General pharmacology

Pharmacology:

The study of substances that interact with living systems through chemical processes. Especially by binding to regulatory molecules and activating or inhibiting normal body processes. These substances may have beneficial therapeutic effect or for their toxic effects .

Drug:- any substances that make change in biological function through its chemical actions . In the great majority of cases ,the drug molecule interacts with a specific molecule in the biologic system that play a regulatory role. This molecule called receptor.

Receptor :- Is a specialized target macromolecule present in cell surface or intracellular, that binds a drug & modulates pharmacologic action.

Therapeutic index :-is a ratio used to evaluate the safety of the drug. Therapeutic index (TI) can be calculated :TI=LD50 / ED50 Theoretically, the larger the TI the safer the drug.

Drug concentration at the site of action influenced by several factors ,such as :

1-Rout of drug administration .

2- Dose

3-Characteristics of drug molecules (e.g,lipid solubility).

The rout of drug administration is determined primarily by the properties of the drug (for example ,water or lipid solubility ,ionization) the therapeutic

objectives (for example, the desirability of a rapid onset of action, the

need for long-term treatment, or restriction of delivery to a local site).

Major routes of drug administration include enteral, parenteral, and topical.

A-Enteral

1-Oral.

2-Sublingual.

3-Rectal.

B-Parenteral

1-Intravenous (IV).

2-Intramuscular (IM).

3-Subcutaneous (SC).

C-Other

1-Inhalation.

2-Intranasal.

3-Intrathecal/Intraventricular.

4-Topical.

5-Transdermal.

Drug names:-

1-Chemical name :-describe the atoms or molecular structure.D(-)-alpha –amino-p-hydroxybenzyl-penicillin trihydrate,describes the chemical composition of a drug .

2-Non- proprietary name: –generic name; Include amoxicillin ,acetaminophen.

Most commonly used , this is name all manufacturers use for a drug, and it is the same in any country. Generic names are not capitalization when written .e.g. (diazepam).

3-Trade or brand name:-this name is followed by the symbol ®,.the first letter of the trade name is capitalized. E.g. Valium, Lanoxin.

4-Official name:-the name given by the food and drug administration (FDA) this name is similar to the generic or chemical name. the first letter of the official name is also capitalized.

The interaction between a drug and the body are conveniently divided into two classes:-

1-pharmacodynamic:- study of how the drug produces its effects on the body.

Notes:

For most drugs it is necessary to know, the site of action and mechanism of action at the level of the organ ,functional system , or tissue .For example ,the drug effect may be localized to the brain ,the neuromuscular junction ,the heart ,the kidney ,etc.

Most drugs exert effects on several organs or tissues ,and have unwanted as well as therapeutic effects .There is a dose-response relationship for wanted and unwanted (toxic) effects.

Factors affect drug responses like age ,weight ,sex, diet ,race, genetic factors ,disease states trauma, concurrent drugs, etc.

2-pharmacokinetic:-Study of how a drug moves into ,through ,and out of the body .or the action of the body on the drug (absorption, distribution, elimination of drug) .(ADME)..

Pharmacodynamics:- describes the actions of a drug on the body.

Cells have different types of receptors, each of which is specific for a

particular ligand.

The term “ligand” refers to a small molecule that binds to a site on a receptor

protein and produces a unique response.

Drug + Receptor ←→ Drug–receptor complex → Biologic effect

.**The receptors may be divided into four families:**

1- ligand-gated ion channels.

2-G protein–coupled receptors

3- enzyme–linked receptors.

4-Intracellular receptors.

.**Properties of receptor :-**

1-most receptor are protein in structures .

2-selectivity.

3-Specificity.

4-Sensitivity.

Types of bound between drug & receptor:-

1-electrostatic bonds(weak)

2-hydrogen bonds & von der force (weak , reversible).

3-Covalent bonds (strong , irreversible.)

Definition of some terms used in the study of drug receptor interaction or pharmacology :-

1-ligand:-drug or endogenous substance that binds to receptor.

2-Affinity:-ability of a ligand to combine with receptor.

3-Potency:-A measure of amount of ligand required to produce given level of effect.

4-Efficacy : -ability of ligand to provoke a cellular response after combining with its receptor & depends on the number of drug-receptor

complexes formed if a drug binds to the receptors & not elicit a response efficacy (antagonist).

5-Agonist:-a ligand that produce an appropriate response when its bind to its receptor .(have affinity & efficacy).

6-Antagonist:-is a drug that high affinity to combine with the receptors but has no efficacy (unable to activate the receptors) it.

Agonists activate the receptors to produce a response.

Type of Agonist .

1-Full agonists

If a drug binds to a receptor and produces a maximal biologic response

that mimics the response to the endogenous ligand, it is known as a full

agonist.

2-Partial agonists

drugs that bind to their targets and activate them to produce a response which is less than that we would expect from a full agonist .

3-Inverse agonists

drugs that bind to their targets and can reduce the normal activity of that chemical target. They have what is termed negative efficacy.

Type of antagonist:-

1-competitive antagonist:-divided according to receptor block into :

a-reversible competitive antagonist:-

b-irreversible competitive antagonist:--

2-non -competitive antagonist :- non –competitive antagonist .-act via different receptor.

3-physiological antagonist:

4-chemical antagonists:-one drug may antagonist the action of a second drug by binding to & inactivating the second drug (protamin + heparin) not need to involve a receptor at cell.