# Introduction to Pharmacology

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# Definitions

**Drug: It is any chemical that affect living processes. It modifies an already existing function, and does not create a new function.**

# Definitions

## Pharmacology:

**The science of drugs.**

**It is the knowledge of history, source, physical and chemical properties, absorption, distribution, excretion, biotransformation, actions and therapeutic uses of drugs. (or toxic effects on microbes and cancer cells).**

# Definitions

## Medical (or Clinical) Pharmacology:

**Is the science that deals with the use of drugs for diagnosis, prevention, mitigation, and treatment of human disease.**

# Definitions

**Pharmacy**:

**Is that branch of the health sciences dealing with the preparation, dispensing, and proper utilization of drugs.**

# Definitions

## Toxicology:

**Is that aspect of pharmacology which deals with adverse effects of drugs and the toxic effects produced by household, environmental and industrial chemicals. (poisons are also drugs, why?)**

# Definitions

## Clinical Toxicology:

**Is the study of the toxic or adverse effects of toxins on the human body, including the diagnosis and treatment of human poisoning.**

## Analytical toxicology:

**Is a branch of analytical chemistry concerned with the measurement of toxic chemicals in biological and environmental materials.**

# Definitions

## Forensic Toxicology:

**Deals with the medico-legal aspects of toxicity. It is concerned with proving the relationship of the health condition of the patient (including death) with a particular poison.**

# Definitions

## Environmental toxicology:

- **Deals with the movement of toxins into the environment and contamination of food chain.**
- **Industrial toxicology is a specific area of environmental toxicology that deals with the work environment which is part of industrial hygiene.**

# Definitions

- **Two general principles that every student should always remember:**

1. **All substances can under certain conditions be toxic.**
2. **All dietary supplements and all substances promoted as health-enhancing should meet the same standards of efficacy and safety as drugs.**

# Definitions

**Pharmacotherapeutics:**

**Is the use of drugs in the prevention and treatment of disease ( or the medical uses of drugs).**

**Chemotherapeutics:**

**Is the use of drugs to stop the growth or kill microorganisms or cancer cells.**

# Definitions

**Pharmacogenomics:**

**The relation between the individual's genetic makeup to his/her response to specific drugs (entire genome).**

**Pharmacogenetics:**

**Interindividual variation in drug response that is due to genetic influences (specific gene).**

# Definitions

**Idiosyncratic drug response:**

**Unusual response, infrequently observed in most patients. Usually caused by genetic differences in metabolism of drug, or by immunologic mechanisms including allergic reactions.**

# Definitions

**Tolerance:**

**Is a decrease in the responsiveness to the drug with continued drug administration.**

**Tachyphylaxis:**

**Similar to tolerance but more rapid.**

# Definitions

**Prescription:**

**The written direction for the preparation, dispensing and administration of the drug.**

**The therapeutic effect:**

**It is the primary effect that the drug is prescribed for such as morphine for analgesia.**

**Adverse effect:**

**It is the undesirable effects of the drug.**

# Definitions

**Drug toxicity:**

**Deleterious effect of the drug on on the body as a result of drug overdose.**

**Drug-Drug interaction:**

**When administration of one drug affect the action of another drug, or when co-adminstered drugs affect the action of each other.**

# Definitions

**Drug misuse:**

**Is the improper use of medications concerning dose, frequency, and duration of administration; or unvalid indication. All may lead to acute and chronic toxicity**

**Drug abuse:**

**It is an inappropriate and habitual intake of drugs either continually or periodically for recreational but not medical reasons. It is related to addiction to drugs.**

# Areas of Pharmacology

## Pharmacodynamics:

**Is what the drug does to the body, which includes the biochemical and physiological effects of the drug, including the mechanism of action, interaction with receptors as well as the adverse effects.**

# Areas of Pharmacology

**Pharmacokinetics:**

- **Is what the body does to the drug.**
- **Deals with absorption, distribution, biotransformation and excretion of drugs:**

1. **Absorption: Is the movement of drug molecules from the site of administration into the circulation.**

# Areas of Pharmacology

2. **Distribution: Is the movement of drug molecules from the circulation to tissues and between different parts of the body.**
3. **Biotransformation: Is conversion of the drug from one chemical structure into another by the action of metabolic enzymes (metabolism).**
4. **Excretion: Is the movement of drug molecules out of the body.**

# Pharmacokinetics & Pharmacodynamics

**Dosage form**



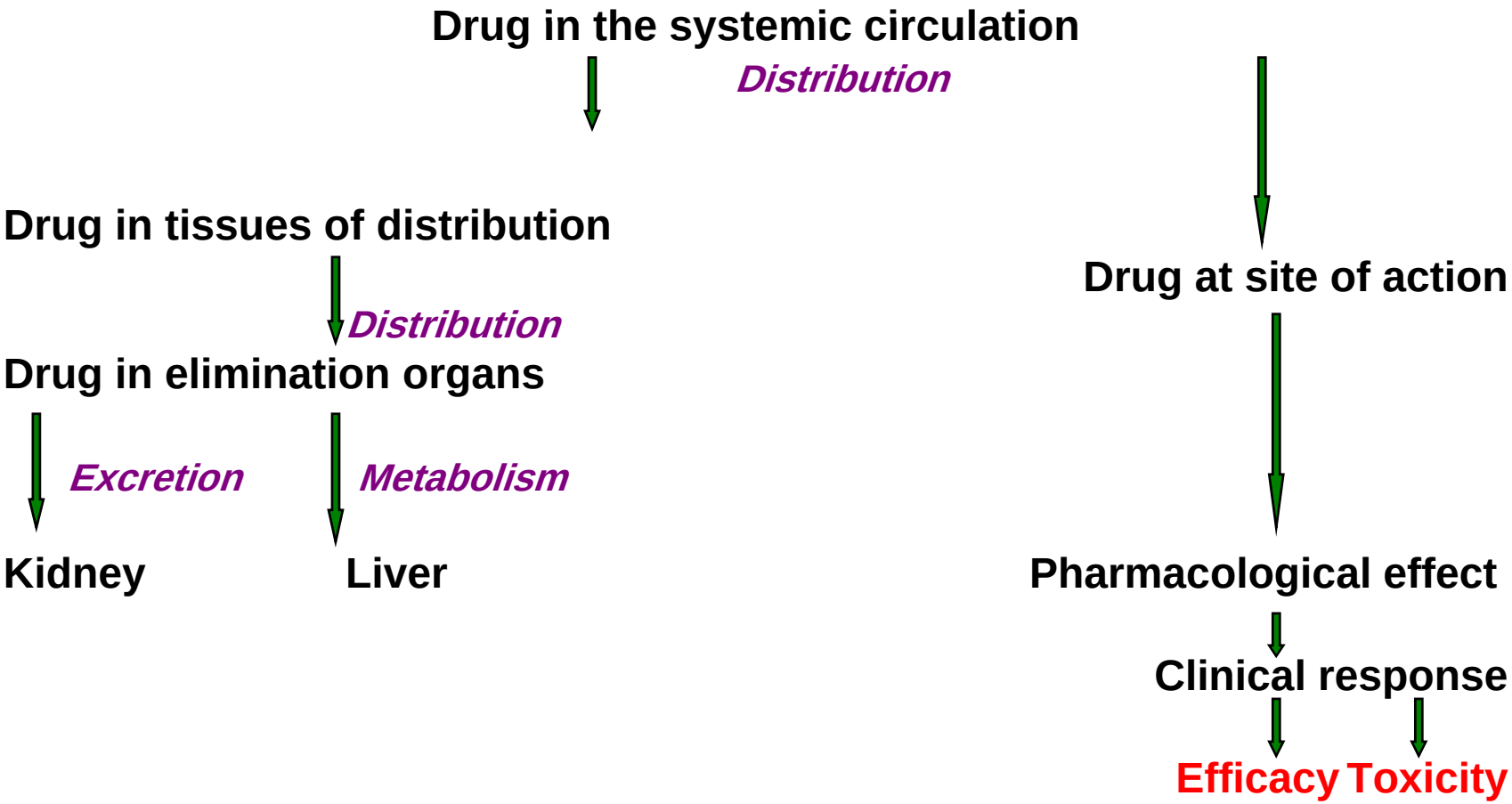
**Disintegration**

**Dissolution**

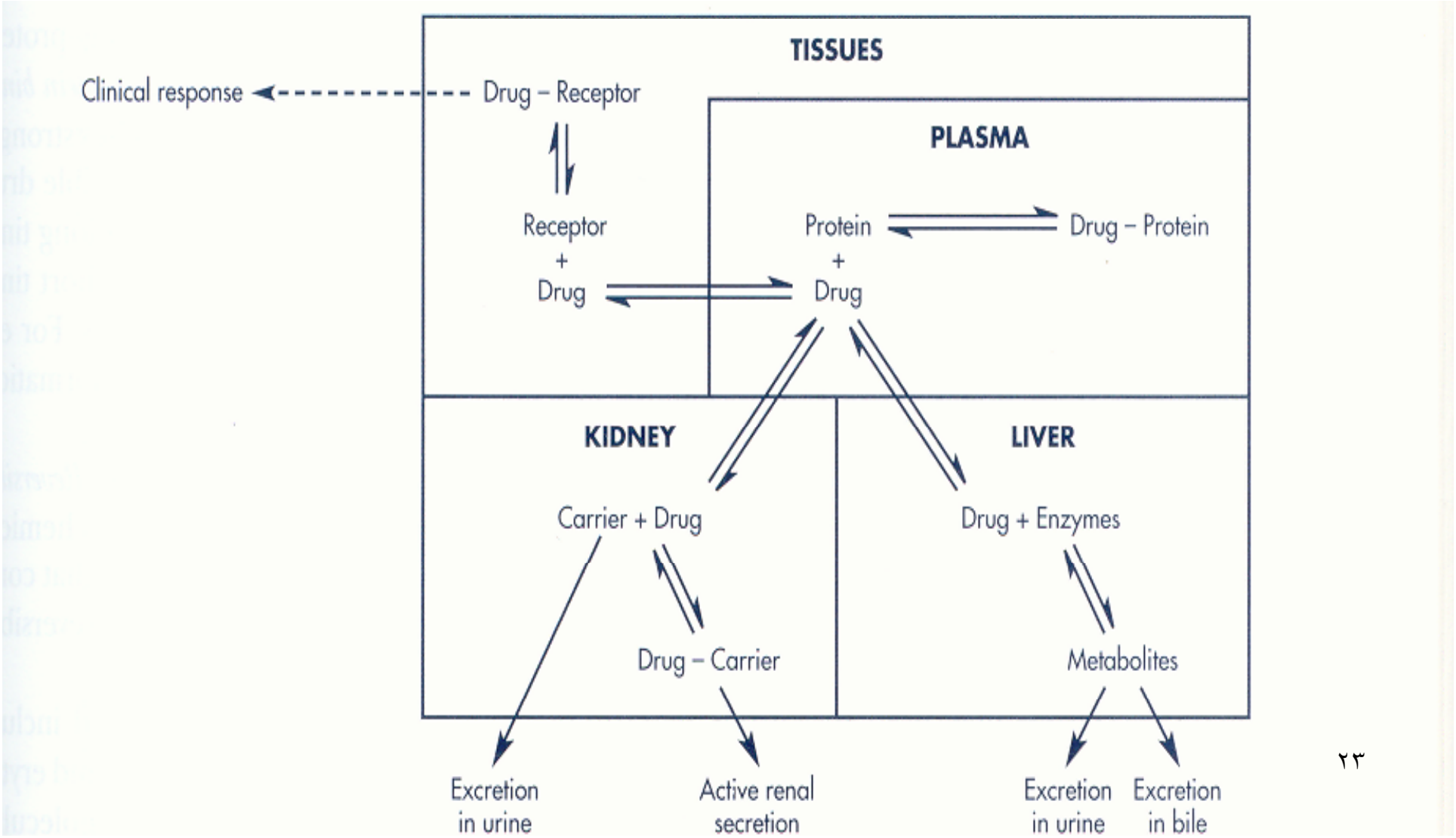
***absorption***

**Drug in the systemic circulation**

# Pharmacokinetics & Pharmacodynamics



# Drug Disposition



# Pharmacoepidemiology

- **The study of the utilization and effects of drugs in large numbers of patients.**
- **It applies epidemiological techniques to study drug use in a large population. Epidemiology is the study of the factors that determine the occurrence and distribution of diseases in populations.**

# Drug Sources

1. **Natural Sources:**

- **Plants:** **include alkaloids , which are substances containing nitrogen groups and give an alkaline reaction in aqueous solution. Including morphine, cocaine, atropine, and quinine.**
- **Microbes:** **include antibiotics which are isolated from microorganisms, such as *Penicillium* and *Streptomyces* species.**

# Drug Sources

- **Animal tissues:** **The most important are hormones used for replacement therapy (Insulin, growth hormone, thyroid hormones). These days, peptide hormones may by synthesized by recombinent DNA technology.**
- **Minerals:** **include few useful therapeutic agents, including the lithium compounds used to treat bipolar mental illness.**

# Drug Sources

## 2. Synthetic Drugs:

- **Synthesized new compounds:** include aspirin, barbiturates, and local anesthetics which were among the first drugs to be synthesized in the laboratory.
- **Modified naturally occurring drugs:** include Semisynthetic derivatives of naturally occurring compounds, such as the morphine derivative oxycodone.

# Drug Sources

- **In some cases, new drug uses were discovered by accident when drugs were used for another purpose, or by actively screening a huge number of related molecules for a specific pharmacologic activity.**

# Drug Sources

- **Medicinal chemists now use molecular modeling software to utilize structure-activity relationship, which is the relationship between the drug molecule, its target receptor, and the resulting pharmacologic activity.**