



UNIVERSITY OF  
PUTHISAstra

# PRINCIPALE OF PHARMACOLOGY

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# Course Objectives



After studying this chapter, student will be able to:

- Understand the concept of pharmacology and its terms clearly.
- Describe different branches of pharmacology
- Understand the different sources of drugs
- Identify the route of drug administration (pharmacokinetics) and mechanism of action of drug (pharmacodynamics)





# Course Outline



- **Definition of Pharmacology**
- **Branches of Pharmacology**
- **Pharmacology Terms**
- **Sources of Drugs**
- **Pharmacokinetics**
- **Pharmacodynamics**





# PHARMACOLOGY



## What does it mean?

- Pharmacology is the study of interaction of drugs with living organisms.
- It also includes history, source, physicochemical properties, dosage forms, methods of administration, absorption, distribution mechanism of action, biotransformation, excretion, clinical uses and adverse effects of drugs.



Rudolf Bucheim



Oswald Schmiedeberg



John Jacob Abel





# BRANCHES OF PHARMACOLOGY



## Branches of Pharmacology

### Pharmacodynamics

What the drug does to the body  
(Biological & therapeutic effects)

### Pharmacokinetics

What the body does to the drug  
(ADME)

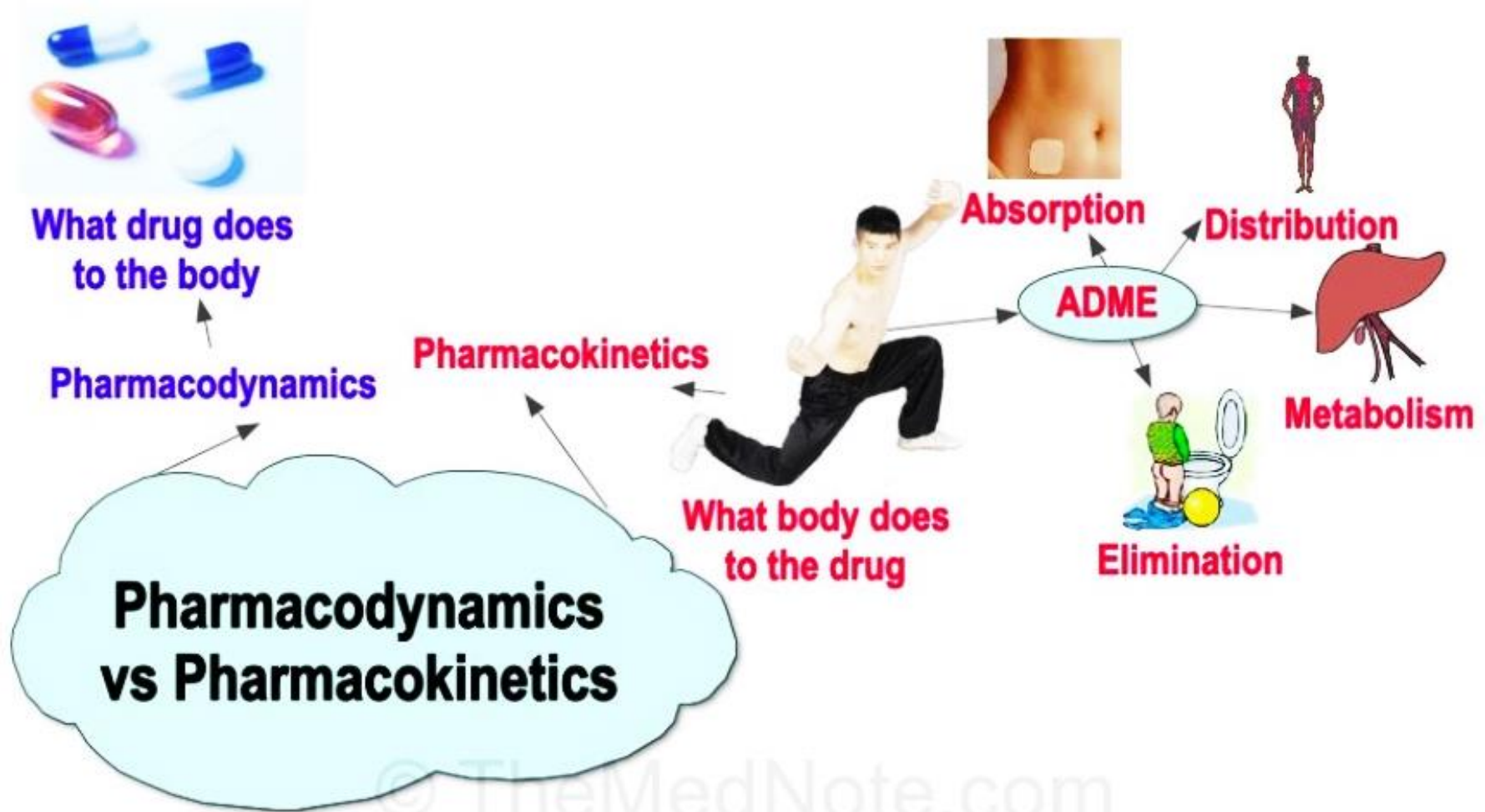
### Pharmacotherapy

Proper selection and use of drugs for the prevention  
and treatment of disease





# BRANCHES OF PHARMACOLOGY





# PHARMACOLOGY TERMS



## 1. Drug:

- Drug is any substance or product that is used or intended to be used to modify or explore physiological system or pathological states for the benefit of the recipient'. (WHO)

## 2. Pharmacodynamics:

- Pharmacodynamics is the study of the biochemical and physiological effects of the drugs and their mechanism of action.





# PHARMACOLOGY TERMS



## ***3. Pharmacokinetics:***

- Pharmacokinetics deals with the alterations of the drug by the body which includes absorption, distribution, binding/storage, biotransformation and excretion of drugs.

## ***4. Pharmacotherapeutics:***

- Pharmacotherapeutics deals with the use of drugs in the prevention and treatment of diseases and it utilizes or depends upon the information of drug obtained by pharmacodynamic studies.







# PHARMACOLOGY TERMS



## **5. Toxicology:**

- Toxicology deals with the side/adverse effects and other poisonous effects of drugs, since the same drug can be a poison, depending on the dose.

## **6. Chemotherapy:**

- Chemotherapy deals with the effects of drugs upon microorganisms and parasites without destroying the host cells.





# PHARMACOLOGY TERMS



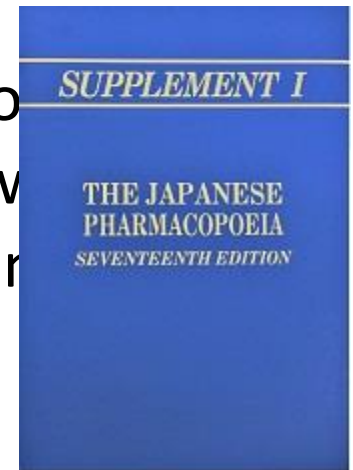
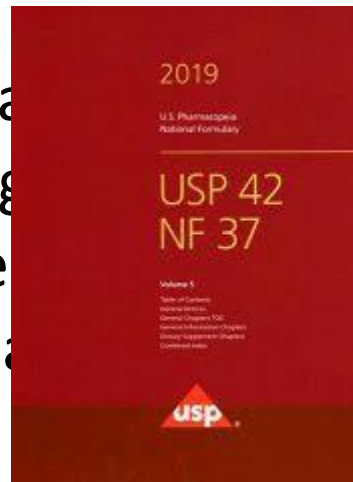
## 7. Pharmacy:

- Pharmacy is the science of preparation, compounding and dispensing of drugs. It is concerned with collection, identification, purification, isolation, synthesis and standardization of medicinal /pharmaceutical substances.

## 8. Pharmacopoeia:

- Pharmacopoeia is a collection of selected drug descriptions, tests and with their standards.

Ex: USP, BP, JP





# PHARMACOLOGY TERMS



## **9. Pharmacognosy:**

- Pharmacognosy deals with the study of the sources of drugs derived from plants and animal origin.

## **10. Materia-medica:**

- Materia-medica: This is an older term and deals with the source, description (physical and chemical properties) and preparation of drugs.





# SOURCES OF DRUGS



- “Drug” is derived from French word “drogue” means a dry herb.
- Drugs are obtained mainly from:
  - Natural resources: Plants, human, animals, microbes and mineral sources.
  - Semi-synthetic
  - Synthetic





# SOURCES OF DRUGS



## 1. Natural Resources:

### A. From Plants:

- Oldest source of drugs used empirically Leaves, seeds, flowers, roots, bark... etc.

### Problems:

- Identification of plant
- Climatic and social conditions of area
- Season of collection
- Condition of storage



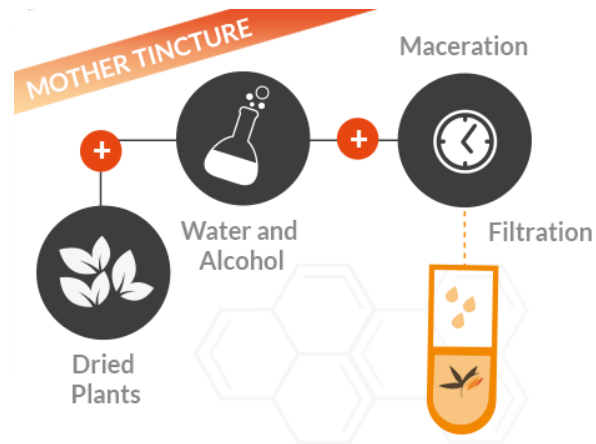


# SOURCES OF DRUGS



## Various Forms of Plant Drugs:

- Extract
- Infusions
- Decoction
- Powders
- Oils





# SOURCES OF DRUGS



➤ The pharmacologically active components in vegetable drugs are:

## ❖ *Alkaloids:*

• Alkaloids are basic substances containing cyclic nitrogen. The important alkaloids are obtained from:

- *Opium (Papaver somniferum):* Morphine group.
- *Cinchona (Cinchona officinalis):* Quinine
- *Coca (Erythroxylum coca):* Cocaine
- *Belladonna (Atropa belladonna):* Atropine group
- *Pilocarpus sp.:* Pilocarpine





# SOURCES OF DRUGS



## ❖ *Glycosides:*

- Glycosides are ether like organic structure combined with sugars, the non-sugar component called aglycone or genin. The important glycosides are:
  - *Digitalis (Digitalis purpurea, Digitalis lanata):* Digoxin
  - *Stropanthus (Stropanthus kombe):* Stropanthin
  - *Senna (Cassia acutifolia):* Sennoside







# SOURCES OF DRUGS



## ❖ *Oils:*

**A. Fixed oils** are glycerides of oleic, palmitic and stearic acids. Mostly fixed oils are edible and used for cooking. The fixed oils used as drug are:

- Castor (*Ricinus communis*): Castor oil.
- Olive (*Olea europaea*): Olive oil.
- Cocoa butter (*Theobroma cacao*): Theobroma oil used as emollient in skin cream and making suppositories.
- Cod liver oil and shark liver oil: Rich source of vitamin A and D.





# SOURCES OF DRUGS



## ❖ *Oils:*

**B. Volatile oil or essential oil** contains the hydrocarbon terpene. The important volatile oils are:

- Oil of clove is mainly useful in relieving pain in toothache.
- Lemon oil (*from Citrus limon*), used as flavouring



as a





# SOURCES OF DRUGS



## B. From Human Being:

There are certain products which are obtained from human being:

- Immunoglobulins: From Blood
- Placental Extract: From placenta
- Human Chorionic Gonadotropin: From urine of pregnant women
- Growth Hormone: From pituitary gland

Human sources:

Drugs	Source
HCG	Pregnant woman
Menotrophin	Post menopausal women urine
Insulin	Human
Urokinase	Human kidney cell





# SOURCES OF DRUGS



## C. Animal:

The different animal products after purification in a suitable dosage form for the treatment of disease are listed below:

Drug	Category	Animal source
Insulin	Hormone	Pancreas of beef or pig
Thyroid extract/thyroxine	Hormone	Thyroid gland
Shark liver oil	Vitamin A	Livers of shark and allied species
Cod liver oil	Vitamin A and D	Livers of Gadus species
Antisnake venom	Immune serum	Blood of horse
Hyaluronidase	Enzyme	Testis of bull
Pepsin	Enzyme	Stomach of beef and pig
Surgical ligatures and sutures	Used in surgery	Intestinal tissues, tendons of animals.





# SOURCES OF DRUGS



## D. From Microorganisms:

There are different classes of drugs obtained/isolated from microbes are:

- **Penicillin:** *Penicillium chrysogenum* and *notatum* (Fungus)
- **Streptomycin:** *Streptomyces griseus* (Actino-mycetes)
- **Chloramphenicol:** *Streptomyces venezuelae* (Actinomycetes).
- **Griseofulvin:** *Penicillium griseofulvum*
- **Streptokinase:** An enzyme from gram positive cocci (*Streptococcus pyogenes*)
- **Vitamin B12 (Cyanocobalamin):** *Streptomyces griseus*.





# SOURCES OF DRUGS



## F. From Minerals:

- Metals, metalloids, non-metal substances. and their compounds.

Ex: Iron, calcium, magnesium, aluminium, sodium, potassium, sulphur, lithium etc





# SOURCES OF DRUGS



## E. From Semi-Synthetic:

- Complex molecules
- Expensive and for impure natural compound

Ex: 6-aminopencillanic acid (fungus), semi-synthetic human insulin (pork insulin)





# SOURCES OF DRUGS



## F. From Synthetic:

- Pharmaceutical laboratory
- Organic or inorganic or combination of organic and inorganic compounds
- > 90% drugs

Ex: Antipyretics, sulphonamides, antihistamines, anticonvulsants, anti anxiety, nitrous oxide...etc.







# DRUG USES



- Symptomatic treatment
- Prevention
- Diagnostic drugs
- Curative
- Health maintenance
- Contraception





# DRUG NAMES



- **Chemical Name:**
  - The drug's chemical composition and molecular structure
- **Generic Name (Nonproprietary Name):**
  - Name given by the United States Adopted Names Council
  - Allows the drug to be marketed
- **Brand Name (Nonproprietary Name):**
  - Also called a Trade Name
  - The drug has a registered trademark; use of the name is restricted by the drug's owner (usually the manufacturer)
  - Allows the drug to be commercially distributed
  - The superscript <sup>®</sup> is registered by the U.S. Patent Office and approved by the FDA (Food and Drug Administration)





# DRUG FORMS



- Epicutaneous / transdermal
  - Ointments
  - Creams
  - Infusion pumps
  - Pastes
  - Plasters
  - Powders
  - Aerosols
  - Lotions
  - Transdermal patches, discs, solutions
- Intraocular/ intraaural
  - Solutions
  - Suspensions
- Intranasal
  - Solutions
  - Sprays
  - Inhalers
  - Ointments
- Intrarespiratory
  - Aerosols





# ROUTES OF DRUG ADMINISTRATION



## CLASSIFICATION

### SYSTEMIC

#### Enteral

Oral  
Sublingual  
Rectal

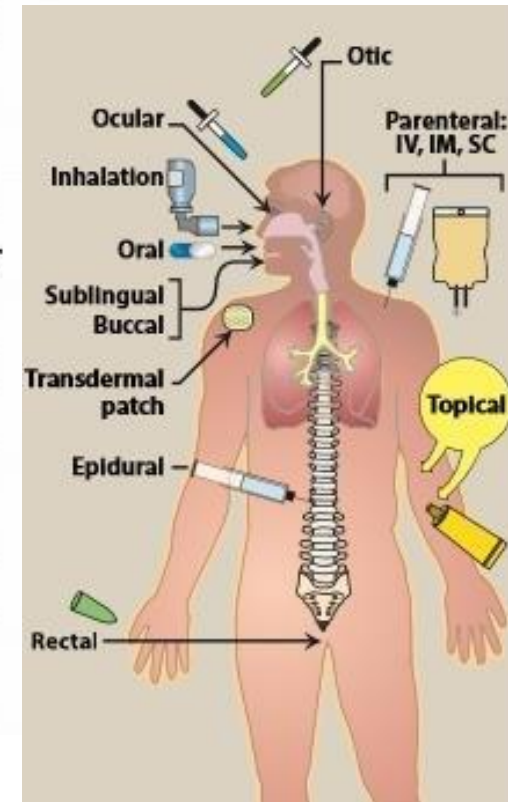
#### Parenteral

*Inhalational*  
*Injections*  
*Transdermal*

Intravenous  
Intramuscular  
Subcutaneous  
Intra-arterial  
Intra-articular  
Intrathecal  
Intradermal

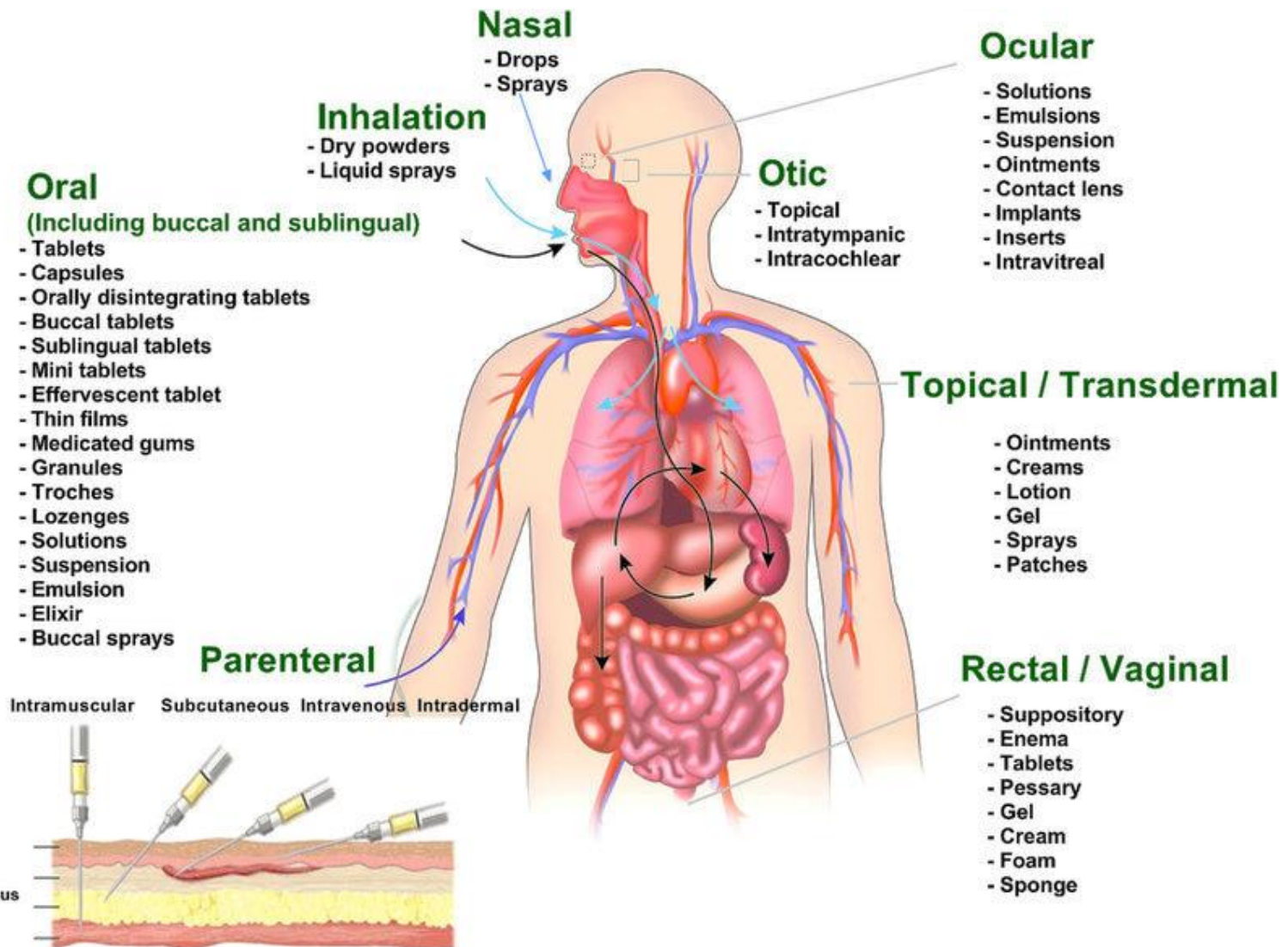
### LOCAL

- Skin topical
- Intranasal
- | Ocular drops
- Mucosal-throat, vagina, mouth, ear
- *Inhalational*
- | *Transdermal*





# ROUTES OF DRUG ADMINISTRATION





# ROUTES OF DRUG ADMINISTRATION



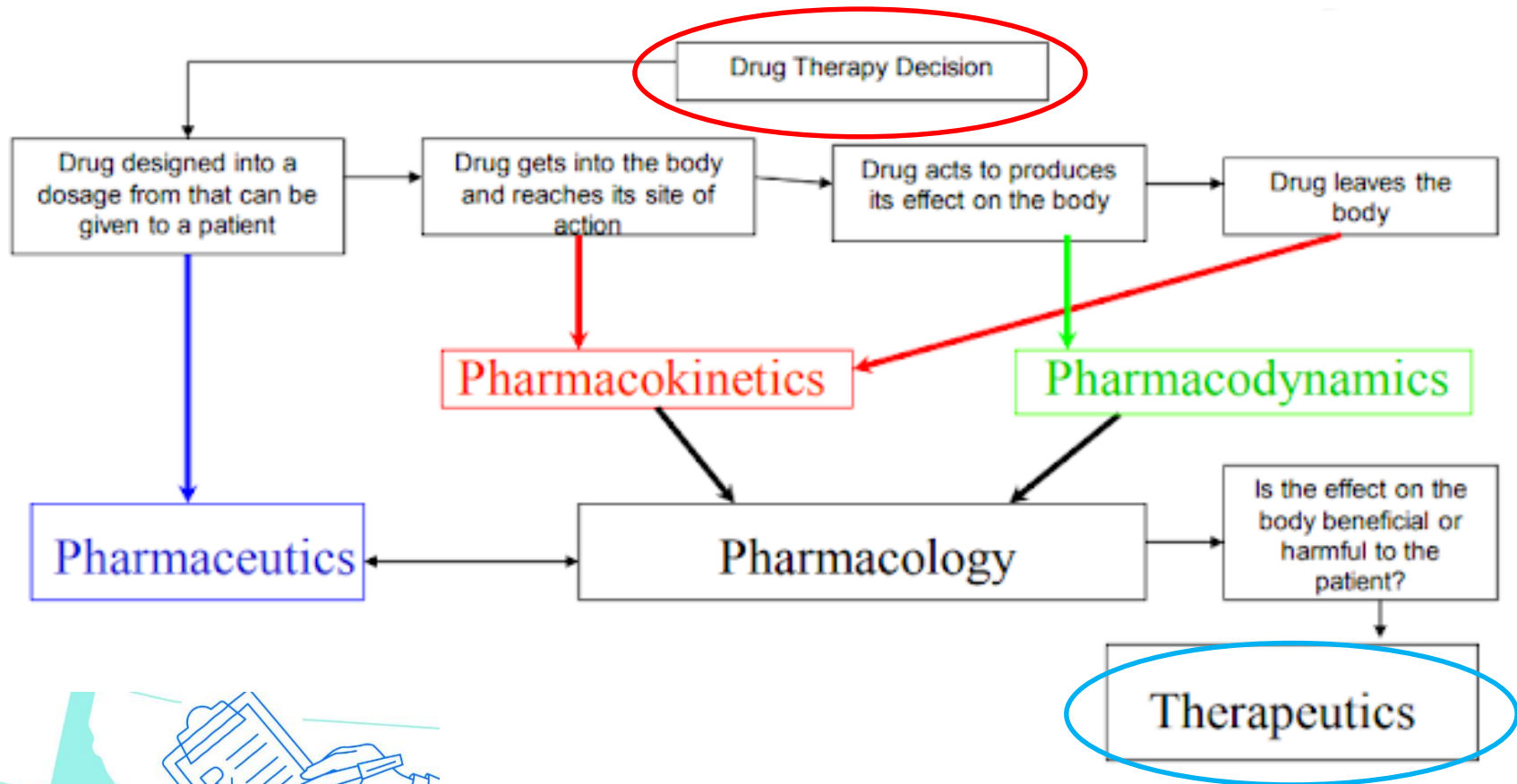
## -Time until effect-

- |  |                             |
|--|-----------------------------|
| <input type="checkbox"/> intravenous           | 30-60 seconds               |
| <input type="checkbox"/> intraosseous          | 30-60 seconds               |
| <input type="checkbox"/> endotracheal          | 2-3 minutes                 |
| <input type="checkbox"/> inhalation            | 2-3 minutes                 |
| <input type="checkbox"/> sublingual            | 3-5 minutes                 |
| <input type="checkbox"/> intramuscular         | 10-20 minutes               |
| <input type="checkbox"/> subcutaneous          | 15-30 minutes               |
| <input type="checkbox"/> rectal                | 5-30 minutes                |
| <input type="checkbox"/> ingestion             | 30-90 minutes               |
| <input type="checkbox"/> transdermal (topical) | variable (minutes to hours) |





# SCIENTIFIC BASIS OF PRESCRIBING





# PRESCRIPTION DRUGS



- Prescription drugs = legend drugs
- Drugs prescribed by:
  - Physician
  - Nurse practitioner
  - Physician's assistant
  - Dentist
  - Veterinarian
  - Others







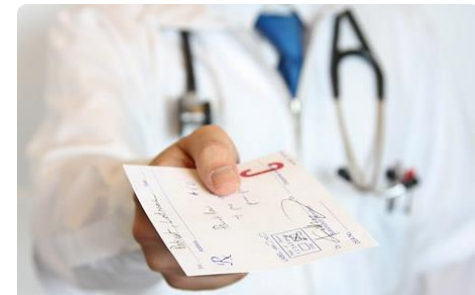
# PRESCRIPTION WRITING



## Sample Prescription for Cambodia

A prescription should have the following components to be considered standard;

1. Identity of prescription issuing facility
2. Identity of patients (medical conditions)
3. Name of drugs (Generic names and dosages)
4. Form and quantity of drugs
5. Indication, method of administration, duration of treatment
6. Special instructions or contraindication, if any
7. Date of prescription
8. Signature and name of physician





# PRESCRIPTION WRITING



<b>Provincial Health Department:</b>		<b>Operational District:</b>	
<b>Health Center/Hospital:</b>		<b>Prescription Number:</b>	
<b>Name of Patient:</b>		<b>Age:</b>	<b>Gender (M/F):</b>
<b>Home Address:</b>		<b>Weight (kg):</b>	
<b>Diagnosis:</b>			
<b>Medicine Name</b>	<b>Form</b>	<b>Dose</b>	<b>Duration</b>
<b>Special Instructions:</b>			
<b>Date:</b>			
<b>Name of Doctor and Qualifications:</b>			
<b>Signature:</b>			
<i>Please bring this prescription on your next visit</i>			





# PRESCRIPTION WRITING



Abbreviation	Latin name	English meaning
ad	ad	up to
ad lib	ad libitum	as desired
aq.	aqua	water
q.s.	quantum sufficiat	as much as it sufficient
collut.	collutorium	a mouth wash
garg.	gargarisma	a gargle
liq.	liquor	a solution
past	pasta	a paste
pign	pigmentum	a paint
o.d	once in die	once daily
b.i.d	bis in die	twice a day
q.i.d	quarter in die	four times a day
s.o.s.	si opus sit	if needed
prim. luc	prima luce	early in the morning
o.m.	omni name	every morning
o.h.	omni hora	every hour
n.	nocte	at night
o.n.	omni nocte	every night
h.s.	hora somni	at bed time
a.c.	anti cibos	before meals
p.c.	post cibos	after meals
i.c.	inter cibos	between meals/food
pulv.	pulvis	powder
sol.	solutio	solution
stat.	statim	at once
tab.	tabella	tablet
caps.	capsula	capsule
tr.	tinctura	tincture
ung.	unguentum	ointment
ex.lact.	exlacte	with milk
ex. aq.	ex aqua	with water
p.r.n.	pro re nata	occasionally
dol. urg.	dolore urgente	when the pain is severe



# Any questions?

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