# HUMAN HEALTH AND DISEASE

**Health**: It can be defined as a state of complete physical, mental and social well-being.

- Health is affected by three factors- Genetic disorders, Infections and Lifestyle.
- The factors which are responsible for maintaining good health are Balanced diet, Personal hygiene, Regular exercise, meditation and yoga.

**Diseases:** The conditions in which one or more organs of the body are not working properly, characterised by various signs and symptoms are called diseases. The organisms which cause diseases are called pathogens.

Diseases can be broadly classified into two types-

1) **Infectious diseases:** Infectious diseases are those which are transmitted from an infected person to another healthy person.

2) **Non-infectious diseases**: Non-infectious diseases are those which are not transmitted from an infected person to another person.

Infectious diseases includes-

❖ **Bacterial diseases:** caused by bacteria.

➢ **Typhoid:** Caused by Salmonella typhi.

- Affects the small intestine and then migrates to other parts of the body through blood.
- Transmitted by contaminated food and water.

- Symptoms– Sustained high fever (39° to 40°C), weakness, stomach pain, constipation, headache and loss of appetite, intestinal perforation and death may occur in severe cases.
- Typhoid fever is confirmed by the Widal test.

➢ **Pneumonia:** Caused by Streptococcus pneumoniae.

• Affects alveoli of lungs.

• Transmitted by droplets released by an infected person, sharing glasses and utensils.

• Common symptoms are fever, chills, cough and headache and in severe cases lips and fingernails turn grey to bluish colour.

❖ **Fungal disease:**

➢ **Ringworm:** Caused by Microsporum, Trichophyton, Epidermophyton.

- Affects skin, nails, folds of skin, groin.
- Transmitted by sharing a towel, clothes, or even comb with an infected person.
- Appearance of dry skin, scaly lesions in nails and scalp with intense itching are some of the common symptoms.
- Heat and moisture help these fungi to grow.

❖ **Viral diseases**

➢ **Common cold:** Caused by Rhinovirus.

- Affects nose and respiratory organs.

- Transmitted by direct inhalation of droplets from cough and sneeze of an infected person, through contaminated objects like pens, books, cups etc.
- Nasal congestion and discharge, sore throat, hoarseness, and cough are common symptoms.

## ❖ Protozoan diseases

➢ **Malaria:** Caused by Plasmodium.

- Affects liver and RBC.
- Transmits by biting of female anopheles mosquito which acts as a vector.
- High fever occurring on alternate days, chill, vomiting are the common symptoms.
- Malarial parasites require two hosts to complete their life cycle– Human & Anopheles mosquito.

➢ **Amoebiasis (amoebic dysentery):** Caused by Entamoebahistolytica.

- Affects the large intestine of man.
- Transmitted by house flies which have a mechanical carrier and food contaminated with cysts of Entamoeba.
- Constipation, abdominal pain, cramps, stools with mucus and blood clots are common symptoms.

## ❖ Helminth diseases

➢ **Ascariasis:** Caused by Ascarislumbricoides.

- Affects intestine of man.
- Transmitted by contaminated water, vegetable fruits etc.

- Internal bleeding, muscular pain, fever, anemia, blockage of intestinal passage are common symptoms.

➢ **Filariasis or elephantiasis:** Caused by Wuchereriabancrofti and Wuchereriamalayi.

- Affects lymphatic vessels of the lower limbs, genital organs.
- Transmitted by biting of infected female culex mosquitoes.
- Chronic inflammation of the organs where they live, abnormal swellings of the lower limbs, scrotum, penis are common symptoms.

**Prevention and control of diseases:** Maintenance of hygiene is very important for prevention and control of diseases.

- Measures for hygiene include keeping the body clean; consumption of clean drinking water, food, vegetables, fruits, proper disposal of waste and excreta; periodic cleaning and disinfection of water reservoirs, pools, cesspools and tanks.
- In case of air borne diseases, close contact with the infected person and his belongings should be avoided.
- For vector borne diseases such as malaria and filariasis, the measures to control diseases are–

- Control or eliminate the vectors and their breeding places.
    - Avoiding stagnation of water in and around residential areas.
    - Use of mosquito nets.
    - Introducing fishes like Gambusia in ponds that feed on mosquito larvae.
    - Spraying of insecticides in ditches, drainage areas and swamps, etc.
    - Doors and windows should be provided with wire mesh to prevent the entry of mosquitoes.
- The use of vaccines and immunisation programmes has enabled us to control diseases like smallpox, diphtheria, polio, pneumonia, tetanus etc.

**Immunity:** The overall ability of the body to fight against disease causing microorganisms with the help of immune system is called immunity. It is of two types–

**1) Innate immunity:** The immunity which occurs by birth is called innate immunity.

- Innate immunity is a non–specific type of defense.
- Innate immunity consists of four types of various barriers which prevent the entry of microorganisms into the body.

a) Physical barriers– Skin on our body.

b) Physiological barriers– Acid in the stomach, saliva in the mouth, tears from eyes

c) Cellular barriers– Certain types of leukocytes (WBC)

d) Cytokine barriers– Virus–infected cells secrete proteins called interferons which protect non–infected cells from further viral infection.

**2) Acquired immunity:** The immunity which develops during lifetime by exposure to suitable foreign agents like microorganisms is called acquired immunity.

- Acquired immunity is pathogen specific and it is characterized by memory.
- When the body first encounters a pathogen it produces a response which takes a long time to develop and of low intensity called as primary immune response.
- When the body encounters the same pathogen it produces a highly intensified and quick response called a secondary immune response.
- The primary and secondary immune responses are carried out with the help of two special types of lymphocytes present in our blood,
    a. **B– lymphocytes:** The B–lymphocytes produce an army of proteins in response to pathogens into our blood to fight with them called as antibodies
    b. **T– lymphocytes:** The T–cells themselves do not produce antibodies but help B cells to produce them

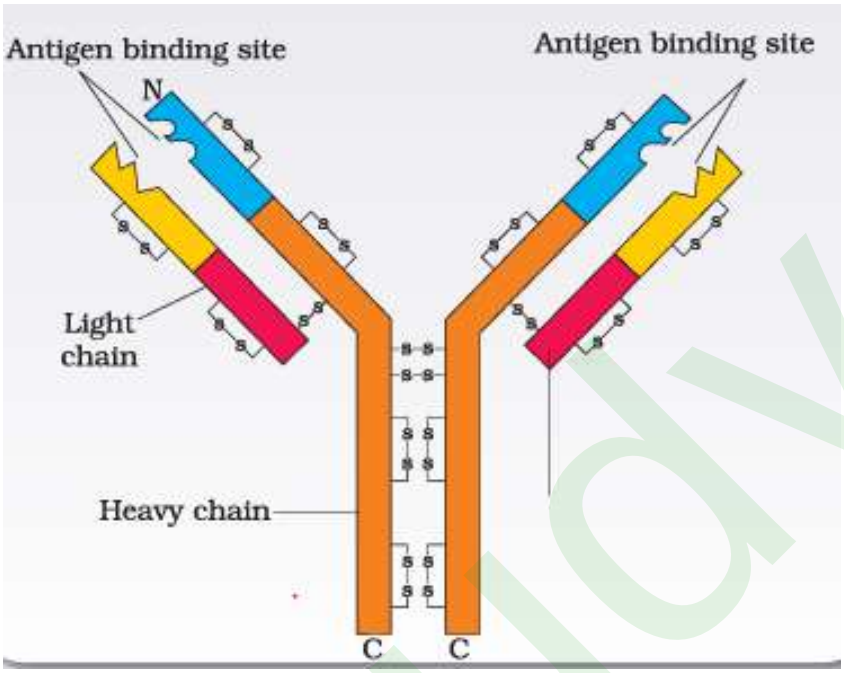
➢ **Structure of antibody:** Each antibody molecule has four peptide chains, two long chains and two short chains arranged in a Y shaped structure.

- Two long chains are called heavy chains and two short

chains are called light chains, hence an antibody is represented as $H_2L_2$.

• Antibodies are also called immunoglobulins (Ig).

• Different types of antibodies are produced in our bodies which are IgA, IgM, IgE, IgG.




➢ **Types of immunity:** Based on the type of immune cell acting against the antigens, immunity can be classified into two types–

1) **Humoral immunity–** the immunity which is mediated by antibodies produced by B– lymphocytes is called humoral immunity.

2) **Cell– mediated immunity–** The immunity which is mediated by T– lymphocytes by directly attaching themselves to the antigens is called cell mediated immunity.

• **Based on the nature of antibodies, immunity is divided into two types–**

1) **Active immunity–** When a host is exposed to antigens, antibodies are produced in the host body, this type of immunity is called active immunity.

Example- antibody produced when any microorganism enters the body.

2) Passive immunity- When ready-made antibodies are directly given to protect the body against foreign agents this type of immunity is called passive immunity.

Example- The yellowish fluid colostrum secreted by mother during the initial days of lactation has abundant antibodies (IgA) to protect the infant.

➢ Vaccination and immunisation: Vaccination is the process of introduction of vaccines into the body to produce antibodies against the antigens to neutralize the effect of pathogens during actual infection.

- Vaccines are the dead or weakened pathogens introduced into the body.
- The dead or weakened pathogen leads to the production of antibodies which neutralizes the pathogenic agents during actual infection with the same pathogen.
- Immunization is the process where performed antibodies against the toxin are introduced into the body.

Example- performed antibody injection against snake venom.

➢ Allergy: The exaggerated response of the immune system to certain antigens present in the environment is called allergy.

- The substances to which immune response is produced are called allergens.
- Examples: mites in dust, pollens, animal dander etc.

- Allergy is due to the release of chemicals like histamine and serotonin from mast cells.
- The antibodies produced to these are of IgE type.
- Symptoms of allergic reactions include sneezing, watery eyes, running nose and difficulty in breathing.

➢ **Auto immunity:** Due to genetic and other unknown reasons, the body attacks self-cell which results in damage to the body and is called auto-immune disease.

- Rheumatoid arthritis is an auto-immune disease.

➢ **Immune system in the body:** Immune system consists of Lymphoid organs, Lymphoid tissues, cells and Antibodies

❖ **Lymphoid organs:** The organs where origin and/or maturation and proliferation of lymphocytes occur are called lymphoid organs. Lymphoid organs are of two types-

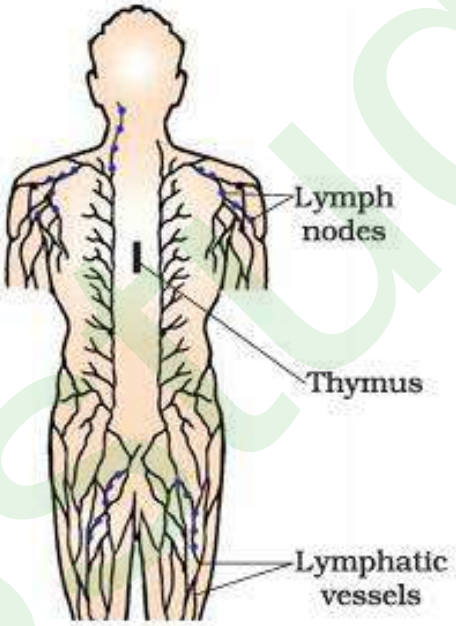
1) **Primary lymphoid organs:** The primary lymphoid organs are bone marrow and thymus where immature lymphocytes differentiate into antigen-sensitive lymphocytes.

- The bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced.
- The thymus is a lobed organ located near the heart and beneath the breastbone.
- Spleen, tonsil, lymph node, Peyer' s patches of small intestine and appendix are secondary lymphoid organs where proliferation of lymphocytes take place.

2) **Secondary lymphoid organs:** The secondary lymphoid

organs provide the sites for interaction of lymphocytes with the antigen, which then proliferate to become effector cells.

- The spleen is a large bean shaped organ mainly contains glymphocytes and phagocytes which acts as a filter of the blood by trapping blood–borne microorganisms and has a large reservoir of erythrocytes.
- The lymph nodes are small solid structures located at different points along the lymphatic system.
- Lymph nodes serve to trap the antigens and these antigens trapped are responsible for the activation of lymphocytes and cause the immune response.




❖ **Lymphoid tissue:** Lymphoid tissue is located within the lining of the respiratory, digestive and urogenital tracts.

- Lymphoid tissues are also called mucosal associated lymphoid tissue (MALT) which constitutes about 50 per cent of the lymphoid tissue in the human body.

**AIDS:** The term AIDS stands for Acquired ImmunoDeficiency Syndrome.

- The disease is acquired during life time.
- AIDS is caused by human immunodeficiency virus (HIV).s
- HIV is a retrovirus that has RNA as the genetic material.
- Mode of transmission–
  - Sexual contact with infected persons.
  - By transfusion of contaminated blood and blood products.
  - By sharing infected needles as in the case of intravenous drug abusers.
  - From an infected mother to her child through placenta.

- Life cycle of HIV–
  - After getting into the body the virus enters into macrophages or T–helper cells.
  - The viral RNA genome replicated to form viral DNA with the enzyme called reverse transcriptase.
  - The viral DNA gets incorporated into the host cell' s DNA and directs the infected cells to produce virus particles and the macrophages continue to produce virus.
  - Viruses released from macrophages attack T–helper cells and cause a progressive reduction in the number of T–helper cells and due to which the person starts suffering from infections with several other microorganisms.
- Diagnosed by ELISA (enzyme linked immune–sorbent assay).

- Treated with anti-retroviral drugs but that is only partially effective.

- **Prevention of AIDS-**
  - To follow safe blood transfusion.
  - To use disposable needles.
  - To distribute free condoms.
  - To prevent drug abuse.

**Cancer:** Cancer is the uncontrolled cell division leading to the formation of a mass of cells called a tumour. Tumours are of two types: benign and malignant.

**1) Benign tumours:** Benign tumours normally remain confined to their original location and do not spread to other parts of the body.

**2) Malignant tumors:** Malignant tumors are a mass of proliferating cells called neoplastic or tumor cells. Malignant tumors grow very rapidly and invade and ultimately damage surrounding tissues.

- The property by which cancer cells moves to distant places from their origin by blood and invade the normal cells and make them cancerous is called as metastasis

➢ **Causes of cancer:** Transformation of normal cells into cancerous cells may be induced by physical, chemical or biological agents called as carcinogens.

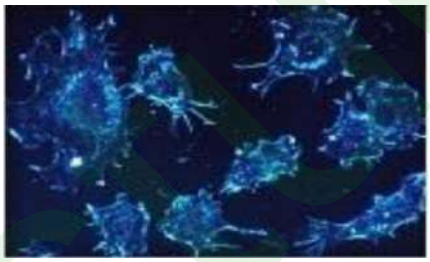
- **Physical carcinogens-** ionizing radiation like X-rays, gamma rays and non-ionizing radiations like UV radiation of the sun.

- **Chemical carcinogens–** tobacco smoke and some other chemicals.
- **Biological carcinogens–** Cancer causing viruses are called oncogenic viruses have genes called viral oncogenes.

Cellular oncogenes or proto–oncogenes in normal cells, when activated lead to oncogenic transformation of normal cells.

➢ **Detection of cancer:** Biopsy and histo–pathological study of the tissues.

- Radiography by using X–rays, CT (computed tomography).
- MRI (magnetic resonance imaging).
- Use of antibodies against cancer–specific antigens.



➢ **Treatment of cancer:**

- Surgery
- Radiation therapy.
- Chemotherapy
- **Biological response modifiers–** alpha–interferon which activate the immune system and help in destroying the tumor.

**Drugs and alcohol abuse:** The drugs which are commonly abused are opioids, cannabinoids and coca alkaloids.

❖ **Opoids:** Opioids are the drugs which bind to specific opioid receptors present in our central nervous system and gastrointestinal tract.

- Heroin commonly called smack is chemically diacetylmorphine which is a white, odourless, bitter crystalline compound and is obtained by acetylation of morphine extracted from the latex of poppy plant Papaversomniferum
- Heroin is a depressant and slows down body functions.

❖ **Cannabinoids:** Cannabinoids interact with cannabinoid receptors present principally in the brain.

- Natural cannabinoids are obtained from the inflorescences of the plant Cannabis sativa.
- The flower tops, leaves and the resin of cannabis plant are used in various combinations to produce marijuana, hashish, charas and ganja.
- Effects on the cardiovascular system of the body.

❖ **Coca alkaloid:** Coca alkaloid or cocaine is obtained from coca plant Erythroxylum coca.

- Coca alkaloid interferes with the transport of the neuro– transmitter dopamine.
- Cocaine, commonly called coke or crack.
- It has a potent stimulating action on the central nervous system, producing a sense of euphoria and increased energy.
- Excessive dosage of cocaine causes hallucinations.

❖ **Tobacco:** Tobacco contains nicotine, an alkaloid.

- Nicotine stimulates adrenal gland to release adrenaline and nor-adrenaline into blood circulation, both of which raise blood pressure and increase heart rate.
- Smoking of tobacco is associated with increased incidence of cancers of lung, urinary bladder, throat, oral cavity, bronchitis, emphysema, coronary heart disease, gastric ulcer etc.

➢ **Adolescence and Drug/Alcohol Abuse:** Adolescence means both ' a period' and ' a process' during which a child becomes mature in terms of his/her attitudes and beliefs for effective participation in society.

- 12-18 years of age may be thought of as adolescence.
- Adolescence is accompanied by several biological and behavioural changes.
- Curiosity, need for adventure and excitement, and experimentation, constitute common causes, which motivate youngsters towards drug and alcohol use.

➢ **Addiction and Dependence:** Addiction is a psychological attachment to certain effects- such as euphoria and a temporary feeling of well-being - associated with drugs and alcohol.

- With repeated use of drugs, the tolerance level of the receptors present in our body increases and consequently the receptors respond only to higher doses

of drugs or alcohol leading to greater intake and addiction.

- Dependence is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if regular dose of drugs/alcohol is abruptly discontinued.
- Withdrawal syndrome is characterised by anxiety, shakiness, nausea and sweating.

➢ **Effects of Drug/Alcohol Abuse:** Immediate effects are reckless behavior, vandalism and violence.

- Excessive doses of drugs may lead to coma and death due to respiratory failure, heart failure or cerebral hemorrhage.
- Those who take drugs intravenously can get infected with AIDS, hepatitis B.
- The chronic use of drugs and alcohol damages nervous system and cause liver cirrhosis.
- The use of drugs and alcohol during pregnancy is also known to adversely affect the foetus.
- Use of anabolic steroids in females can cause masculinisation, increased aggressiveness, mood swings, depression, abnormal menstrual cycles, excessive hair, growth on the face and body, enlargement of clitoris, deepening of voice.
- In males anabolic steroids can cause acne, increased aggressiveness, mood swings, depression, reduction of size of the testicles, decreased sperm production, potential for kidney and liver dysfunction, breast

enlargement, premature baldness, enlargement of the prostate gland.

➢ **Prevention and Control:** The measures useful for prevention and control of alcohol and drugs abuse among adolescents.

- Avoid undue peer pressure on children.
- Children should be educated and counseled to bear problems and stress in life.
- The child should seek help from parents and elders.
- Affected individuals should seek medical help of qualified psychologists, psychiatrists, and deaddiction and rehabilitation programmes.