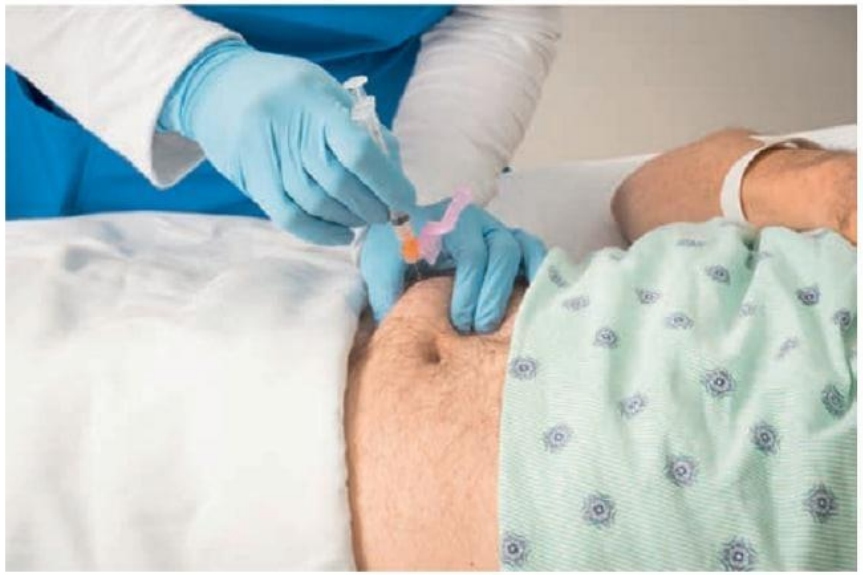


Fig. 9.39 When giving a subcutaneous injection in the abdomen, be sure to choose a site at least 2 inches away from the umbilicus.

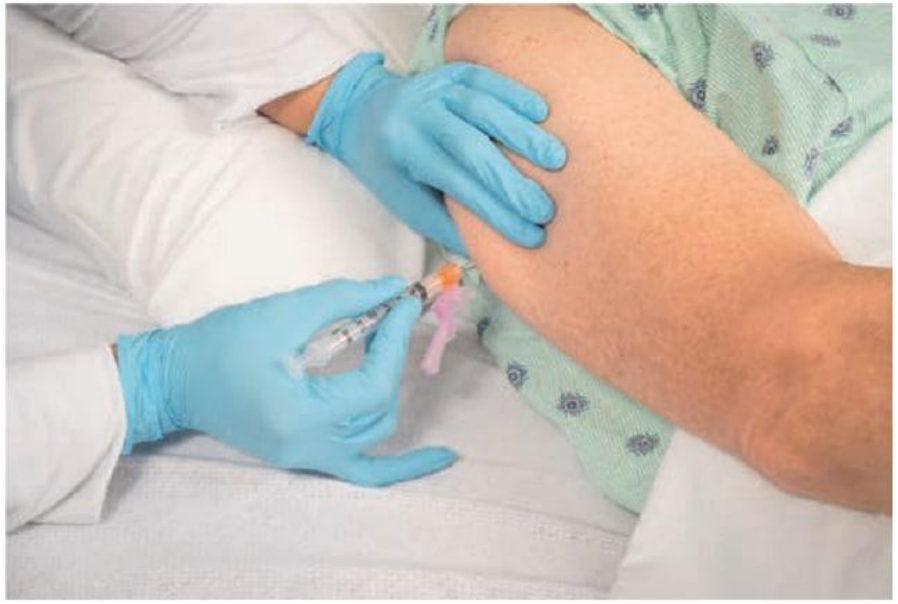


Fig. 9.38 Giving a subcutaneous injection at a 90-degree angle.

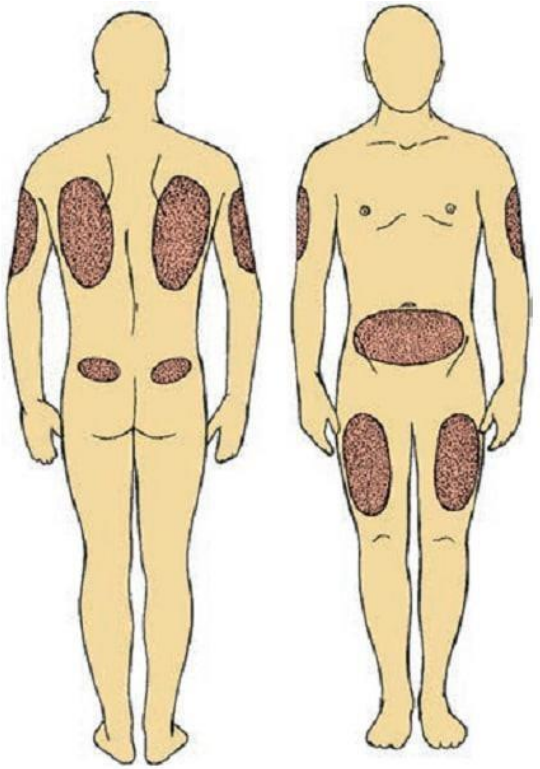
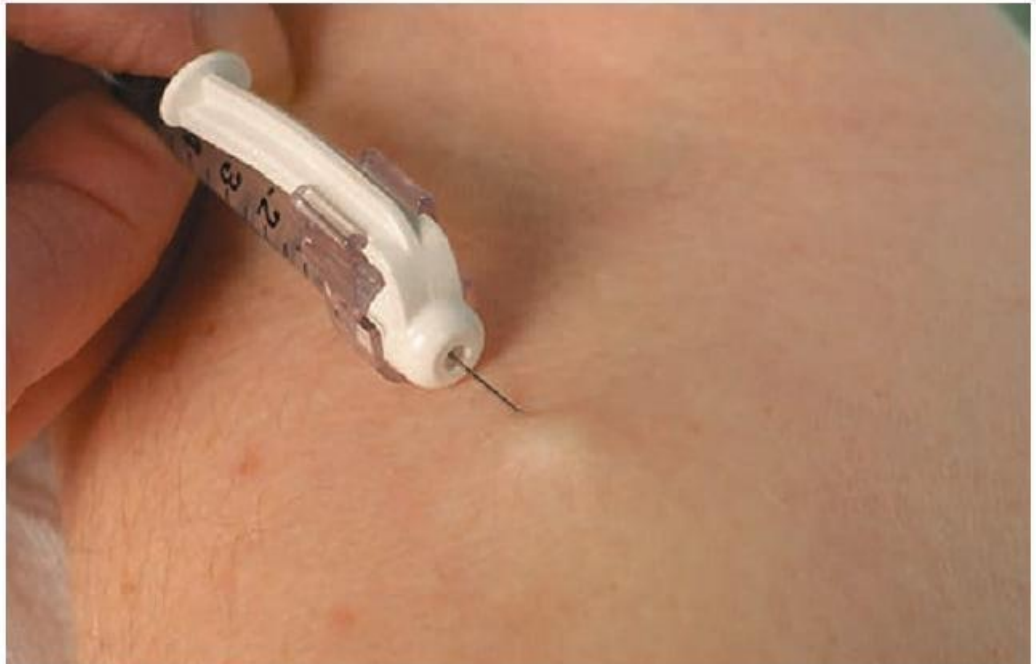
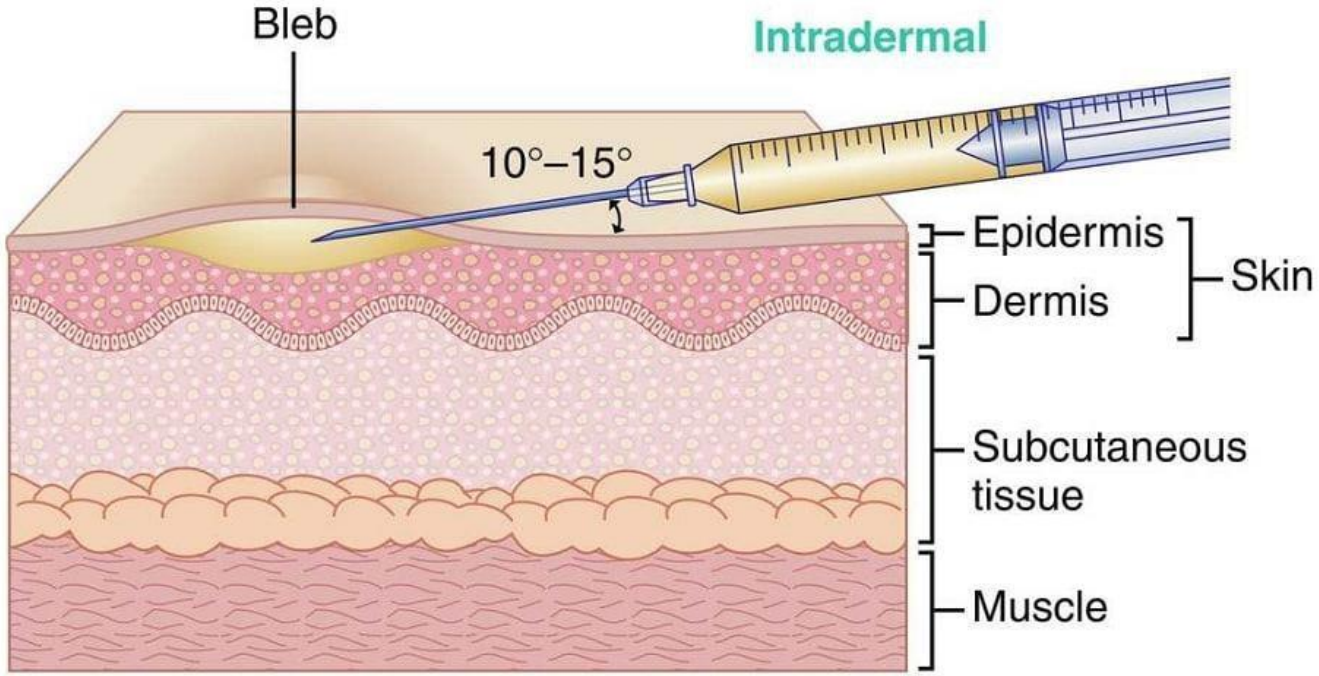
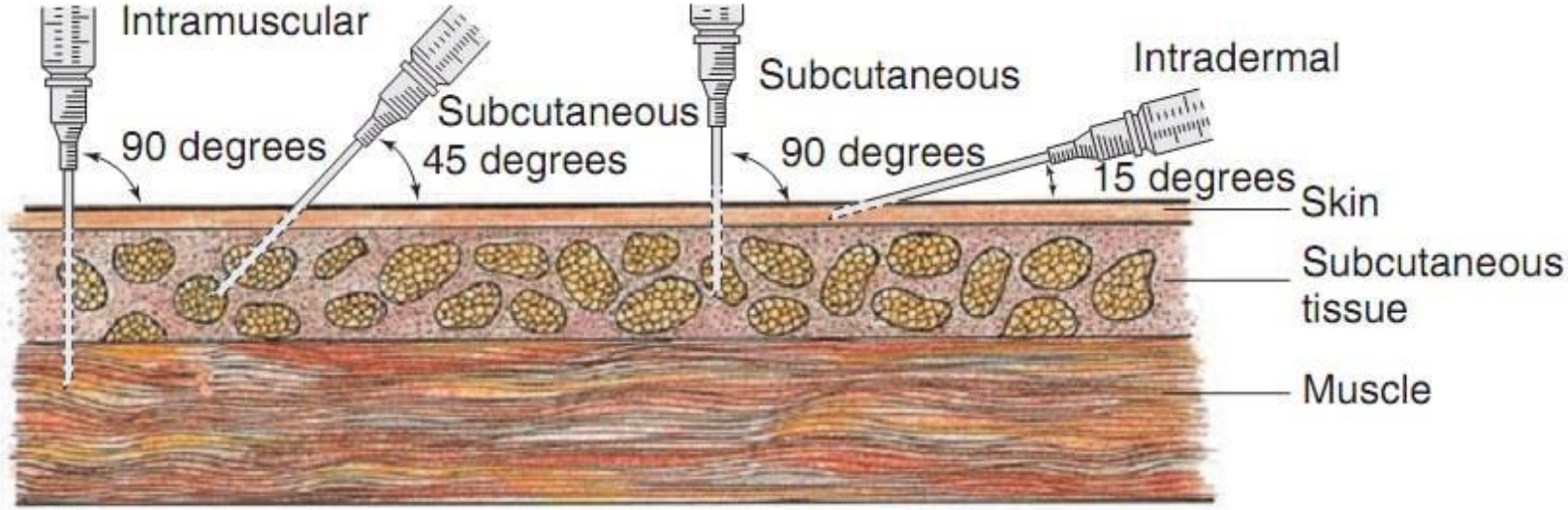


Fig. 9.36 Potential sites for subcutaneous injections. (From Perry, A.

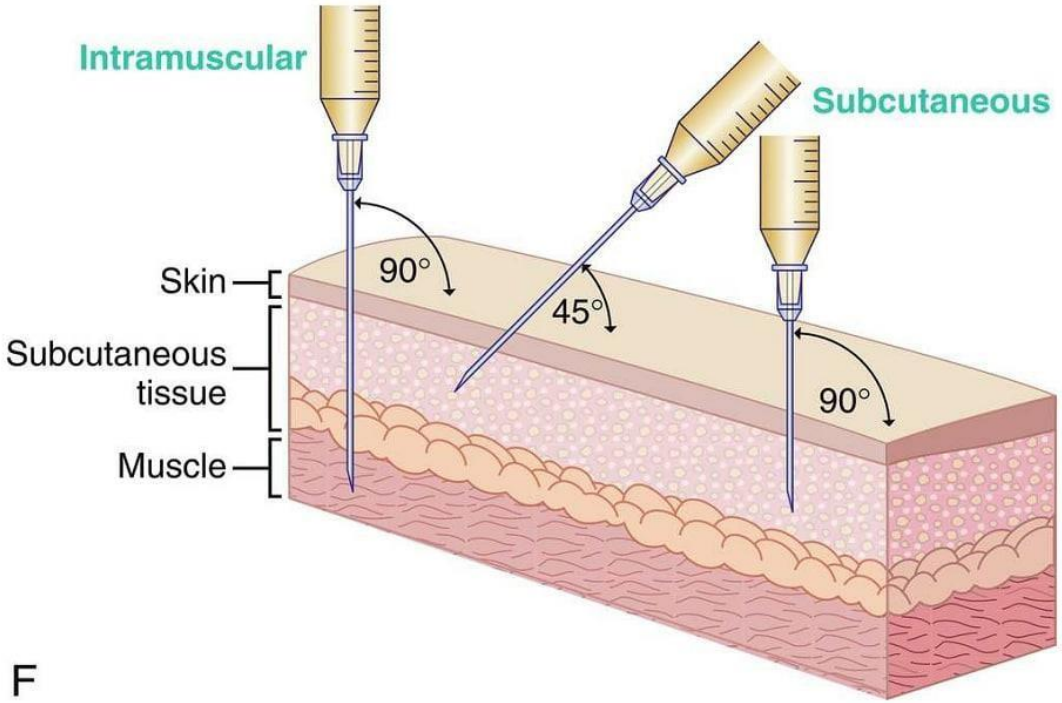


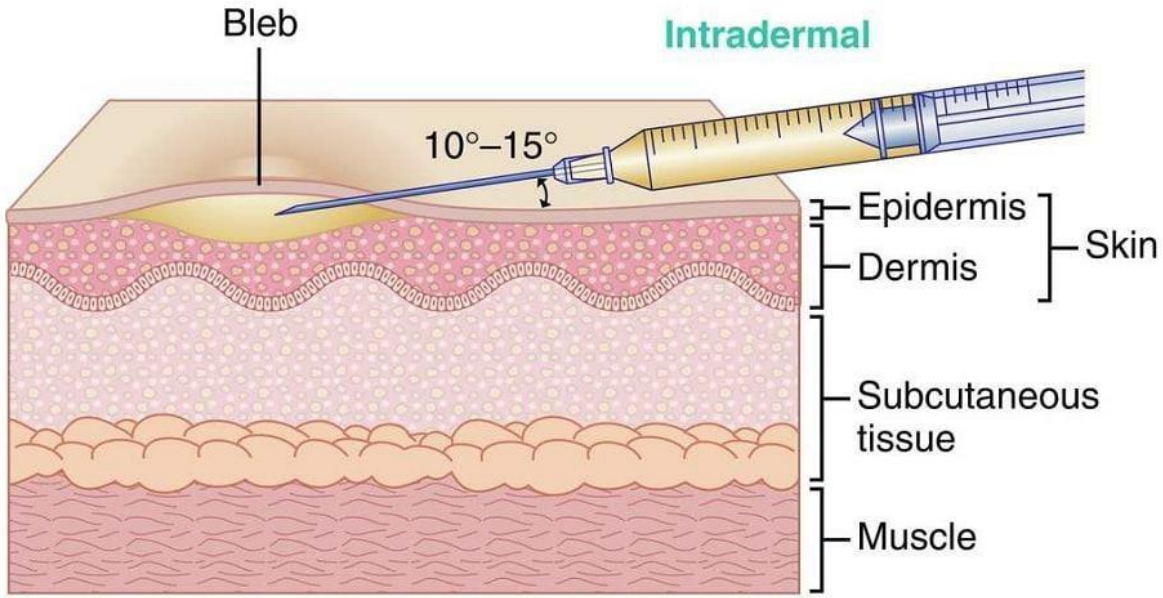
Intradermal administration



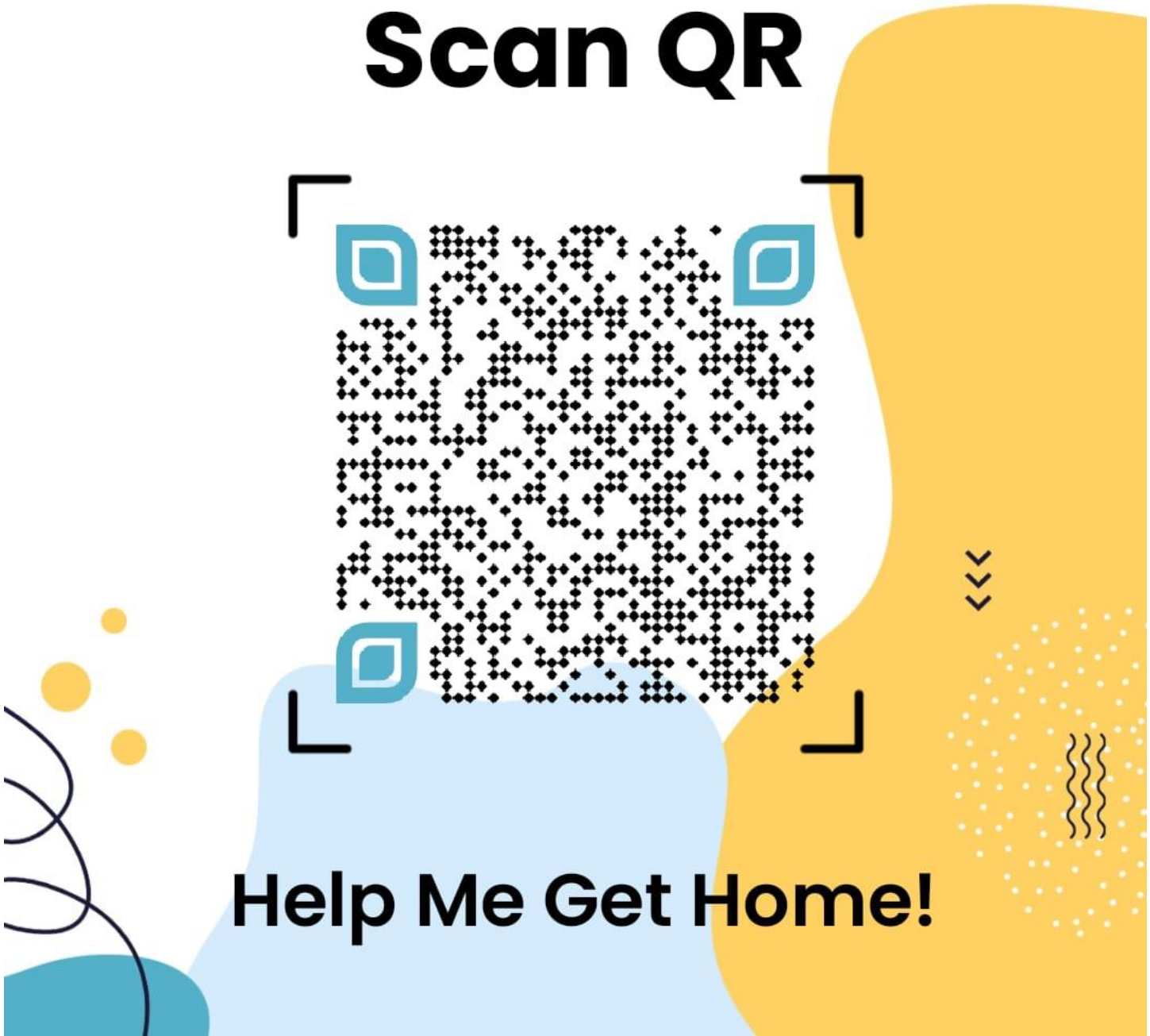


Comparison of angles of needle insertion for injections.





F


Scan QR
Help Me Get Home!

An 18 year old female patient is brought to emergency department due to drug overdose. Which of the following routes of administration is the most desirable for administering the **antidote** for the drug overdose?

A. Intramuscular
B. Intravenous
C. Oral
D. Subcutaneous
E. Transdermal

Onset of Action

- Onset of action of different routes

  - 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(

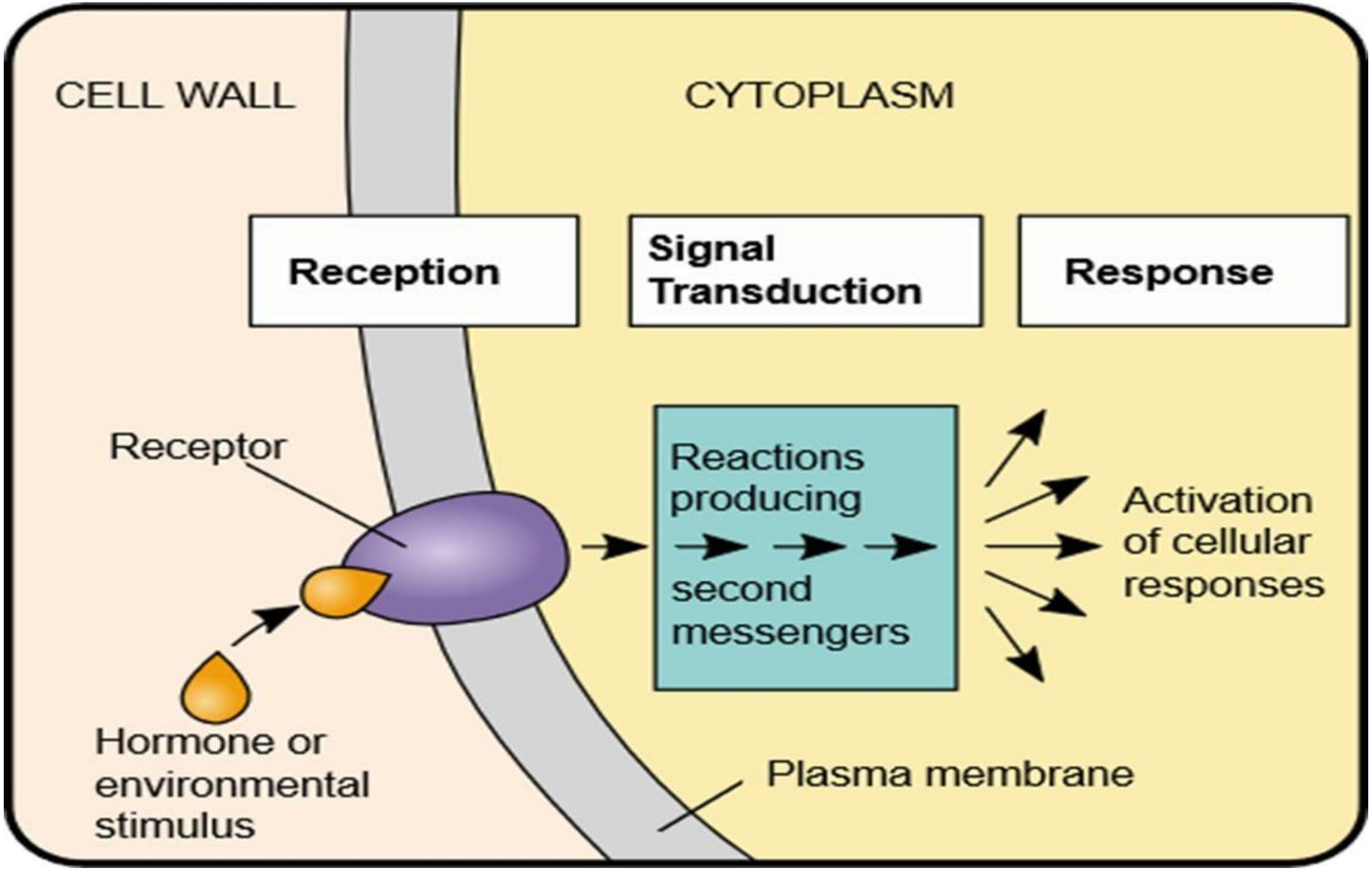
Signal transduction

It is a cellular mechanism converts a stimulus into a response in the cell

Effector molecules or “Second messenger” are part of the cascade of events that translates agonist binding into a cellular response.

Example
adrenaline (1st messenger) + β receptor → ↑ activity of adenylyl cyclase→ ↑cAMP {2nd messenger (effector molecule) } → response (either beneficial, or harmful → adverse effects.(

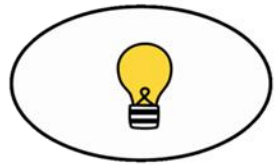
Signal transduction

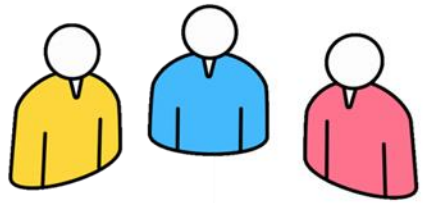


https://classroom.google.com/c/NzI4NDg2MDM2NzUw?cjc=wqi6q4r

مهمة

كوكل كلاس





SCAN ME

quizizz


Thank
you

General Pharmacology

Lab Sessions

Dosage forms

By
Assistant Lecture Abdulazeez .M.H

Class III

DOSAGE FORM

Dosage forms are pharmaceutical drug products in the form in which they are marketed for use, with a specific mixture of active ingredients and inactive components

Dosage Forms

Solid

Unit dosage form

- Tablet
- Capsule
- Powder
- Pills

Bulk dosage forms

- Fine powders & Granules
- Dusting powder
- Insufflations
- Dentifrice

Liquid

Monophasic

- Syrups
- Elixirs
- Linctus
- Drops

Biphasic

- Emulsions
- Suspensions

Semi solid

Internal

- Suppositories
- Pessaries

External

- Ointments
- Creams
- Paste
- Jellies

Others

Gaseous Prepn

- Inhalers
- Aerosols

1- SOLID PREPARATIONS

A- Tablets

B- Capsule

C- Pill

TYPES OF TABLETS

TABLETS

Ordinary tablets

prepared by forcing the powdered drug into solid mass

the powdered contain the drug alone or the drug with a suitable diluent into a solid mass using a mechanical machine with optimal degree of compression.

e.g. paracetamol tab.

ORDINARY TABLETS

Diluent: it is an inert substance (pharmacologically inactive) used to increase the size of the powder in order to make compression of tablet easier.

Some very common diluents in tablets include starch, cellulose derivatives, and magnesium stearate

COATED TABLET

A solid disc of one or more pharmaceutic agents that is coated with sugar

or a flavoring to mask the taste .

Enteric-coated, meaning that it is coated with a substance that resists dissolution in the stomach but allows release of the medication in the intestine.

It has the following advantages :

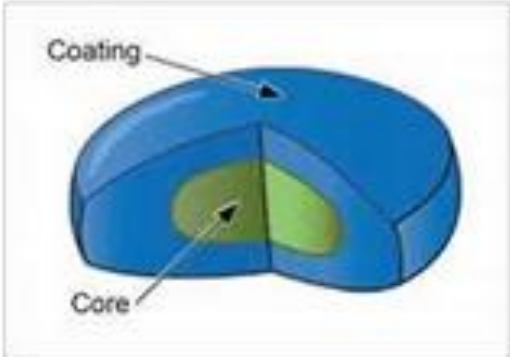
1- **to avoid the bitter taste of the drug**

2- **to prevent air oxidation of the drug**

3- **to facilitate swallowing in some patients**

4- **extending its shelf live. e.g. flu out tablet**

COATED TABLET



ENTERIC COATED TABLE

ordinary compressed tablet covered with acid resistant covering (salol) to allow the tablet to pass the stomach unchanged but is dissolved in the alkaline medium of the intestine

e.g. Aspirin

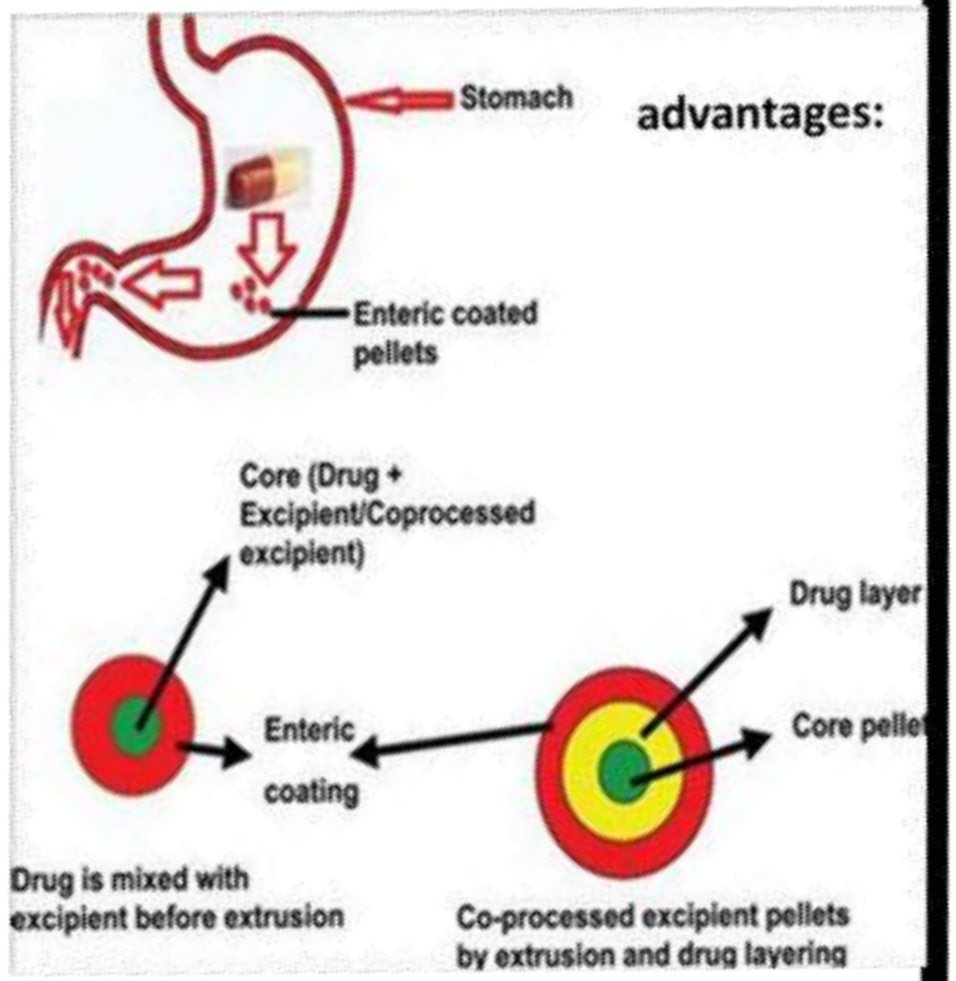
an oral dosage form in which a tablet is coated with a material to prevent or minimize dissolution in the stomach but allow dissolution in the small intestine..

ENTERIC COATED TABLET

1- avoid irritation

2- prevent drug destruction

3-to get local action



SUSTAIN RELEASE TABLET(SR)

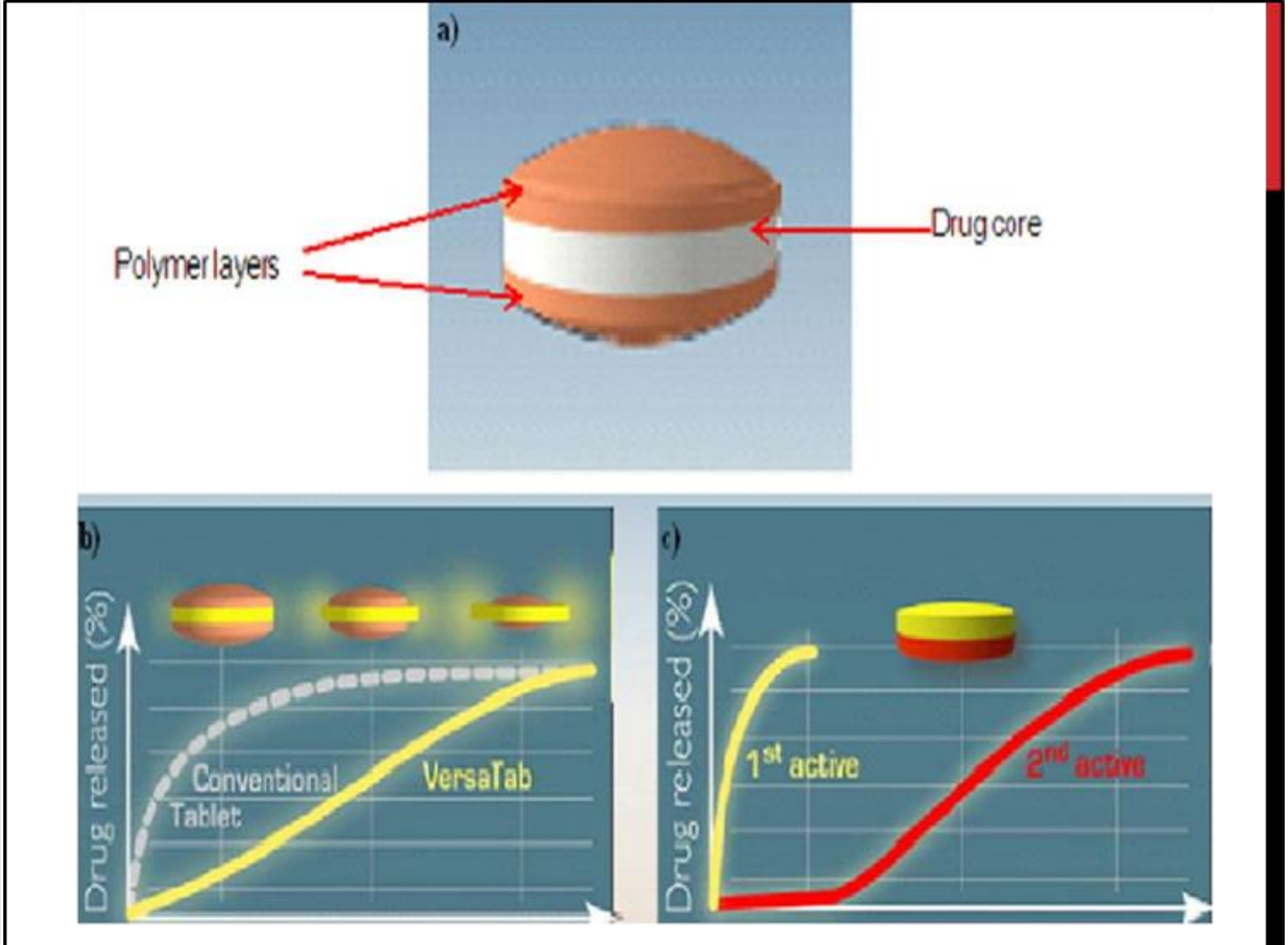
an ordinary tabdesigned to release (liberate) a drug at a predetermined rate in order to maintain a constant drug concentration for a specific period of time with minimum side effects..

Advantages:

1- prolong the duration of action

2- decrease the frequency of administration

e.g. glucophage retard tab.


a)
Polymer layers
Drug core
b)
Drug released (%)
Conventional Tablet
VersaTab
c)
Drug released (%)
1st active
2nd active

SUSTAIN RELEASE TABLET

SUBLINGUAL TABLET

.

It is uncoated tab. especially manufactured to be suitable for absorption from sublingual mucosa

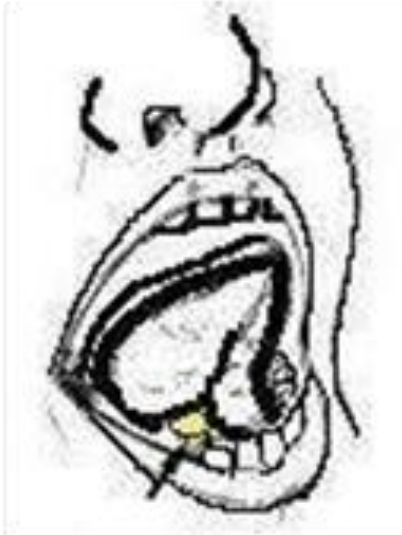
Advantages

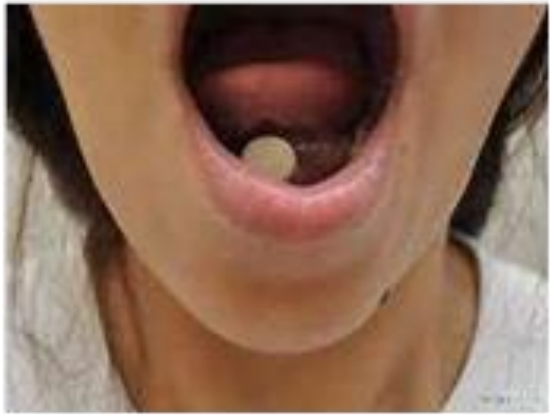
rapid action .١

avoid destruction by 1st pass metabolism .٢

e.g. glyceride trinitrates

SUBLINGUAL TABLET





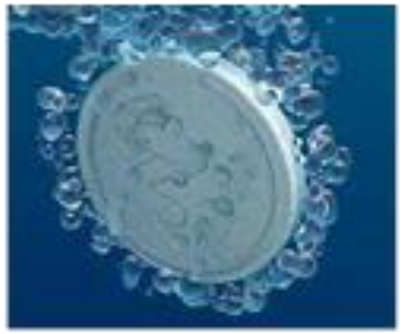
EFFERVESCENT TABLET

Effervescent or carbon tablets are tablets which are designed to dissolve in water, and release carbon dioxide.

Large tab. Contain large dose ,manufactured by mixing the drug with citric acid and sodium bicarbonate to get granules.

The action of drug appears more rapid because the disintegration and dissolution takes place inside water and become ready for absorption .

EFFERVESCENT TABLET



CHEWABLE TABLET

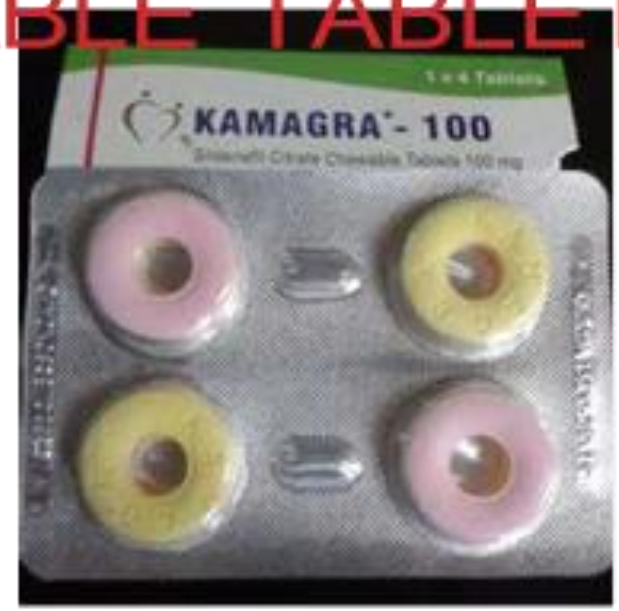
Chewable tablets are an oral dosage form intended to be chewed and then swallowed by the patient rather than swallowed whole.

Ordinary uncoated tab. specially manufactured to be sucked or chewed

This tab usually with good taste

To bite and grind with the teeth; masticate.

CHEWABLE TABLET



LOZENGES

Sugar flavored tab with different shapes and attractive colors.

It is sucked to treat tonsillitis and relief cough It contains volatile oils , antiseptic , antibiotics

e.g. Riabas

LOZENGES

PASTILLES

They are solid medicated preparations designed to dissolve slowly in the mouth.
They are softer than lozenges and their bases are either glycerol and gelatin, or and sugar

CAPSULES

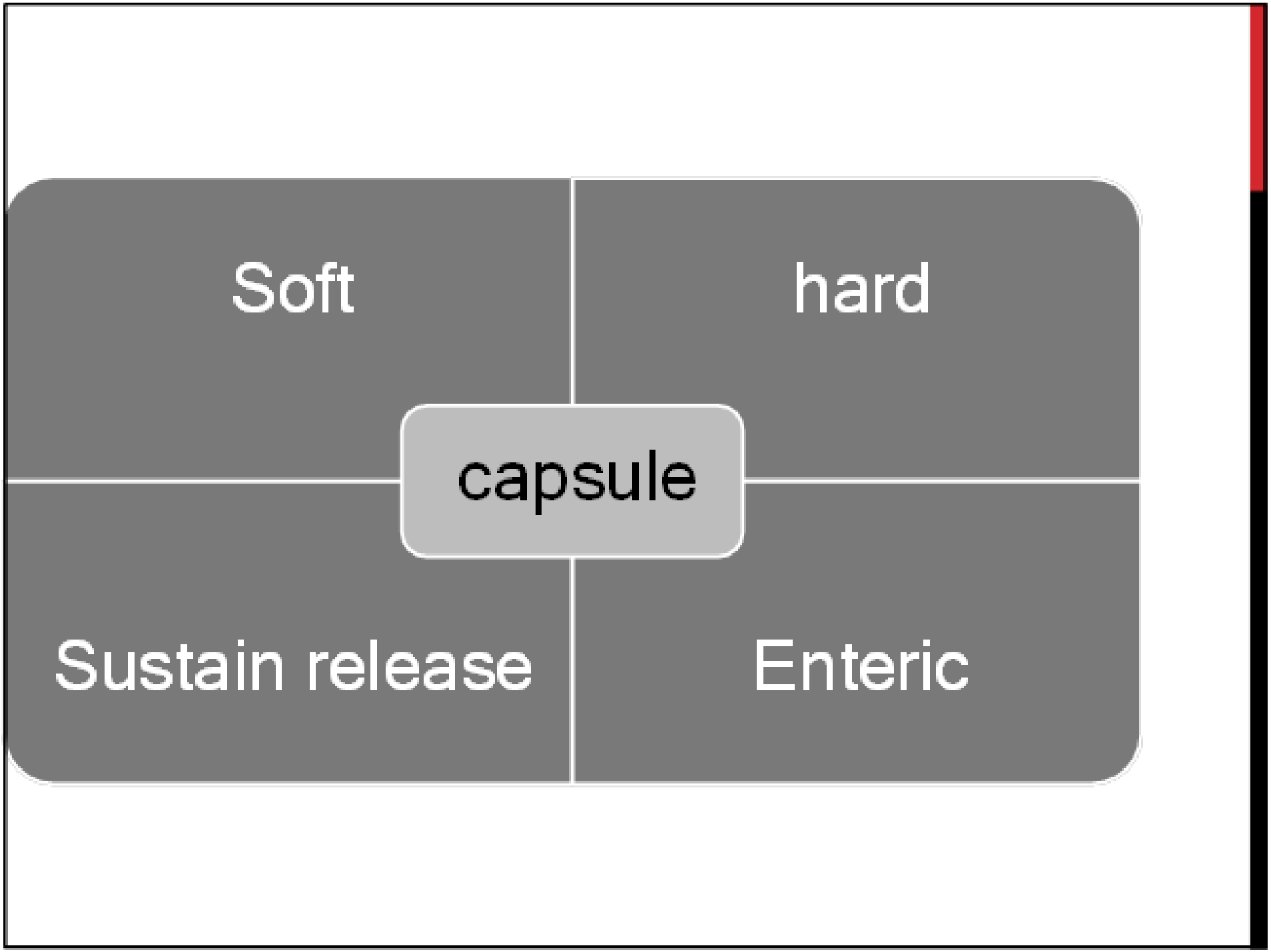
Ordinary capsules

Small cylindrical , oval , or rounded receptacles made of gelatin.

The two main types of capsules are:

1- Hard-shelled capsules, which are normally used for dry, powdered ingredients,

2- Soft-shelled capsules, primarily used for oils and for active ingredients that are dissolved or suspended in oil.


Soft
hard
capsule
Sustain release
Enteric

Cap . Shell which dissolve in the stomach is used for the following purposes

1- to mask the bad taste of the drug

2- to prevent air and moisture oxidation

3- to get accurate amount of the drug

ORDINARY CAPSULES

SPANCULE CAPSULE

Ordinary cap. Contains different granules each with different disintegration and dissolution rates

Advantages :

1- prolong the duration of action

2- decrease the frequency of administration

SPANCULE CAPSULE

SOFT CAPSULE

PILL

It is solid spherical body containing a drug in solid or liquid form given by mouth usually apill should not weight more than 0.3 g , it is sometime coated with sugar coat when the drug is liable to change during exposure to aim or when the drug has bitter taste

e.g. contraceptive

PILL

LIQUID PREPARATION

Syrup

It is a concentrated aqueous solution of a sugar, usually sucrose to which medicaments are added.

Flavored syrups are a convenient form to get good taste particularly for children .

SYRUP


Children's
Dimetapp
Cold
& Cough
Relieves Nasal Symptoms
Stuffy Nose
Runny Nose
Sneezing
Plus Other Symptoms
Itchy, Watery Eyes
Cough
For Ages
6 Yrs.
& Over


PHARMACIST ONLY MEDICINE
Painstop
for children
Night-Time
Pain Reliever
200mL

Syrup of antibiotics supplied as powder form in which the antibiotic is mixed with specified quantity of sugar to be prepared as syrup by adding certain quantity of water ,this is because antibiotics may hydrolyzed in aqueous solution to other component which either has no antibacterial activity or a substance causes allergic reactions ,therefore all syrups of antibiotics must be discarded (7) days after adding water.

ELIXIR

It is a clear sweat – flavored liquid (usually contain alcohol)

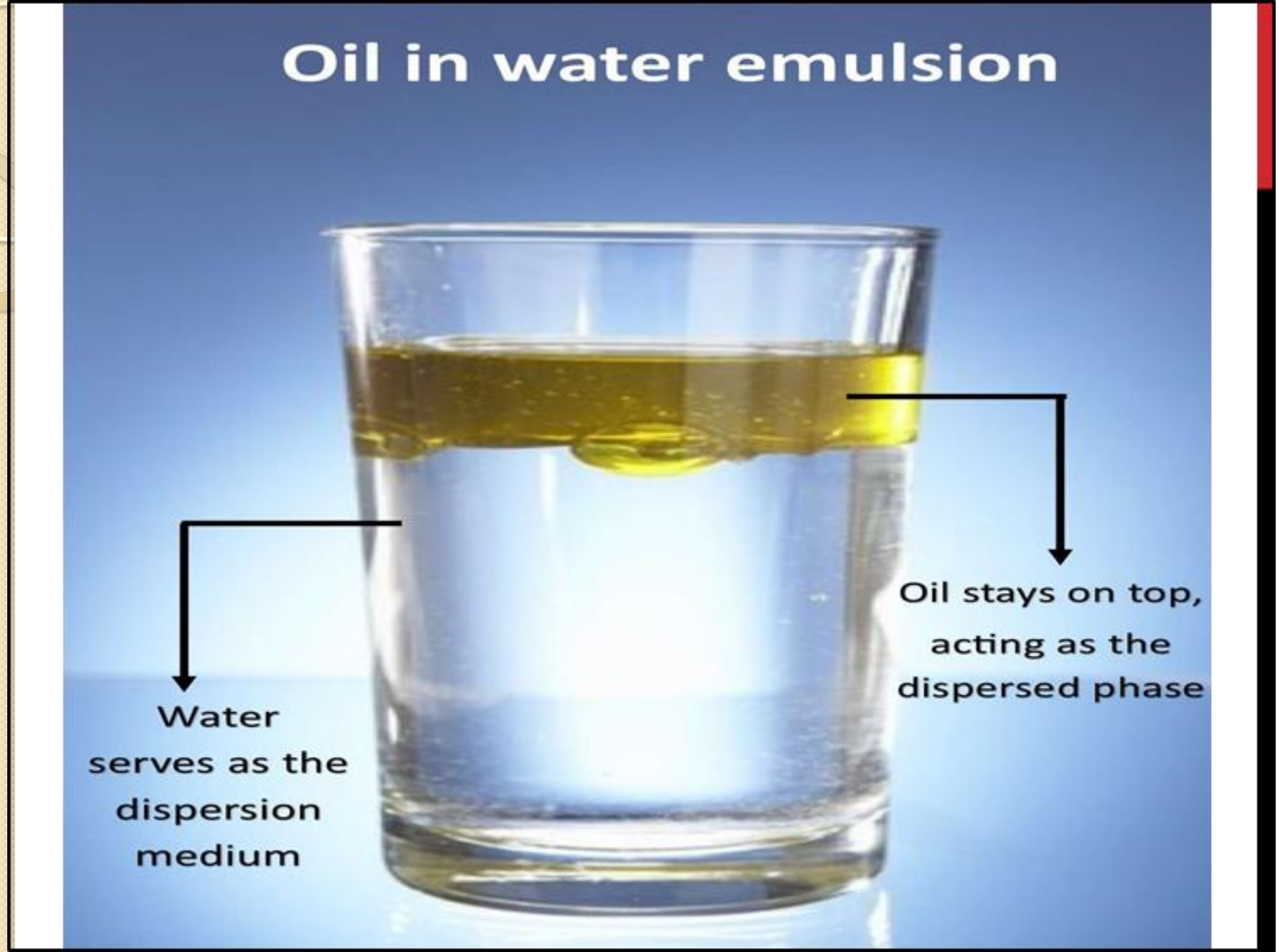
It contains at least one active ingredient dissolved in a solution contains 15 – 50 % by volume of ethyl alcohol and is designed to be taken oral

EMULSION

It is amixture containg 2 immiscible liqiuds (such as oil and water)

One of which is broken up into minute globules.

Each globule is surrounded by a film of emulsifying agent and dispersed through out the other liquid .


Oil in water emulsion
Water serves as the dispersion medium
Oil stays on top, acting as the dispersed phase

EMULSION


Water
Water and oil
Mustard (emulsifier)
mixed with water and oil

SUSPENSION

Liquid preparations for oral use containing one or more active ingredients suspended in a suitable vehicle.

- may show a sediment which is readily dispersed on shaking to give a uniform suspension which remains sufficiently stable to enable the correct dose to be delivered

SUSPENSION


TESTOSUS 100
20 mL
PRESCRIPTION ANIMAL REMEDY
KEEP OUT OF REACH OF CHILDREN
FOR ANIMAL TREATMENT ONLY
TESTOSUS 100
ANDROGENIC STEROID
SUSPENSION
ACTIVE CONSTITUENT
100 mg/mL TESTOSTERONE
For the treatment of
impotence and lack of male
libido in horses and dogs
20mL
Jurox


TRIMOX®

POWDERED PREPARATIONS

1- ordinary powder : drug for internal use in form of fine powder mixed with water before administration

2- Effervescent powder active drug manufactured in form of effervescent granules by complexing the drug with sodium bicarbonate , citric acid , to be dissolved in water before ingestion.

EFFERVESCENT POWDER

DROPS FOR INTERNAL USE

This preparation is mostly convenient for infants , it is prepared by concentrating the drug in few drops to decrease volume of dose in order to facilitate swallowing of this small dose and minimize loss of the dose .

PARENTAL PREPARATION

Ampoule

It’s a thin glass container for a single injectable dose the solution of ampoule is usually sterile indented to be use Im , sc , Iv

Ampoule for Iv injection usually contains very purified pyrogen free solution and most of Iv ampoule contain large volume in comparison with ampoule for Im injection

In some instances the active ingredient is putted in separated ampoule in form of powder and the solvent is putted in another separated ampoule to be mixed immediately before injection to avoid hydrolysis of the active ingredient

AMPOULE

VIALS

It is a thick glass container with rubber cap containing either solution or powdered drugs either for a single or multiple dose

VIALS


Thank
you

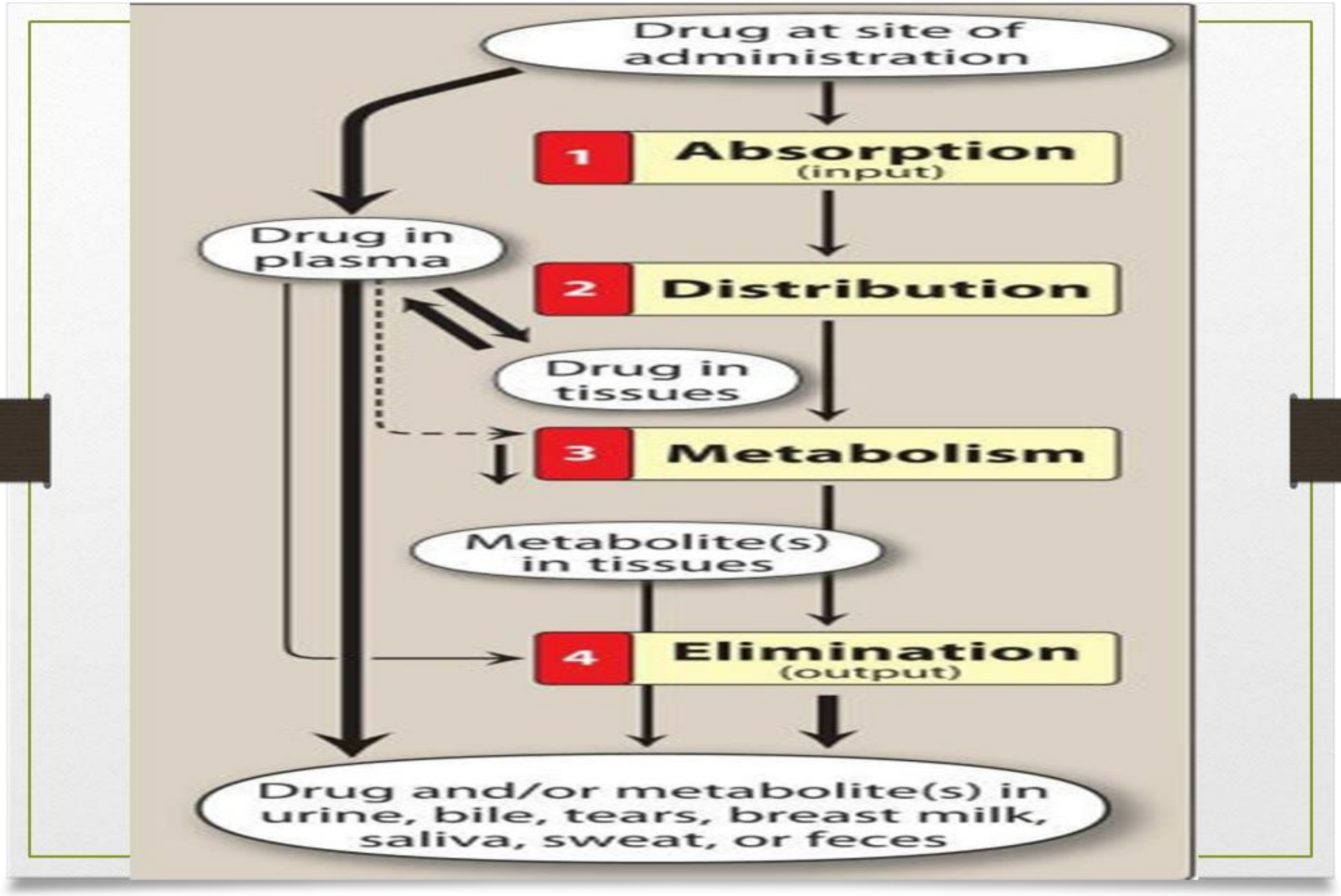
General Pharmacology

Lab Sessions

Saliva and Drug Excretion

By
Assistant Lecture Abdulazeez .M.H

Class III


Drug at site of administration
1 Absorption (input)
Drug in plasma
2 Distribution
Drug in tissues
3 Metabolism
Metabolite(s) in tissues
4 Elimination (output)
Drug and/or metabolite(s) in urine, bile, tears, breast milk, saliva, sweat, or feces

Major route of drug excretion

- Renal
- Liver
- intestine

Drug Clearance by the Kidney

Drugs must be sufficiently polar to be eliminated from the body.

Removal of drugs from the body occurs via a number of routes; the most important is elimination through the kidney into the urine.

Patients with renal dysfunction may be unable to excrete drugs and are at risk for drug accumulation and adverse effects.

Minor route of drug excretion

- Lung
- Bile
- Milk
- Saliva

Total body clearance

The total body (systemic) clearance, CL total, is the sum of all clearances from the drug-metabolizing and drugeliminating organs.

The kidney is often the major organ of excretion.

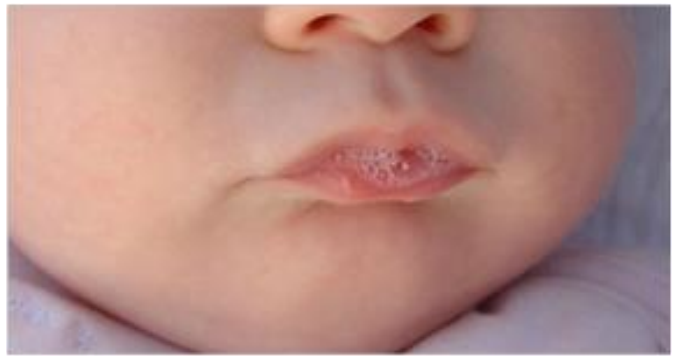
The liver also contributes to drug clearance through metabolism and/or excretion into the bile.

Total clearance is calculated using the following equation:

$$CL_{total} = CL_{hepatic} + CL_{renal} + CL_{pulmonary} + CL_{other}$$

Salivary secretion

- The drugs that secreted by saliva gain access to oral environment from the systemic circulation and can affect the microorganisms and tissue surfaces of the mouth.



Stimulated and Unstimulated Saliva

At rest, without exogenous or pharmacological stimulation, there is a small, continuous salivary flow, an unstimulated secretion, present in the form of a film that covers, moisturizes, and lubricates the oral tissues.

This flow of saliva at rest is in the region of 0.4–0.5mL/minute in healthy subjects.

Stimulated saliva is produced in response to a mechanical, gustatory, olfactory, or pharmacological stimulus, contributing to around 40-50% of daily salivary production.

- Drug may enter the oral fluids from several sources:

1. passive diffusion across the cell of salivary gland.
2. passive diffusion across oral epithelium.
3. Flow of fluid from gingival cervices.

Example of salivary drug secretion

- Aspirin
- Phenytoin
- Ampicillin
- Diazepam
- Penicilin
- Tetracycline
- phenobarbital

- Most drugs are secreted in saliva are lipid soluble and enter from plasma to the saliva by simple passive diffusion.

- Some drug are secreted in gingival cervicular fluid at high conc. so it is useful in treatment of periodontal diseases like
- Tetracycline.

And other will causes side effects orally like

Gingival hyper plasia

e.g phenytoin,amelodipine.

And some which affect the normal flora like ampicillin.

Excretion of KI

- Iodine is essential for formation of thyroid hormons for synthesis of thyroxin.
- Deficiency of iodine → thyroid hypertrophies
- → simple(non toxic goiter)
- Excessive intake of iodine → swelling of gland
- → iodine mumps.

Uses of iodine

1. Treatment of goiter due to deficiency of iodine.
2. Used as salageous agent to increase salivary secretion.
3. It is used for sterilization.
4. Used as expectorant to encourage productive cough.

Procedure

- Take 300 mg of KI in a capsule
- Take the saliva (unstimulated saliva) from volunteers.
- Add 1 ml of saliva in a test tube then add the following to it:
- 2-3 drops of 1% Sodium nitrite
- 2-3 drops 2N Sulphuric acid
- 1 ml 1% starch solution

- Test the samples of saliva for the presence of iodine at
- 5 min., 15 min. 30 min.
- Indicated the presence of iodine by using +,++,+++,++++.
- Arrange results in table.

Reactions

- $NaNo_3+KI(SALIVA) \rightarrow NaI+KNo_3$
- $NaI+H_2So_4+H2O \rightarrow Na_2So4+I_2$
- $I_2+Starch \rightarrow$ blue complex

THANK YOU

General Pharmacology

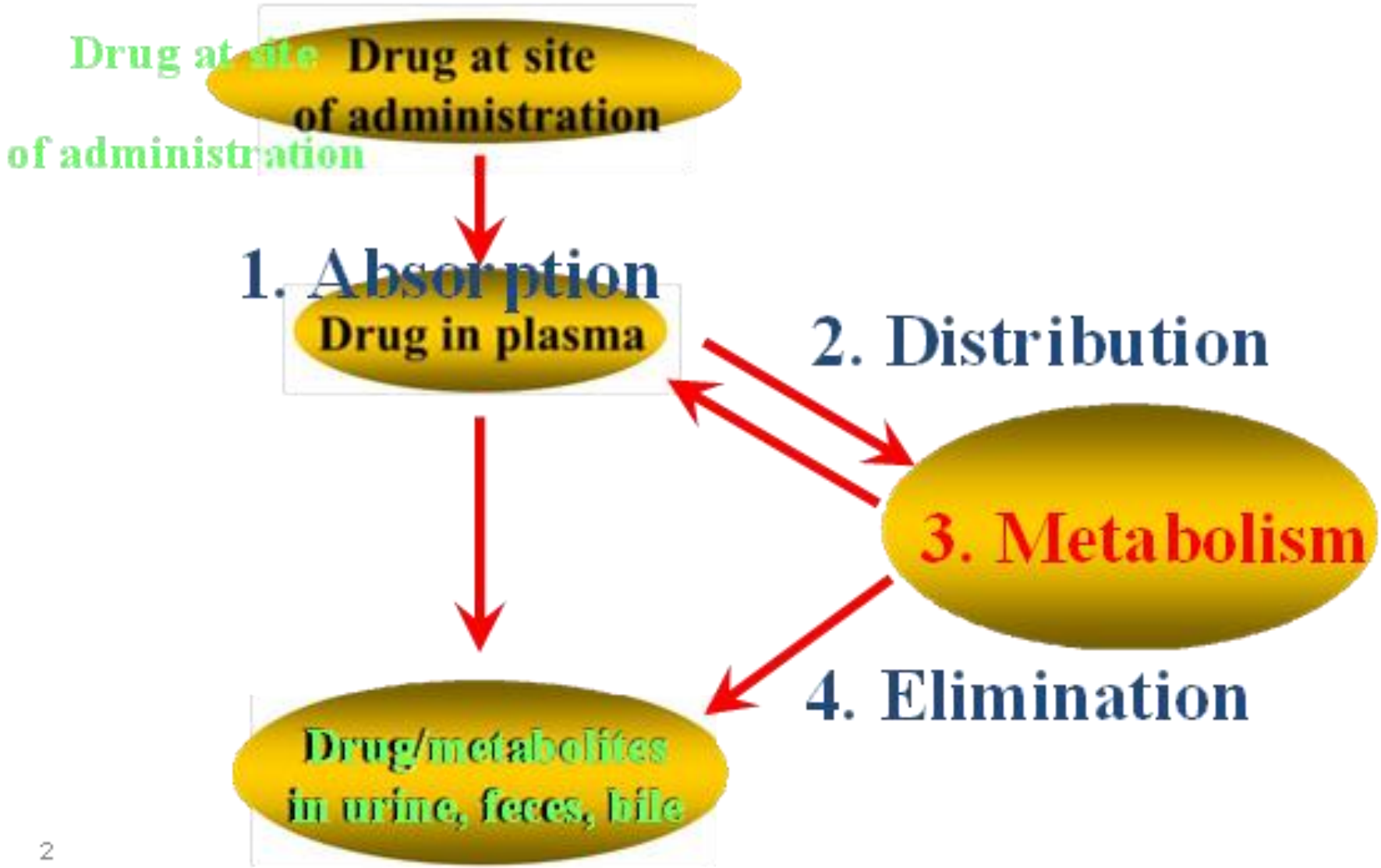
Lab Sessions

Effect of pH on drug absorption

By
Assistant Lecture Abdulazeez .M.H

Class III

After Drug Administration?



Factors Affecting Drug Absorption

1. **Transport : active or passive**
2. **pH**
3. **Physical factors: include**
   - **blood flow**
   - **surface area**
   - **contact time**

PH

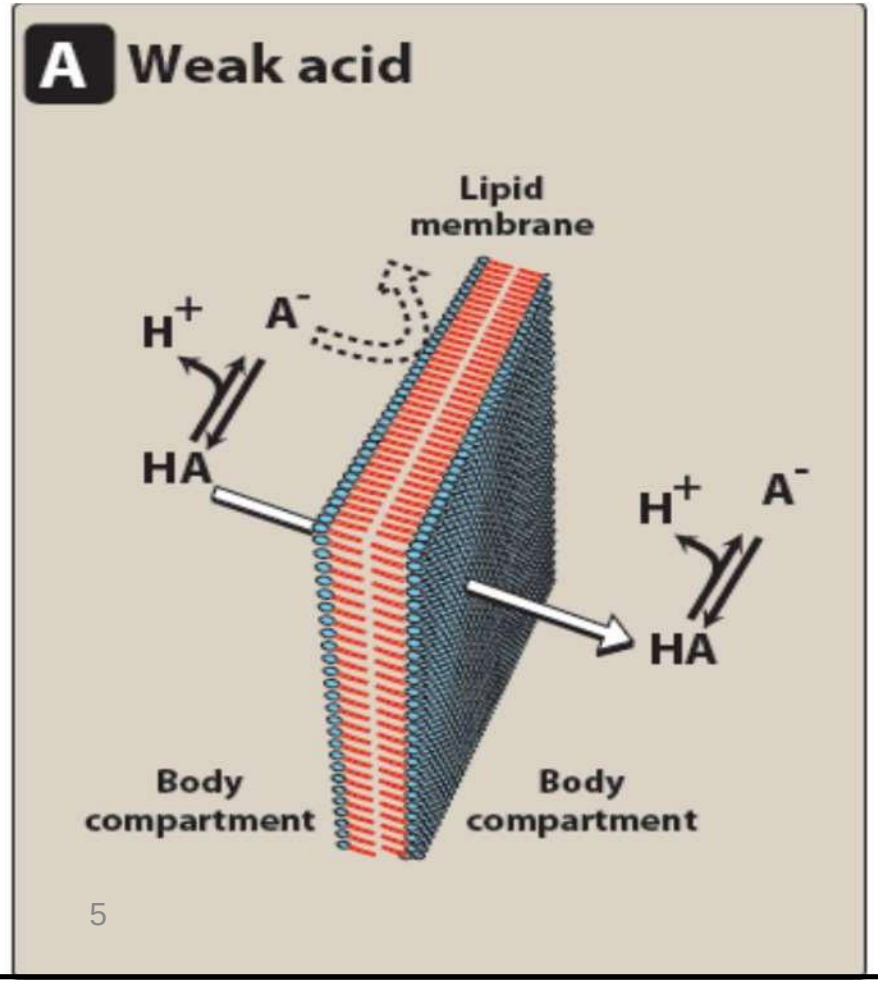
- Drug are either weak acid or weak base
- **Weak acid**
- $HA \rightleftharpoons H^+ + A^-$
- **Weak base**

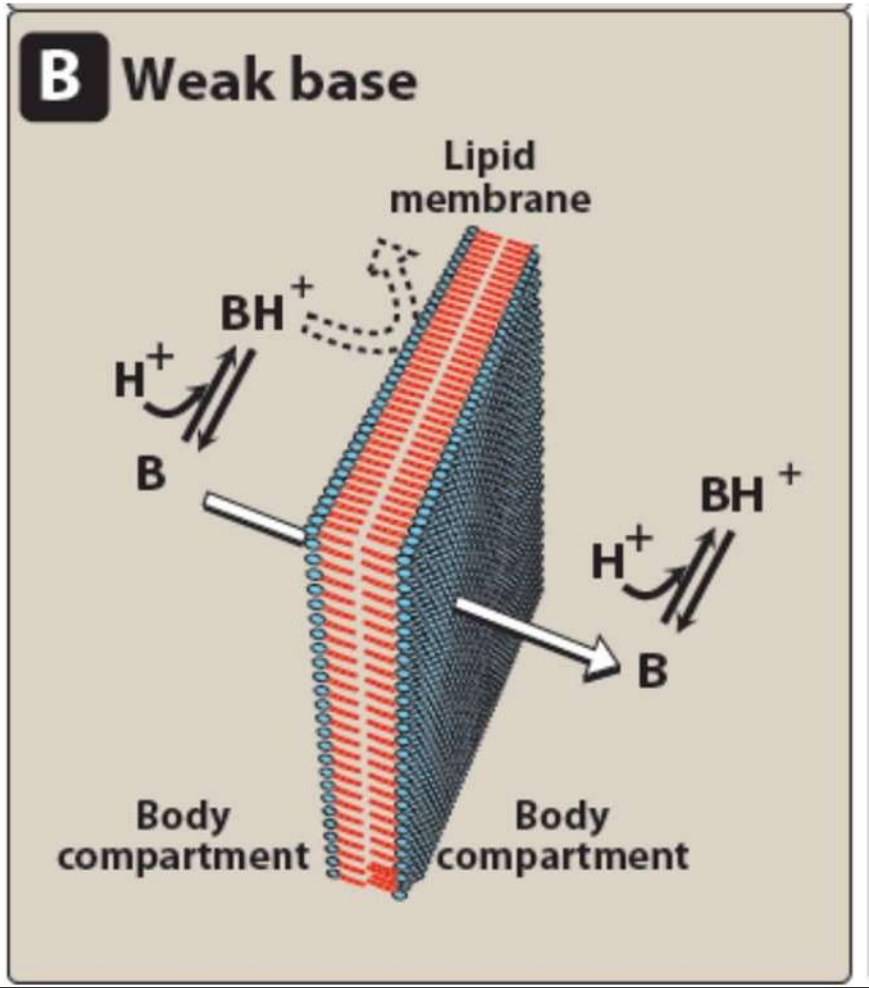
$BH^+ \rightleftharpoons B+H^+$

pH of the medication

- The **pH** and **pKa** are the most important factors.
- The **pH** of the **tissue determines** the **ratio of ionized to non-ionized drug.** This ratio depends on the **pKa** of the drug.
- This amount will determine the **easy** with which the drug will **penetrate or not** through the tissues.

Drugs **pass** through ,membrane more **easy if it is uncharged (not ionized)** i.e ((HA) for acid) and ((B) for base) while charged **(ionized)** can **not passes**





- the ratio between **charged and uncharged** is determined by **PH** at site of absorption and by the **strength of acid** and base i.e **(pka)**

The **lower pka** of drug the **stronger the acid** ,conversely the **higher pka the stronger the base**

Henderson Hasselbalch Equation

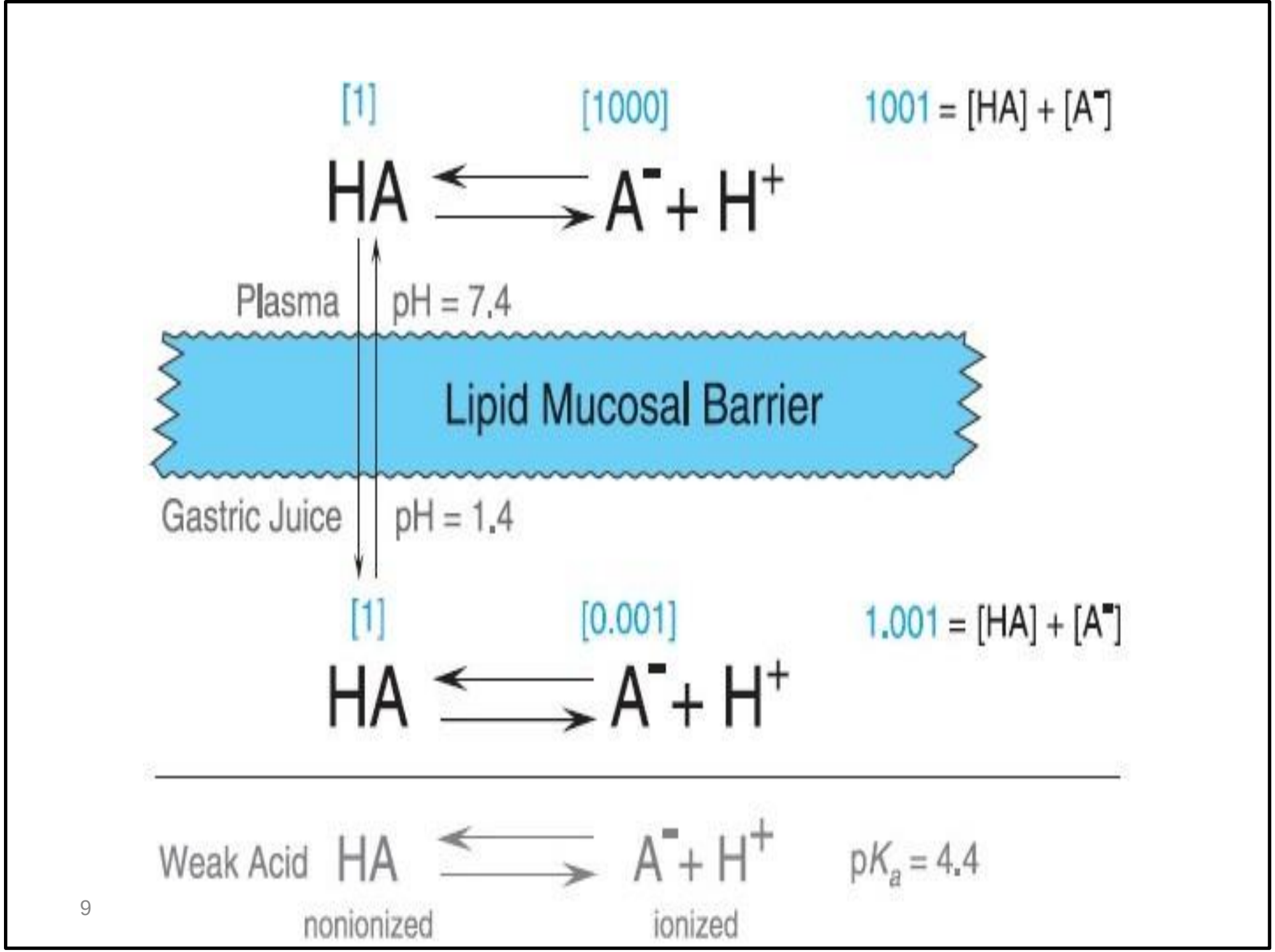
- **When pKa equals the pH where the ionized and non-ionized forms are at equilibrium. (50% of each form is present.)**
- the pKa - pH relationship is described by the Henderson Hasselbalch equation, as follows:

For acid : pH - pKa = antilog [ionized / non-ionized]

For bases: pH - pKa = antilog [non-ionized /ionized]

- e.g. in case of **infection or inflammation low natural PH** (acidic tissue) cause **less effect of L.A (weak base).**
- This acidity results in a greater proportion of the ionized (charged) form of the anesthetic, thereby **delaying or preventing the onset of action.**
- **i:e the PH < pKa (more drug in ionized form)**

➢ e.g. **acidic drug (aspirin)** unionized at acid gastric PH and absorbed from stomach.


[1]
[1000]
1001 = [HA] + [A⁻]
HA ⇌ A⁻ + H⁺
Plasma
pH = 7.4
Lipid Mucosal Barrier
Gastric Juice
pH = 1.4
[1]
[0.001]
1.001 = [HA] + [A⁻]
HA ⇌ A⁻ + H⁺
Weak Acid HA ⇌ A⁻ + H⁺
pKa = 4.4
nonionized
ionized

Local anaesthetics are weak bases –

(Henderson-Hasselbalch equation)

pH - pKa = - log [non-ionized /ionized]

Example: Calculate the proportions of free base and salt forms of drug X , (pKa = 8.5) at pH (7.5).

7.5 - 8.5 = - log unionized/ (ionized)

-1 = - log unionized/ (ionized)

log 10 = log unionized/ (ionized)

10/1 = unionized/ (ionized)

∴ there is 10x more drug in the ionized than (1) in the non-ionized form at physiological pH


Thank
you

General Pharmacology

Lab Sessions

LOCAL ANESTHETICS

By
Assistant Lecture Abdulazeez .M.H

Class III

Functional consequences of Na^+ channel blockade by local anesthetics:

- **nerves:** decrease or abolition of conduction
- **vascular smooth muscle:** vasodilatation
- **heart:** decreased excitability (reduced pacemaker activity, prolongation of effective refractory period)
- **central nervous system:** increased excitability, followed by generalized depression

Pharmacological effects and toxicities

Effects of local anesthetics on nerve conduction

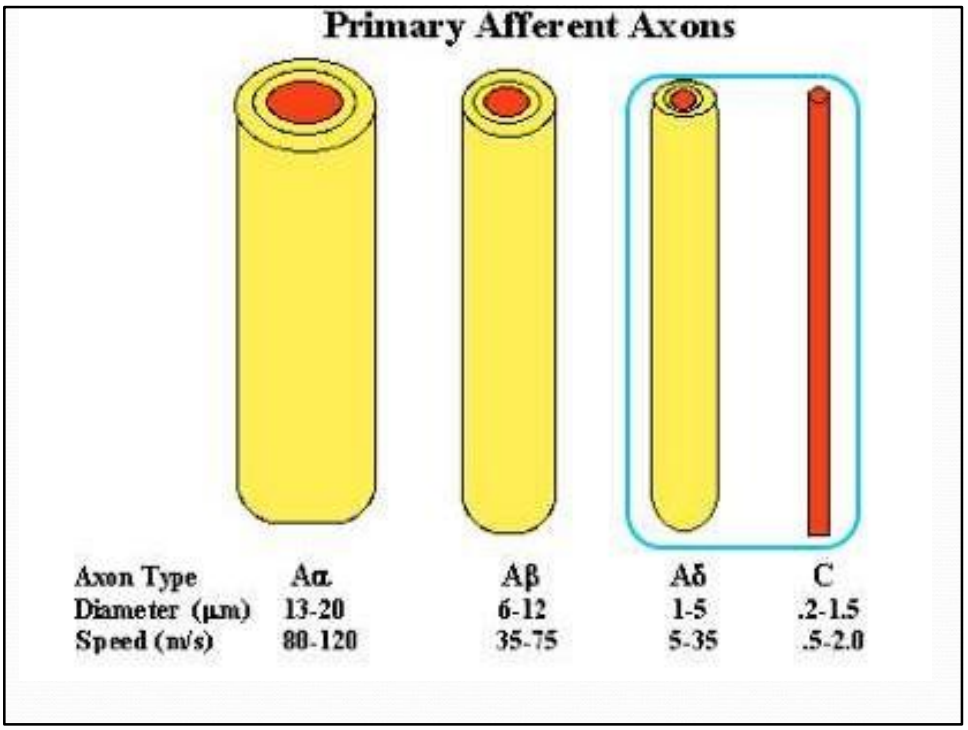
- **Na^+ channels** are present in all nerves and local anesthetics, at sufficient concentrations, can **completely** block **action potential generation** and **conduction**
- "**differential nerve blockade**" – nerve fibres differ markedly in their susceptiblity to conduction blockage by local anesthetics (this is the basis of their **clinical use**)

  e.g., **small**, **non-myelinated neurons** mediating **pain** are much more susceptible **that large**, **myelinated fibres** mediating **motor functions**

Pharmacological effects and toxicities

Relative size and myelination and susceptibility to blockage by local anesthetics

Fibre type	function	diameter (μm)	myelination	susceptiblity to LA block
Type A alpha	proprioception, motor	12-20	heavy	+
beta	touch, pressure	5-12	heavy	++
gamma	muscle spindles	3-6	heavy	++
delta	pain, temperature	2-5	heavy	+++
Type B	preganglionic	<3	light	++++
Type C dorsal root	pain	0.4-1.2	none	++++



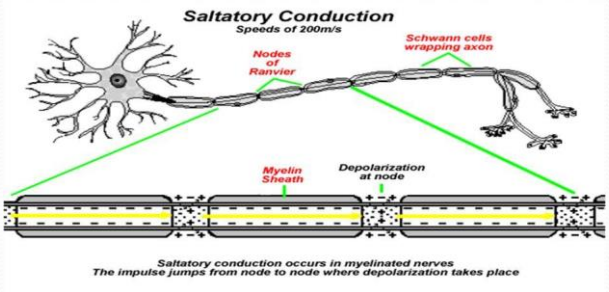
Sequence of clinical anesthesia

- Sympathetic block (vasodilatation)
- Loss of pain and temperature sensation
- Loss of proprioception
- Loss of touch and pressure sensation
- Loss of motor function

Pharmacological effects and toxicities

Differential susceptibility of nerves to local anesthetics

1. In neuronal conduction, depolarizing current moves along nodes of Ranvier – 2-3 successive nodes must be blocked to completely impair neuronal conduction



small fibres have smaller internodal distances - ∴ a shorter length of nerve fibre needs to be blocked to impair conduction as compared to larger nerve fibres

Pharmacological effects and toxicities

Differential susceptibility of nerves to local anesthetics (cont'd)

2. Anesthetic blockade of Na^+ channels exhibits **"use-dependence"** - increased frequency of stimulation ⇒ increased level of blockade

high stimulation frequency increases # of Na^+ channels in the "open" form that preferentially binds anesthetic

∴ **neurons with high rates of firing (e.g., pain fibres) or ectopic pacemakers in the myocardium will be highly susceptible to blockade by local anesthetics**

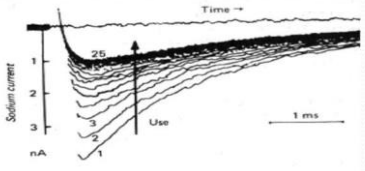


Illustration of use-dependent local anesthetic neuronal blockade – as stimulation frequency increases from 1 to 25, the downward Na^+ current spike is progressively reduced.

Pharmacological effects and toxicities

Differential susceptibility of nerves to local anesthetics (cont'd)

3. In excitable tissues with long action potentials, probability of Na^+ channels being in (susceptible) "open" form is increased ⟹ enhanced susceptibility to blockade by local anesthetics

   e.g., pain fibres have long action potentials (3 millisec) as motor fibres (0.5 millisec)

   cardiac muscle has prolonged action potentials relative to other excitable tissues - ∴ myocardium highly susceptible to local anesthetics (clinically important)

Pharmacological effects and toxicities

Effects of local anesthetics on vascular smooth muscle

Blockade of Na^+ channels in vascular smooth muscle by local anesthetics ⟹ vasodilatation

consequences of vasodilatation:

- enhanced rate of removal of anesthetic from site of administration (decreased duration of anesthetic action and increased risk of toxicity)
- hypotension (may be intensified by anesthetic-induced cardiodepression)

Pharmacological effects and toxicities

Effects of local anesthetics on vascular smooth muscle

Anesthetic-induced vasodilatation can be counteracted by the concomitant administration of a vasoconstrictor

consequences of including vasoconstrictor:

- **prolongation of anesthetic action**
- **decreased risk of toxicity**
- **decrease in bleeding from surgical manipulations**

COMERCIALLY PREPARED LOCAL ANESTHESIA CONSISTS OF :

- Local anesthetic agent (xylocaine, lignocaine 2%)
- Vasoconstrictor (adrenaline
- Reducing agent (sodium metabisulphite)
- Preservative (methylparaben,capryl hydrocuprienotoxin)
- Fungicide (thymol)
- Vehicle (distillde water,NaCl)

Vasoconstrictors

- Two types:
  - Sympathomimetic naturally occurring.
  - Synthetic polypeptides, Felypressin

Pharmacological effects and toxicities

Effects of vasoconstrictors on local anesthetic duration

Adrenaline is the conventional vasoconstrictor included in commercial local anesthetic preparations

The concentration of adrenaline in these preparations can vary and is expressed as grams/ml (e.g. 1:100,000 = 1 gram/100,000 ml)

local anesthetic	adrenaline	duration of anesthesia (min)
lidocaine (2%)	-	5-10
lidocaine (2%)	1:100,000	60
lidocaine (2%)	1:50,000	60

Vasoconstrictors

- ***Epinephrine***: (Adrenaline)
  - Uses in dentistry:
    - Local anaesthetic solution.
    - Gingival retraction cords.
    - In the ER as life-saving drug in anaphylaxis.
  - Mechanism of action:
    - Interact with adrenergic receptors in the vessels
      - α_1 & α_2 producing vasoconstriction in skin & MM
      - β_2 stimulation causing vasodilatation in skeletal muscles.

Vasoconstrictors

Epinephrine

- Haemostasis:
  - The vasoconstricting effect.
  - Adrenaline promote platelets aggregation in the early stages.
  - Fibrinolytic activity compromise clot stability.
- Lungs:
  - Stimulation of β_2 receptors in the lung lead to bronchial muscle relaxation, life-saving in bronchial (spasm) constriction during anaphylactic reaction.
- Wound healing:
  - Reduced local tissue oxygen tension.
  - Epinephrine-induced fibrinolysis.

- Vasoconstrictors
- ***Felypressin:***
  - It is an analogue of the naturally occurring Vasopressin.
  - Bind to vasopressin V_1 receptor in the vascular smooth muscle producing vaso-constriction and reduce local blood flow.
  - Less potent than the catecholamines &poorer control of bleeding during operative procedures.
  - Acts on the venous side rather than the arterial side.

Benefits of Decreased Absorption

- Increased neuronal uptake
- Enhances quality of analgesia
- Prolongs duration of action
- Limits toxic side effects
- Produce less blood field operation

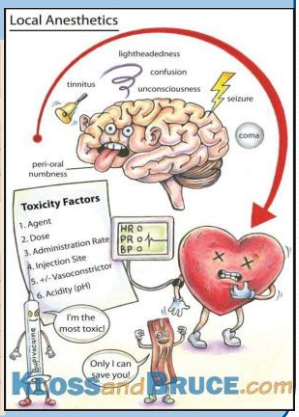
Review of literature

Toxicity

Maximum Dosage (mg/lbs) X weight (lbs) = Maximum Total Dosage (mg)

Maximum Total Dosage (mg) ÷ mg/carpule = Maximum Number carpules

		Maximum dose (mg/kg) without Epinephrine	Maximum dose (mg/kg) with Epinephrine	Duration of Action
Ester				
	Procaine	7	10	60-90
	2-Choroprocaine	15	20	30-60
	Tetracaine	1	1.5	180-600
Amide				
	Lidocaine	4	7	90-200
	Mepivacaine	5	7	120-240
	Bupivacaine	2	3	180-600
	Levobupivacaine	2	3	180-600
	Ropivacaine	2	3	180-600
	Articaine		7	60-230



Clinical aspects

local anesthetic toxicity

most **common** causes:

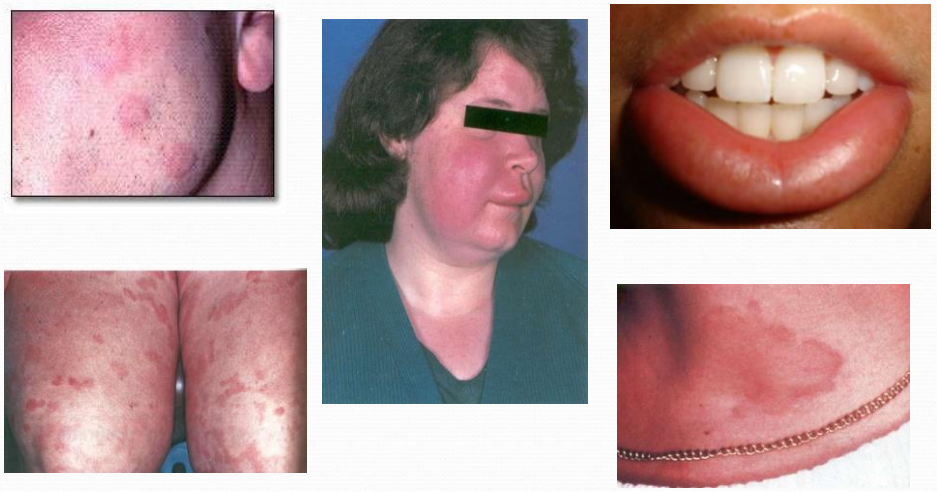
- inadvertent **intravascular injection** while inducing nerve block (important to always aspirate before injecting!)
- rapid absorption following spraying of mucous membranes (e.g., respiratory tract) with local anesthetic prior to diagnostic or clinical procedures

manifestations of local anesthetic toxicity: **allergic reactions**, **cardiovascular** and **CNS effects**

Clinical aspects

local anesthetic toxicity (cont'd)

- **allergic reactions:** restricted to **esters** - metabolized to allergenic **p-amino benzoic acid** (PABA) (∴ **amides** usually preferred for nerve block)
- **cardiovascular**: may be due to **anesthetic** (cardiodepression, hypotension) **or** **vasoconstrictor** (hypertension, tachycardia) ∴ monitor pulse/blood pressure
- **CNS: excitability (agitation, increased talkativeness – may → convulsions) followed by CNS depression** (∴ care in use of CNS depressants to treat convulsions - may worsen depressive phase – convulsions usually well tolerated if brain oxygenation maintained between seizures)



Clinical Manifestations of an Allergy

Adverse Effect of local Anesthesia

- **Hematologic effects**

The administration of large doses (more than 10 mg/kg) of prilocain during L.A

↓

accumulation of the metabolite o-toluidine

↓

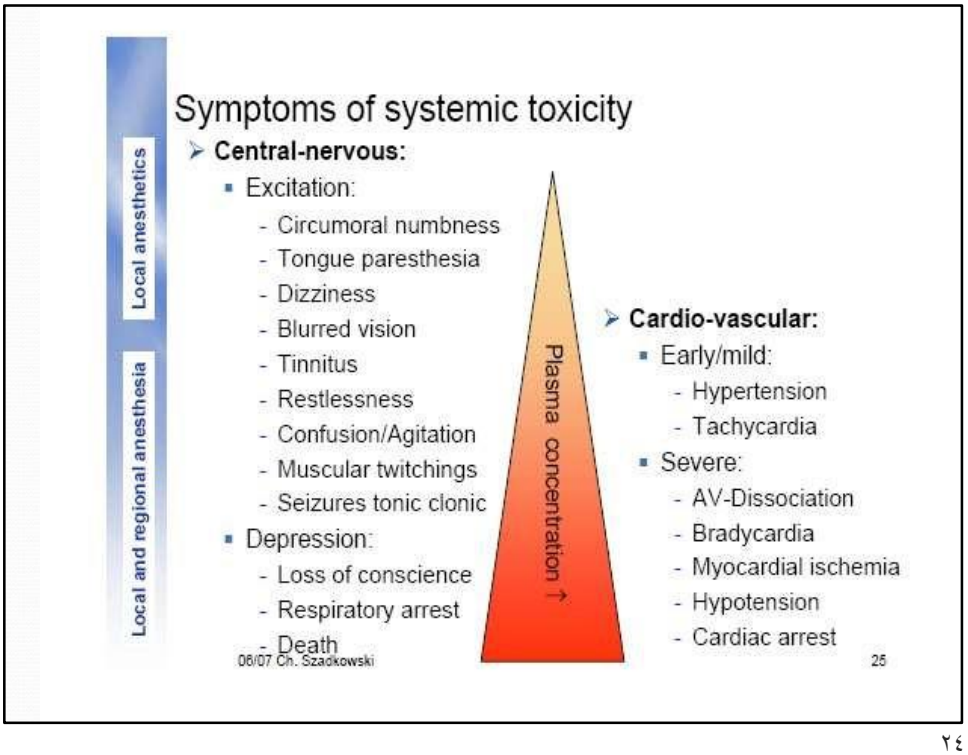
converting hemoglobin to methemoglobin

↓

cause methemoglobinemia

↓

hemoglobin



\

Treatment of toxicity

- Treatment includes supportive measures. Excitement and convulsions may be controlled with 5 mg doses of diazepam or 2 mg doses of midazolam. Respiratory depression requires oxygen and possibly rescue breathing . hypotension Treatment includes patient positioning, IV fluids, and vasopressors. Cardiac asystole will require CPR.

General

Pharmacology

Lab Sessions

Prescription Writing

By
Assistant Lecture
Abdulazeez .M.H

Class
III

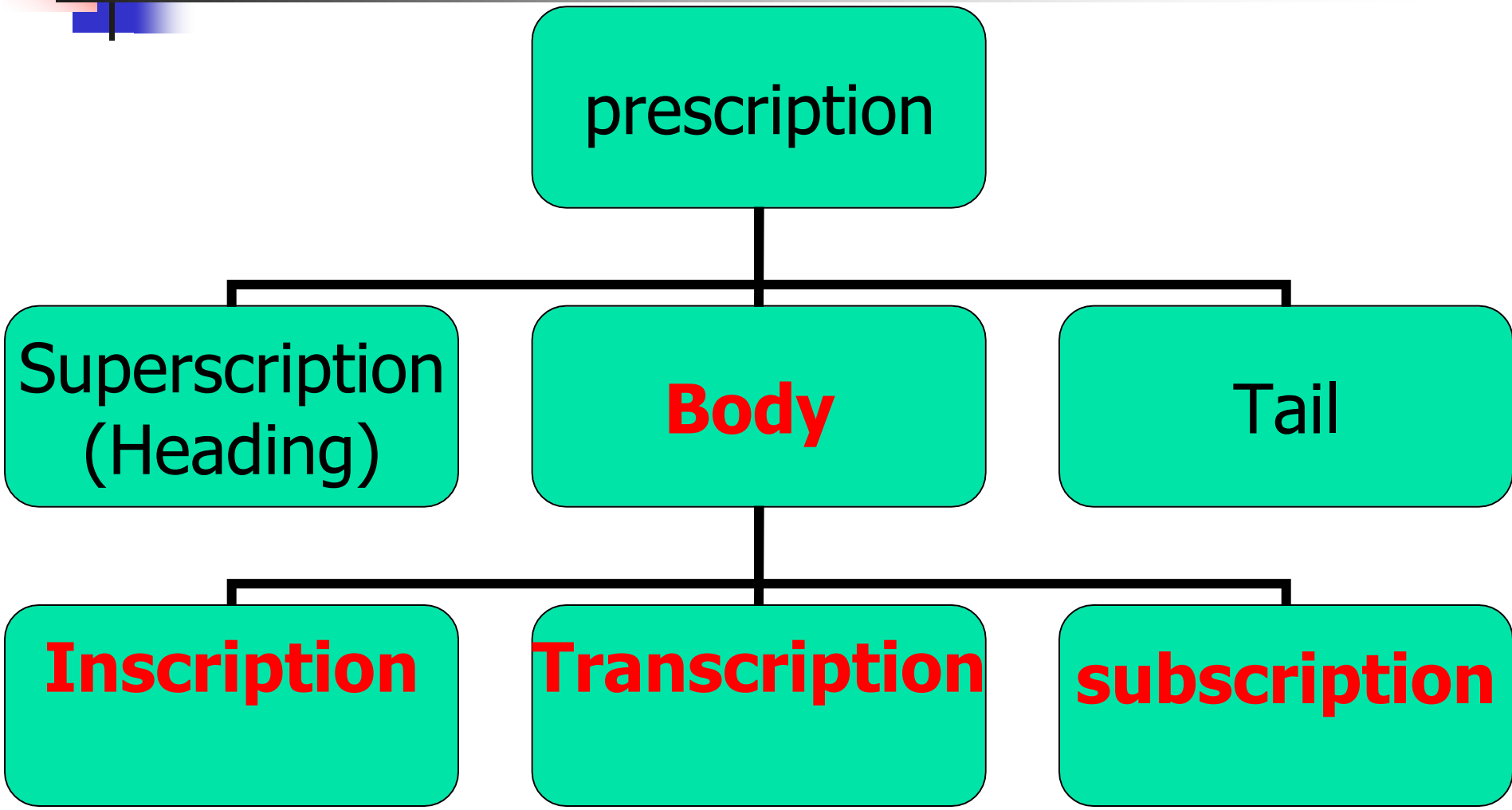
Definition

Prescription

Is term applied to formula written by physician/dentist

- to the pharmacist for the preparation of remedies.
- to the patient for the use of these drugs.

Elements of prescription



1. Superscription (Heading)

name
sex
age
address

name
address
teleph. no.
qualification
B.D.S, MSc.

Date
Registration no. and date
Diagnosis
R (Recipe)

2. Body of prescription

a. Inscription

- Name of drug
- Strength of drug
- Pharmaceutical form
- Amount of drug

Tetracycline 250 mg capsule (20 caps)

2. Body of prescription

b. Subscription

Comprises directions from the physician to the pharmacist concerning the way of preparation to give the form and amount of prescribing drug. This is usually applied when there is compounded prescription.

Paracetamol 500 mg

Diazepam 2 mg

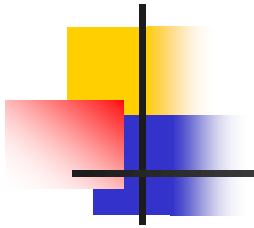
Mitte 10 caps

2. Body of prescription

c. Transcription

- Method of administration
- Amount to be taken
- Frequency of administration
- Time around meals

Orally 1x4 before meal



Example (inscription and transcription):

Tetracycline 250 mg capsule (20 caps)
Orally 1x4 before meal

3. Tail of prescription

- Refill directions.
- Type of bottle e.g antichildren bottle.
- Signiture.

General notes

1. Write in clear hand writing with correct names of drugs.
2. Date of prescription is important to detect cases where prescription orders are brought months or years after they were written by the prescriber.
3. Medicines are either prescribed using scientific or commercial names or both to avoid confusion with drugs having similar names.

e.g. mefenamic acid.

ponstane.

General notes

4. When the prescriber insist on certain brand produced by particular drug company write (please dispense as directed).
5. Write full name of prescriber.

6. Avoid personal abbreviations because it lead to misinterpretation. e.g.

Propranolol

propoxyphene

General notes

7. Avoid as needed many times in the same prescription and write down exactly when the patient must use the drug.
8. Drugs and food interaction should be consider carefully to avoid decreasing activity of the drug.

e.g. tetracycline and antacid.

General notes

9. Meals and drugs; generally :

- Drugs given 30 min before food (appetite stimulants, most antibiotics, all cholinergic, antiemetic).
- Drugs given within meals (drugs that cause stomach irritation (digestive enzymes).
- After food (NSAIDs).

Abbreviations

- B.I.d twice daily
- T.I.d three times daily
- Q.I.d four times daily

- a.c before meal
- P.c after meal

Compound prescription

- Drugs prepared by the pharmacist at the time of dispensing which are not available as patent preparation.

- They are prepared by mixing 2 or more drugs in a variety of dosage form including capsules, solutios, creams, ointments.

Compound prescription

- Example:

Diazepam (2mg)

Paracetamol (500 mg)

Make (mitte) 10 cap.

Reasons for preparing Compound prescription

1. To mask a well known drugs from the patient which the physician convinced that it is the required treatment e.g. diazepam, paracetamol.
2. Unavailability of small doses.
3. Unavailability of certain ingredients needed for treatment certain diseases.


Thank
you