



BIOLOGY: HUMAN HEALTH AND DISEASE

Health:-

It can be defined as a state of complete physical, mental and social well-being. When people are healthy, they are more efficient at work.

Health is affected by –

- Genetic disorders – inheritable defects of parents to offspring.
- Infections and
- 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. Among non-infectious diseases, cancer is the major cause of death.

Common Diseases in Humans:

Pathogen :- Disease causing organisms.

Typhoid:

- *Pathogen:* *Salmonella typhi*.
- *Symptoms:* High fever, weakness, stomach pain, constipation, headache and loss of appetite, intestinal perforation and death may occur in severe cases. Typhoid fever could be confirmed by Widal test.
- *Mode of transmission:* These pathogens generally enter the small intestine through contaminated food and water and migrate to other organs through blood.

Pneumonia:

- *Pathogen:* *Streptococcus pneumoniae* and *Haemophilus influenzae*.
- *Symptoms:* the alveoli get filled with fluid leading to severe problems in respiration. Symptoms include fever, chills, cough and headache, in severe cases the lips and finger nails may turn gray to bluish in colour.
- *Mode of transmission:* transmitted through droplets of infected persons.

Common Cold:

- *Pathogen:* *Rhino viruses*.
- *Symptoms:* nasal congestion and discharge, sore throat, hoarseness, cough, headache, tiredness.
- *Mode of transmission:* through droplets of infected persons.

DISEASES CAUSED BY PROTOZOANS.

Malaria.(means bad air)

- *Pathogen.* Protozoan Plasmodium.
- *Vector.* Female Anopheles mosquito
- *Symptoms.* Head aches, muscle pain, high fever. During fever the patient feels chill and shivering.
- *Prevention.* Eradication of vector and keeping the surrounding clean.
- *Treatment.* It involves the use of medicine like quinine and protection of patients from the mosquitoes.
- *Mode of spread.* This disease spreads by the bite of infected Anopheles mosquito. Only the female Anopheles is capable of spreading the disease because it sucks the blood of man.

Amoebiasis.

- *Pathogen.* It is due to an intestinal protozoan parasite *Entamoeba histolytica*.
- *Symptoms.* This parasite lives in the large intestine and destroys the mucus membrane. This may cause bleeding and ulcer that produce dysentery. Hence patient passes out blood and mucus with the stool. There will be severe pain in abdomen, fever, nausea and nervousness.
- *Mode of transmission:* As the cysts of pathogen are found in the intestinal discharge the possibility of infection to healthy persons is through contaminated water or improperly washed or cooked vegetables and fruits. The pathogen can also be transmitted through dirty hands.
- *Prevention.* Proper disposal of faecal matter of the patient. Vegetables and fruits when used raw, should be thoroughly washed. Water should be boiled before drinking.

DISEASE CAUSED BY HELMINTHES WORM.

Ascariasis.

- *Pathogen.* A round worm *Ascaris lumbricoides*.
- *Symptoms.* This parasite is found in the small intestine of man and is of world wide distribution. It causes a lot of stomach ache, nausea and cough.
- *Mode of transmission:* Through food, when soil consist of cyst and eggs, it will be transmitted through vegetables growing on it or through dirty hands or by ingestion of soil.
- *Prevention:* The disposal of human faeces by underground sewer canals is an efficient measure to prevent the spread. Washing of vegetables and fruits before eating help of keep away the eggs of the worm.

Filariasis.

- *Pathogen.* *Wuchereria bancrofti*.
- *Vector.* *Culex* mosquito.
- *Symptoms.* The worm lives in the lymph vessels and block them, this causes swelling of the body parts like, legs scrotum, foot, etc. This enlargement of legs gives the disease its name as Elephantiasis.
- *Prevention.* Eradication of vector.

DISEASE CAUSED BY FUNGI

Ringworms:

- *Pathogens:* Trichophyton and Epidermophyton

- **Symptoms:** appearance of dry, scaly lesions on various parts of the body such as skin, nails and scalp with intense itching.

Measures for prevention and control of infectious diseases –

- **Personal hygiene:** It includes cleanliness of body, drinking of clean water, etc.
- **Public hygiene:** It includes cleaning of water reservoirs, proper disposal of sewage, etc.

Immunity

- Ability of the body to fight infectious agents
- On the basis of the immunity possessed by the body, immunity can be innate immunity and acquired immunity.

1. Innate immunity is a non-specific type of defense mechanism. It has four types of barriers –

- **Physical barrier:** Example, skin covering of the body, secretion of mucous in the respiratory tract
- **Physiological barrier:** Example, acid in the stomach, tears from the eyes
- **Cellular barrier:** Example, monocytes and lymphocytes in blood
- **Cytokine barrier:** Example, interferon

2. Acquired immunity: It is a specific type of defense mechanism. It shows two types of responses: primary response and secondary response. It involves two types of lymphocytes –

- **B lymphocytes:** Show humoral immune response (HI)
- **T lymphocytes:** Show cell mediated immunity (CMI)

Structure of an Antibody:

- The antibodies are protein molecules called immunoglobulins and are of various types like IgA, IgM, IgE, IgG.
- Each antibody molecule consists of four polypeptide chains, two are long called heavy chains and other two are short called light chains. Both are arranged in the shape of 'Y', hence an antibody is represented as H₂L₂.

On the basis of production of antibodies, immunity can be further categorised as –

- **Active immunity:** Body produces its own antibodies against antigens
- **Passive immunity:** Readymade antibody is transferred from one individual to another
- Colostrum (contains antibodies IgA) is an example of passive immunity provided by the mother to her child.

Auto immunity:

Production of antibodies against the tissues of its own cells. Example – Rheumatoid arthritis.

Lymphoid organs:

It acts as the sites of formation and maturation of lymphocytes.

Primary lymphoid organ – where lymphocytes are produced and matured. Example – Bone marrow and Thymus.

Secondary lymphoid organ – where lymphocytes fight with antigens. Example - Spleen, lymph nodes, tonsils, Peyer's patches Mucosal Associated Lymphocyte Tissues (MALT).

Vaccination:

It is the protection of the body from communicable diseases by administration of agents (called vaccines) that mimic the microbes. Vaccines are available against tetanus, polio, etc.

Allergies:

Hypersensitivity to a particular allergen (such as pollens, dust) is termed as allergy. IgE is an antibody responsible for allergy. Symptoms include, sneezing, watery eyes, running nose and difficulty in breathing. Allergy is due to secretion of histamine and serotonin by mast cells. Allergy is treated with anti-histamine, adrenaline and steroids.

AIDS (Acquired immunodeficiency syndrome) :

It can spread –

- through sexual contact with the infected person
- from the mother to her child, through the placenta
- infected blood transfusion
- by the use of infected syringe

It is caused by HIV virus (a retro virus) and has RNA as genetic material. HIV stands for Human Immunodeficiency Virus.

When HIV virus enters the host cell, the virus enters into macrophages, where RNA replicates and forms viral DNA by the help of enzyme reverse transcriptase. The viral DNA gets incorporated into the host cell's DNA and directs the infected cells to produce daughter viruses. The macrophages continue to produce virus that enters the helper T-lymphocytes. Thus the number of helper T-lymphocytes progressively decreases in the body and weaken the immune system.

Diagnostic test for AIDS: ELISA (enzyme-linked-immuno-sorbent assay)

Cancer

- Tumour caused by abnormal and uncontrolled cell division. It is of two types –
- **Benign tumour:** Remains confined to a particular location and does not spread
- **Malignant tumour:** Cells divide and invade new locations by getting transported through blood to distant sites
- **Metastasis:** Property of malignant tumour to invade the distant body parts, thereby initiating formation of new tumours.
- **Carcinogen:** Cancer-causing agents; e.g., X-rays, UV rays
- **Cancer detection and diagnosis:** Techniques involved are radiography, computed tomography and magnetic resonance imaging

Treatment of cancer:

1. Surgical – cancerous tissues are surgically removed.
2. Radiotherapy – tumor cells are irradiated lethally by radiation.
3. Chemotherapy – drugs are used to kill cancerous cells, but shows side effects like hair loss, anemia, etc.
4. Immunotherapy – patients are given with alpha-interferon which activate their immune system and help in destroying the tumor.

Drugs and Alcohol

Drugs and alcohol abuse includes –

- **Opioids:** Morphine is obtained from Poppy plant. It is a sedative (depressant) and pain killer. Heroin is chemically diacetylmorphine. It slows down body functions. Example, Heroin (extracted from *Papaver somniferum*)
- **Cannabinoids:** It is obtained from *Cannabis sativa*. These are taken by inhalation and oral ingestion, they affect the cardiovascular system of the body. Example, marijuana, hashish, *charas, ganja* (obtained from *Cannabis sativa*),
- **Coca alkaloids / Cocaine:** it is obtained from *Erythroxylon coca*. It is taken by smoking. It is a stimulant and activates central nervous system.
- **Hallucinogens:** It is obtained from *Atropa belladonna* and *Datura sp.* LSD (Lysergic acid Diethylamide) is obtained from fungus.
- **Tobacco:** it contains nicotine, which is stimulant. It stimulates adrenaline and increases the secretion of adrenaline. Smoking of tobacco leads to lung cancer, bronchitis, emphysema, coronary heart diseases.

Adolescence and Drug abuse

- **Adolescence** is the period during which the child becomes matured.
- It is between 12 – 18 years of age.

Causes of drug abuse –

- Curiosity
- Adventure
- Excitement
- Experimentation
- Stress or pressure to excel in examination

Effects of drug/alcohol abuse –

- Reckless behaviour
- Malicious mischief
- Violence
- Drop in academic performance
- Depression, isolation, aggressiveness, etc.

Prevention and control –

- Avoid peer pressure
- Counselling and education
- Take help from teachers, parents and peers
- Take professional and medical help