

Chapter_16

Chemistry in Everyday Life

1. **Drugs** are chemicals of low molecular masses (N 100-500 u). These interact with macromolecular targets and produce a biological response.

2. **Chemotherapy** means treatment of a disease with the help of chemicals in the form of medicines.

3. **Classification of Drugs :**

These are classified as follows

(a) On the basis of pharmacological effects.

(b) On the basis of drug action.

(c) On the basis of chemical structure.

(d) On the basis of molecular targets.

4. Drug-target interaction can take place with the help of enzymes and receptors.

- A drug travels through the human system in order to reach the target. So, the drug should be designed in such a way that it reaches the target without getting metabolised in between.
- Enzyme perform two major functions :
 - (a) Hold the substrate for a chemical reaction.
 - (b) Provide functional groups that will attack the substrate.
- **Competitive inhibitors** compete with the natural substrate for their attachment on the active site of enzymes.
- Some drugs, instead of binding to the enzyme's active site, bind to a different site of enzyme, which is called **allosteric site**. Due to this action, the shape of the active site is changed to the extent that substrate does not recognise it.
- The message between two neurons and that between neurons to muscles is communicated through certain chemicals in the body, known as **chemical messengers**.

5. **Therapeutic Action of Different Classes of Drugs**

- **Antacids** some chemical substances which remove the excess acid in the stomach and raise the pH at appropriate level are called **antacids**. e.g. sodium hydrogen carbonate, a mixture of aluminium and magnesium hydroxide, etc.
- **Tranquilizers** are a class of chemical compounds used for the treatment of stress and mild or severe mental diseases. These are an essential component of sleeping pills chlorodiazepoxide, meprobamate are mild tranquilizers and are used in relieving pain. Equanil is used in controlling depression and hypertension.
- **Barbiturates** (Derivatives of barbituric acid), like veronal, amytal, nembutal, luminal, seconal, valium, serotonin, etc. are used as hypnotic, i.e. sleep producing agents.
- **Analgesics** abolish or reduce pain without causing impairment of consciousness, mental confusion, incoordination or paralysis or some other disturbances of nervous system. **Aspirin** and **paracetamol** belong to the class of (non-narcotic or sedative or non-habit forming) analgesics. Morphine and many of its homologues are narcotic or habit forming analgesics.
- Chemical substance used to bring down body temperature at the time of high fever are called **antipyretics**, e.g. aspirin, paracetamol, etc.

- **Antibiotics** are the substances produced wholly or partially by chemical synthesis, which in low concentrations inhibit the growth or destroy microorganisms by intervening in their metabolic processes. Arsphenamine (salvarsan) was the first effective antibiotic for syphilis.

The two types of antibiotics are :

(a) Antibiotics which kill or inhibit a wide range of gram-positive and gram-negative bacteria are called **broad spectrum antibiotics**.

(b) Antibiotics that are effective against a narrow range of bacteria (either gram-positive or gram-negative bacteria) are called **narrow spectrum antibiotics**. Penicillin G is a narrow spectrum antibiotics while, ampicillin and amoxycillin are synthetic penicillins and are broad spectrum antibiotics. **Chloramphenicol** is one of the broad spectrum antibiotics and can be given orally to treat typhoid, dysentery, acute fever and pneumonia. Other example is ofloxacin.

- **Antiseptics** are chemicals which check the growth of microorganisms or kill them but are not harmful to the living human tissues. Some important examples are :
 - (a) **Dettol**, a mixture of chloroxylenol (also known as parachlorometaxylenol) and terpineol, is a commonly used antiseptic for wounds, cuts, diseased skin surfaces, etc.
 - (b) **Bithionol** is added to soaps to impart them antiseptic properties. Such soaps are used to reduce odour due to bacterial action on skin surface.
 - (c) **Iodine** is also used as an antiseptic in the form of tincture of iodine, i.e. a 2-3% solution of iodine in alcohol-water.
 - **Disinfectants** are the chemicals which prevent the growth of microorganisms or kill them but they are harmful for the living tissues, thus these are applied on inanimate objects. 0.2% solution of phenol can be used as an antiseptic while 1% solution of phenol acts as a disinfectant.
 - **Anti-fertility Drugs** Birth control pills contain a mixture of synthetic estrogen and progesterone derivatives. Norethindrone is an example of synthetic progesterone derivative. The estrogen derivative which is used in combination while progesterone derivative is ethynylestradiol.
6. **Artificial sweetening agents** are artificial sweeteners that has a great value to diabetic persons and people who need to control intake of calories. Some commonly used artificial sweeteners are
- **Aspartame** (an artificial sweetener) is methyl ester of dipeptide formed from aspartic acid and phenylalanine. It is unstable at cooking temperature so it is only used in cold foods and soft drinks.
 - **Alitame** (an artificial sweetener) is high potent sweetener therefore, control of sweetness of food is difficult while using it. It is more stable than aspartame.
7. **Antioxidants** retard the action of oxygen on food thus, reducing the speed of decomposition by oxidation. The most familiar antioxidants are BHT (butylated hydroxy toluene) and BHA (butylated hydroxy anisole).

8. Cleansing Agents

Two types of cleansing agents are:

- **Soaps** are sodium or potassium salts of long chain fatty acids. Toilet soap, medicated soaps, soap chips, etc.
- **Synthetic detergents** some cleansing agents have all the properties of soaps, but actually do not contain any soap, they are **synthetic detergents**. They can be used both in soft and hard water as they give foam even in hard water. These are classified as follows :
 - (a) **Anionic detergents** are sodium salts of sulphonated long chain alcohol or hydrocarbon. e.g. sodium lauryl sulphate, sodium dodecyl benzene sulphonate.
 - (b) **Cationic detergents** are quaternary ammonium salts of amines with acetates, chlorides or bromides as anions.
e.g. cetyltrimethyl ammonium bromide used as hair conditioner.
 - (c) **Non-ionic detergents** do not contain any ion in their constitution. These are esters of high molecular mass alcohols. One such detergent is formed by the reaction of stearic acid with polyethylene glycol.
 - (d) **Biodegradable detergents** are those detergents which can be degraded or decomposed by microorganisms present in water. Such detergents have straight chains of hydrocarbons in the molecule. e.g. sodium lauryl sulphate, sodium dodecyl benzene sulphate.
 - (e) **Non-biodegradable detergents** are not degraded by microorganism. It is observed that bacteria cannot degrade detergents having highly branched hydrocarbon chain. e.g. sodium 4-(1,3,5,7-tetramethyloctyl) benzene sulphonate.