UNIT VIII – BIOLOGY IN HUMAN WELFARE.

CHAPTER 8: HUMAN HEALTH AND DISEASES

- **Health** could be defined as a state of complete physical, mental and social well-being.
- **Health** is affected by:
  (i) Genetic disorders - deficiencies with which a child is born and deficiencies/defects which the child inherits from parents from birth
  (ii) Infections and
  (iii) Life style including food and water we take, rest and exercise we give to our bodies, habits that we have or lack etc.
- Diseases can be broadly grouped into **infectious** and **non-infectious**. Diseases which are easily transmitted from one person to another, are called infectious diseases. E.g viral fever, malaria, etc.
  Diseases which cannot be transmitted from one person to another, are called **non-infectious** diseases. E.g. AIDS, cancer.

- A wide range of organisms belonging to bacteria, viruses, fungi, protozoa, helminths, etc., could cause diseases in man. Such disease causing organisms are called **pathogens**.

- ***Salmonella typhi*** is a pathogenic bacterium which causes typhoid fever in human beings. These pathogens generally enter the small intestine through food and water contaminated with them and migrate to other organs through blood. Sustained high fever (39° to 40°C), weakness, stomach pain, constipation, headache and loss of appetite are some of the common symptoms of this disease,
- **Pneumonia** in humans which infects the alveoli (air filled sacs) of the lungs. As a result of the infection, the alveoli get filled with fluid leading to severe problems in respiration. The symptoms of pneumonia include fever, chills, cough and headache. In severe cases, the lips and finger nails may turn grey to bluish in colour

- **Plasmodium** is responsible for causing **malaria**. Different species of Plasmodium (***P. vivax, P. falciparum***) aree responsible for different types of **malaria**. Out of these, malignant malaria caused by ***P. falciparum*** is the most serious one and can even be fatal.

LIFE CYCLE OF PLASMODIUM:

- Plasmodium enters the human body as sporozoites (infectious form) through the bite of infected female Anopheles mosquito. The parasites initially multiply within

the liver cells and then attack the red blood cells (RBCS) resulting in their rupture. The rupture of RBCs is associated with release of a toxic substance, haemozoin, which is responsible for the chill and high fever recurring every three to four days. When a female Anopheles mosquito bites an infected person, these parasites enter the mosquito body and undergo further development. The parasites multiply within them to form sporozoites that are stored in their salivary glands. When these mosquitoes bite a human, the sporozoites are introduced into his/ her body.

DISEASES

Amoebic dysentery (Amoebiasis):

Causal organism: Entamoeba histolytica.
Symptom: constipation, abdominal pain and cramps, stools with excess mucous and blood cloths.
Transmission: houseflies acts as mechanical carriers and serve to transmit the parasite from faeces of infected person to food and food products.
Drinking of such contaminated water and food by the faecal matter.

Ascariasis:

Causal organism: Ascaris.
Symptoms: internal bleeding, muscular pain, fever, anaemia and blockage of intestinal passage.
Transmission: through soil, water, vegetables, fruits, etc contaminated with eggs of Ascaris excreted along with the faeces of infected person.

Elephantiasis (Filariasis):

Causal organism: Wuchereria (W. bancrofti and W. malayi)
Symptom: chronic inflammation of the organ usually the lymphatic vessels of the lower limbs. Genital organs are often affectd resulting in gross deformities.
Transmission: through the bite of female mosquito vectors.

Ringworms:

Causal organism: microsporum, trichophyton and epidermophyton
Symptom: appearance of dry, scally lesions on various parts of the body such as skin, nail and scalp.
Transmission: through the soil or by using towel, clothes or even the comb of infected individuals.

IMMUNITY

- The overall ability of the host to fight the disease-causing organism conferred by the immune system is called **immunity**.

- **Immunity** is of two types: **(i) Innate immunity and (ii) Acquired immunity.**

- **Innate immunity** consist of four types of barriers.

These are:

(i) Physical barriers: Skin on our body is the main barrier which prevents entry of the micro-organisms. Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes entering our body.

(ii) Physiological barriers: Acid in the stomach, saliva in the mouth, tears from eyes-all prevent microbial growth.

iii) Cellular barriers: Certain types of leukocytes (WBC) of our body like polymorpho-nuclear leukocyte and monocytes and natural killer (type of lymphocytes) in the blood as well as macrophages in tissues can phagocytose and destroy microbes.

(iv) Cytokine barriers: Virus-infected cells secrete proteins called interferons which protect non-infected cells from further viral infection.

- **Acquired immunity** on the other hand, is pathogen specific. It is characterised by memory. This means that our body when it encounters a pathogen for the first time produces a response called primary response which is of low intensity. Subsequent encounter with the same pathogen elicits a highly intensified secondary or anamnestic response. The primary and secondary immune response out with the help of two special types of lymphocytes present in our blood i.e**. B-lymphocytes** and **T lymphocytes.**

- When a host is exposed to antigens, which may be in the form of living or dead microbes or other proteins, antibodies are produced in the host body. This type of immunity is called **active immunity**.

- When ready-made antibodies are directly given to protect the body against foreign agents, it is called **passive immunity**.

- The exaggerated response of the immune system to certain antigens present in the environment is called **allergy**.

- Sometimes, due to genetic and origin organisms. Most of the experimental other unknown reasons, the body attack self-cells. This results in damage to the body and is called **autoimmune disease**.

- A widely used diagnostic test for AIDS is enzyme linked immuno-sorbent assay (ELISA).

- Causes of **cancer**: Transformation of normal cells into cancerous neoplastic cells may be induced by physical, chemical or biological agents. These agents are called carcinogens. Ionising radiations like X-rays and gamma rays and non-ionizing radiation like UV cause DNA damage leading to neoplastic transformation. The chemical carcinogens present in tobacco smoke have been identified as a major cause of lungs cancer.

DRUGS AND ALCOHOL ABUSE

- .The drugs, which are commonly abused are **opioids, cannabinoids** and **coca alkaloids**. Majority of these are obtained from flowering plants.

- **Opioids** are the drugs, which bind to specific opioid receptors present in our central nervous system and gastrointestinal tract. Heroin is a white, odourless, bitter crystalline compound.

- **Cannabinoids** are a group of chemicals which interact with cannabinoid receptors present principally in the brain.

- **Coca alkaloid** or **cocaine** is obtained from coca plant Erythroxylum coca. It interferes with the transport of the neuro-transmitter dopamine.

- **Tobacco** contains a large number of chemical substances including nicotine, an alkaloid. Nicotine stimulates adrenal gland to release adrenaline and noradrenaline on blood circulation, both of which raise blood pressure and increased heart rates. Smoking is associated with increased

incidence of cancers of lung, urinary bladder and throat, bronchitis, emphysema, coronary heart disease, gastric ulcer, etc.

ADDICTION AND DEPENDENCE

- **Dependence** on drugs is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if regular dose of drugs/alcohol is abruptly discontinued. This is characterised by anxiety, shakiness, nausea and sweating, which may be relieved when use is resumed again.

- In some cases, withdrawal symptoms can be severe and even life threatening and the person may need medical supervision.

- **Dependence** leads the patient to ignore all social norms in order to get sufficient funds to satisfy his/her needs. These result in many social adjustment problems.