Types of receptors

3-**ENZYMES**

Many drugs are targeted on enzymes .Often, the drug molecule is a substrate analogue that acts as a competitive inhibitor of the enzyme (e.g. **captopril**, acting on angiotensin-converting enzyme;); in other cases, the binding is irreversible and non-competitive (e.g. **aspirin**, acting on cyclo-oxygenase;). Drugs may also act as false substrates, where the drug molecule undergoes chemical transformation to form an abnormal product that subverts the normal metabolic pathway.

4-TRANSPORTERS

The movement of ions and small organic molecules across cell membranes generally occurs either through channels , or through the agency of a transport protein, because the permeating molecules are often too polar (i.e. insufficiently lipid-soluble) to penetrate lipid membranes on their own .

Adverse effects:-

Adverse drug reactions are unwanted effects caused by normal therapeutic doses. Drugs are great mimics of disease, and adverse drug reactions present with diverse clinical signs and symptoms. The classification proposed by Rawlins and Thompson (1977) divides reactions into type A and type B .

Type A reactions, which constitute approximately 80% of adverse drug reactions, are usually a consequence of the drug's primary pharmacological effect (e.g. bleeding from **warfarin**) or a low therapeutic index (e.g. nausea from **digoxin**), and they are therefore predictable. They are dose-related and usually mild, although they may be serious or even fatal (e.g. intracranial bleeding from **warfarin**). Such reactions are usually due to inappropriate dosage, especially when drug elimination is impaired. The term 'side effects' is often applied to minor type A reactions. Type B ('idiosyncratic') reactions are not predictable from the drug's main pharmacological action, are not dose-related

and are severe, with a considerable mortality. The underlying pathophysiology of type B reactions is poorly if at all understood, and often has a genetic or immunological basis. Type B reactions occur infrequently (1:1000–1:10 000 treated subjects being typical).

Three further minor categories of adverse drug reaction have been proposed:

1. *type C* – continuous reactions due to long-term drug use (e.g. neuroleptic-related tardive dyskinesia or analgesic nephropathy).
2. *type D* – delayed reactions (e.g. alkylating agents leading to carcinogenesis, or retinoid-associated teratogenesis).
3. *type E* end-of-use reactions, such as adrenocortical insufficiency following withdrawal of glucocorticosteroids, or withdrawal syndromes following discontinuation of treatment with benzodiazepines or β-adrenoceptor antagonists.

Drug interaction

Drug interaction is the modification of the action of one drug by another. There are three kinds of mechanism:

1. pharmaceutical;
2. pharmacodynamic;
3. pharmacokinetic.

Pharmaceutical interactions occur by chemical reaction or physical interaction when drugs are mixed. Pharmacodynamic interactions occur when different drugs each infuence the same physiological function (e.g. drugs that influence state of alertness or blood pressure); the result of adding a second such drug during treatment with another may be to increase the effect of the first (e.g. alcohol increases sleepiness caused by benzodiazepines). Conversely, for drugs with opposing actions, the result may be to reduce the effect of the first (e.g **indometacin** increases blood pressure in hypertensive patients treated with an antihypertensive drug such as **losartan**). Pharmacokinetic interactions occur when one drug affects the pharmocokinetics of another (e.g. by reducing its elimin-ation from the body or by inhibiting its metabolism). These mechanisms are discussed more fully below in the section on adverse interactions

grouped by mechanism. A drug interaction can result from one or a combination of these mechanisms.

Pharmacogenetics :-

The study of variation in drug responses under hereditary control is known as pharmacogenetics. Mutation results in a change in the nucleotide sequence of DNA. Single nucleotide polymorphisms (SNPs) are very common.