13. Human Health and Diseases

- **Disease** is characterised by various signs and symptoms.

Diseases	
Infectious	Non-infectious
Example: Common cold	Example: Cancer

Infectious diseases

- It spreads through infectious agents that include bacteria, viruses, protozoans and fungi.
    - **Bacterial diseases**
        - **Typhoid fever:** *Salmonella typhi*; Widal test is used for confirmation of typhoid
        - **Pneumonia:** *Streptococcus pneumoniae and Haemophilus influenzae*; it infects the alveoli of lungs
        - Other examples include **dysentery, plague, diphtheria**
    - **Viral diseases**
        - **Common cold:** Spreads through Rhino viruses

    - **Protozoan diseases**
        - **Malaria:** Pathogen is *Plasmodium*; malarial parasite requires two hosts: humans and female anopheles mosquito; malarial parasite reproduces asexually in the human host while in the mosquito host it reproduces sexually
        - **Amoebiasis (amoebic dysentery):** *Entamoeba histolytica*
    - **Helminthes diseases**
        - **Ascariasis:** Pathogen is *Ascaris*
        - **Elephantiasis or filariasis**: Pathogen is *Wuchereria bancrofti*
    - **Fungi**
        - **Ringworms:** Caused by fungi which belong to genera *Microsporum*, *Trichophyton* and *Epidermophyton*

- **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.

    - **Innate immunity** is a non-specific type of defence 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

- **Acquired immunity** is a specific type of defence mechanism. It shows two types of responses: primary response and secondary response.
- **It involves two types of lymphocytes –**
  - **B lymphocytes:** Show humoral immune response
  - **T lymphocytes:** Show cell mediated immunity (CMI)

- 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.

- **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.
- **Antibodies:** Special, proteinous chemicals produced by B-lymphocytes present in our blood, in response to the entry of any foreign pathogen on our body.

Blood groups

- Human body contains four types of of blood groups – **A, B, AB, and O.**

Blood group	Antigens on RBCs	Antibodies in plasma
A	A	Anti – B
B	B	Anti – A
AB	A, B	Nil
O	Nil	Anti – A, B

- Person with **blood group AB** is known as **universal recipient.**
- Person with **blood group O** is known as **universal donor.**

Rh factor:

- Rh is an antigen (antigen D) found on surface of red blood cells.
- Presence of Rh factor indicates Rh+ individual
- Absence of Rh factor indicates Rh- individual
- **Rh-incompatibility** can be observed between Rh-negative blood of mother and Rh-positive blood of foetus. The condition is known as **erythroblastosis foetalis.**

Blood coagulation:

- Platelets contain chemicals that help in clotting. Clotting takes place through a series of linked enzymatic reactions called cascade process.
- Calcium ion is important for **clotting.**

- **Treatment of Diseases-** Two ways to treat the diseases are-

    - Reducing the effect of a disease
    - Killing the cause of a disease
- **Prevention of diseases**
    - There are some general and specific ways to prevent the diseases
- General ways -
    - Stay away from the diseased person.
    - Ensure safe drinking water supply.
    - Provide a clean environment, which helps in preventing vectors like mosquitoes from breeding.
    - Cover your mouth and nose while coughing or sneezing to prevent the spread of the disease.
    - Availability of proper nutrition. If proper and sufficient nutrition is not available, the immune system of the body will not function properly.
- Specific ways-
    - Vaccination- It is protection of the body from communicable diseases by the administration of some agents that mimic the microbe. Vaccines are available against many diseases like tetanus, polio, measles, hepatitis B, whooping cough, yellow fever etc. These vaccines can be prepared from dead germs, or live, weakened germs, or live virulent germs, or toxoids.
    - Immunization- The immune system develops strength in the body to fight off microbes. It is made up of special cells, proteins, and organs which protect the body against micro-organisms.

- 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.

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 viral RNA gets converted into viral DNA, which gets incorporated into the host DNA and starts producing new virus particles.
- Diagnostic test for AIDS: ELISA (enzyme-linked-immunosorbent serologic assay)

Treatment –No permanent cure; antiretroviral therapies can prolong the life of patient

Prevention of AIDS

- Ensuring use of disposable syringes
- Screening blood from blood banks
- Advocating safe sex

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 divides and invades 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:** Involves techniques like radiotherapy, chemotherapy and immunotherapy.

Drugs and alcohol abuse includes –
 Opioids: Example, Heroin (extracted from Papaver somniferum)
 Cannabinoids: Example, marijuana, hashish, charas, ganja (obtained from Cannabis sativa), cocaine (obtained from Erythroxylum coca)

- **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 pressure
  - Counselling and education
  - Take help from parents and peers
  - Take professional and medical help