CHAPTER-7

HUMAN HEALTH AND DISEASES

Topic-1

Health, Common Human Diseases and Immunity

Concepts Covered ● *Types of diseases, Different microorganisms causing different type of diseases, life cycle of Plasmodium, Immune system, Immunisation, AIDS and cancer.*

Revision Notes

Human Diseases and Immunity

- Health is a state of complete physical, mental and social well-being.
- Health is affected by genetic disorders, infections, sedentary lifestyle (Junk food, lack of exercise, habits, etc).
- **Disease:** A disease can be defined as any condition that may lead to discomfort, distress, health problems or death of the affected person.
- **Congenital diseases:** These are diseases that are present since birth. For instance, a hole in the heart of an infant. They are caused by some genetic abnormalities or metabolic disorder or malfunctioning of an organ.
- **Acquired diseases:** These are diseases that may occur after birth during one's lifetime.
- Among non-infectious diseases, cancer is the major cause of death.
- Pathogens are disease-causing organisms.
- Parasites are pathogens as they harm the host by living in or on them.
- Pathogens have to adapt to live within the environment of the host.

Common Infectious Diseases in Man

1. **BACTERIAL DISEASES**
   - **(a) Typhoid**
     - **Pathogen:** *Salmonella typhi*.
     - **Mode of transmission:** It enters the small intestine through food and water and migrates to other organs through blood.

- **Symptoms:** Sustained high fever (39°- 40°C), weakness, stomach pain, constipation, headache and loss of appetite. Intestinal perforation and death may occur.
- **Confirmation:** The Widal test is used for confirmation of the disease.

(b) Pneumonia

- **Pathogen:** *Streptococcus* or *Diplococcus pneumoniae and Haemophilus influenzae.*
- **Mode of transmission:** Inhaling the droplets/aerosols released by an infected person. Sharing glasses and utensils with an infected person.
- **Symptoms:** Infects lung's alveoli. The alveoli get filled with fluid leading to respiratory problems. Fever, chills, cough, headache.
- **Severe cases:** Lips and fingernails turn grey to a bluish colour.
- Dysentery, plague, diphtheria are some other bacterial diseases in humans.

Key Words

Hemozoin: It is a brownish black granular material within the red blood cell, which is generated during host haemoglobins degradation by the parasite.

Sporozoite: It is a motile spore-like stage of some parasitic sporozoans, which act as an infective agent.

2. VIRAL DISEASES

(a) Common cold

- **Pathogen**: Rhino viruses
- **Mode of transmission**: Inhaling droplets resulting from cough or sneezes through contaminated objects.
- **Symptoms**: Infects nose and respiratory passage. Nasal congestion and discharge, sore throat, hoarseness, cough, headache, tiredness, etc., Last for 3-7 days.

Key Facts

- *Aedes aegypti*, vector of a viral disease, Dengue fever, is a daytime biting mosquito.
- National T.B. programme was started in 1962.
- Hepatitis B is more dangerous than AIDS

3. PROTOZOAN DISEASES

(a) Malaria

- **Pathogen:** *Plasmodium* sp. *(P. vivax, P. malariae, P. ovale. and P. falciparum).*
- **Mode of transmission:** Biting of *Anopheles* mosquito.
- **Symptoms:** **Haemozoin** causes chill and high fever recurring every 3-4 days.

Life cycle of *Plasmodium*-: The life cycle of *Plasmodium* has three phases - *Schizogony*, *gamogony* and *sporogony*. Female *Anopheles* mosquito is the primary host while man is the secondary host.

Life cycle of *Plasmodium* in Man:

(a) The infective stage of *Plasmodium* is the **sporozoite**, which is injected into the blood of the human by the bite of female *Anopheles* mosquito.
(b) From the human blood, sporozoites reach the liver cells where they multiply.
(c) The liver cells rupture to liberate the parasites into the blood where they attack the RBCs, multiply and cause their rupture.
(d) The rupture is associated with the release of a toxin called haemozoin, which is responsible for the recurring chill and high fever within 3 - 4 days.
(e) The development of gametocytes takes place in the RBCs, which are of two types: male gametocytes or microgametocytes, and female gametocytes or macrogametocytes.

Life cycle of *Plasmodium* in Female *Anopheles* Mosquito

(a) When a female *Anopheles* mosquito sucks the blood of an infected human host, it receives the RBCs including gametocytes.
(b) Further development occurs in the stomach wall of the mosquito, the gametes fuse to form a zygote.
(c) The zygote undergoes further development to form sporozoites.
(d) The sporozoites after liberation from the stomach wall move to different organs in the body cavity, but many of them penetrate the salivary glands.
(e) The mosquito now becomes infective, when the female *Anopheles* mosquito bites a healthy person the sporozoites are injected in his / her blood along with saliva.

(b) Amoebiasis (Amoebic dysentery) or Enteritis.

- **Pathogen:** *Entamoeba histolytica* found in the large intestine of humans.
- **Mode of transmission**: Houseflies (mechanical carriers) transmit **parasites** from the faeces of an infected person to food and water and thereby contaminating them.
- **Symptoms:** Constipation, abdominal pain and cramps, stools with excess mucous and blood clots.

Key Word

Parasite: An organism residing on organism of another species (it's host) and draws benefit by deriving nutrients from its host.

4. **HELMINTH DISEASES**
   - **(a) Ascariasis**
     - **Pathogen**: *Ascaris lumbricoides* (Intestinal parasite).
     - **Mode of transmission**: Soil, water, vegetables, fruits, etc., contaminated with faeces containing eggs of parasites.
     - **Symptoms**: Internal bleeding, muscular pain, fever, anaemia and blockage of intestinal passage.
   - **(b) Filariasis (Elephantiasis)**
     - **Pathogen**: Filarial worms or *Wuchereria* (*W. bancrofti* & *W. malayi*).
     - **Mode of transmission**: Bite of female *Culex* mosquito.
     - **Symptoms:** Filarial worms live in lymphatic vessels (usually of lower limbs). It causes chronic **inflammation** of the organs, in which they live for many years. Limbs and genital organs may be deformed.
5. **FUNGAL DISEASES**
   - **(a) Ring worms**
     - **Pathogens**: *Microsporum, Trichophyton & Epidermophyton*. They are seen in groin between the toes.
     - **Mode of transmission**: From soil or by using towels, cloths, comb, etc. Heat and moisture help fungi to grow.
     - **Symptoms**: Appearance of dry, scaly lesions on various body parts such as skin, nails and scalp. Intense itching.

Key Word

Inflammation: A process by which our body's WBC protect as from infection from outside invaders, such as bacteria and viruses. It can be either short-lived (acute) or long-lasting (chronic).

Other Infectious Diseases

(i) Bacterial Diseases

Disease	Pathogen	Transmission
Dysentery	*Shigella*	Contact, Contaminated food and water
Plague	*Pasteurella pestis*	Rat fleas
Diphtheria	*Corynebacterium diphtheriae*	Contaminated food, Direct contact
Cholera	*Vibrio cholerae*	Food & water contaminated with faeces
Tuberculosis	*Mycobacterium tuberculosis*	Droplets from patient/carrier
Tetanus	*Clostridium tetani*	Contamination of wound by bacteria
Whooping cough	*Bordetella pertussis*	Contact, Droplets
Leprosy	*Mycobacterium leprae*	Direct contact
Anthrax	*Bacillus anthracis*	Contact with cattle
Weil's disease	*Leptospira*	Contact with rodents, dogs, etc.

(ii) Viral Diseases

Disease	Pathogen	Transmission
Rabies	Rabies virus	Rabid dogs.
Dengue	Dengue virus	*Aedes* mosquito
Influenza	Influenza virus	Coughing & Sneezing
Measles	Rubeola virus	Droplets
German measles	Rubella virus	Close contact
Mumps	Mumps virus	Airborne droplets
Chickenpox	*Varicella zoster*	Airborne droplets
Smallpox	Variola virus	Direct contact
Polio	Polio virus	Faeces & Air
Chikungunya	CHIK virus	*Aedes* mosquito
Avian flu	H_5N_1 virus	Contact with infected poultry. Airborne spread
H_1N_1 (Swine flu)	H_1N_1 virus	Contact with pigs, cough & sneeze of infected person.

- **Prevention and Control of Diseases**

1. **Personal Hygiene:** Keep the body clean. Use clean drinking water, food, etc.
2. **Public Hygiene**
   - **(a)** Proper disposal of wastes and excreta.
   - **(b)** Periodic cleaning and disinfection of water reservoirs, pools, cesspools and tanks.
   - **(c)** Avoid contact with infected persons or their belongings (to control air-borne diseases).
   - **(d)** Standard practices of hygiene in a public gathering.
   - **Control and eliminate the vectors (e.g., mosquitoes) and their breeding places by following methods:**
     - **(i)** Avoid stagnation of water.
     - **(ii)** Regular cleaning of household coolers.
     - **(iii)** Use of mosquito nets.
     - **(iv)** Introduce larvivorous fish like *Gambusia* in ponds.
     - **(v)** Spraying insecticides in ditches, drainage and swamps.
     - **(vi)** Doors and windows should be provided with wire mesh to prevent the entry of mosquitoes.

These precautions can avoid vector-borne diseases like malaria, filariasis, dengue and chikungunya.

- **Immune System**
  - It is the system that gives immunity to the body by recognizing, responding and remembering foreign antigens.
  - It plays an important role in an allergic reaction, auto-immune disease and organ transplantation.
  - It includes lymphoid organs, tissues, cells and soluble molecules like antibodies.
- **Lymphoid Organs**
  - These are the organs where origin, maturation and proliferation of lymphocytes occurs.
  - These are of two types namely, primary lymphoid organs and secondary lymphoid organs.

(a) Primary Lymphoid Organs

- Here, immature lymphocytes differentiate into antigen-sensitive lymphocytes e.g., Bone marrow and thymus.
- Bone marrow is the main lymphoid organ and is the site of formation of all the blood cells including lymphocytes.
- Thymus is large during birth but gradually reduces in size and becomes very small size at puberty.
- Growth and maturation of T-lymphocytes takes place here.

(b) Secondary Lymphoid Organs

- The organs to which matured lymphocytes migrate, interact with antigens and then proliferate to become effector cells e.g., Spleen, lymph nodes, tonsils, Peyer 's patches, MALT and appendix. Secondary lymphoid organs are:

(i) Spleen:
- **(i)** It is a bean-shaped organ.
- **(ii)** It contains lymphocytes and phagocytes.
- **(iii)** It removes worn-out RBCs and microorganisms from blood.
- **(iv)** It is a reservoir of erythrocytes in the foetus.

(ii) Lymph Nodes
- **(i)** These are found in the lymphatic system.
- **(ii)** They trap microorganisms or other antigens that enter the lymph and tissue fluid.
- **(iii)** The trapped antigens activate lymphocytes and cause an immune response.

(iii) Mucosa Associated Lymphoid Tissue (MALT):
- **(i)** It is located within the lining of respiratory, digestive and urinogenital tracts.
- **(ii)** It constitutes 50% of lymphoid tissue in the human body.

- **Immunity**
  - It is the ability of the immune system of the body to fight against the disease-causing organisms.
  - It is of two types namely Innate immunity and Acquired immunity.

(a) Innate Immunity

- It is the *non-specific* defence present at the time of birth.
- It provides barriers to the entry of foreign agents into our body.
- It consists of four types of barriers:
  - **(i) Physical Barriers**
    - Skin on our body is the first and main barrier that prevents entry of the micro-organisms. It is the first line of defence.
    - 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 leukocytes (PMNL-neutrophils) 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 *interferon* which protect non-infected cells from further viral infection.

(b) Acquired Immunity

- It is a pathogen-specific immunity.
- It is not present since birth but develops during the lifetime of an individual.
- It is characterized by memory i.e., during the first encounter of a pathogen; our body produces a primary response in low intensity. The second encounter with the same pathogen produces a secondary (anamnestic) response in high intensity.
- The primary and secondary immune responses are carried out with B-lymphocytes and T-lymphocytes.
  (a) B-lymphocytes (B-cells): Produce antibodies.
  (b) T-lymphocytes: Help B-cells to produce antibodies.

► **Structure of an Antibody Molecule**

- Each antibody has 4 polypeptide chains namely, 2 small light chains and 2 large heavy chains (H_2L_2).
- In our body, different types of antibodies such as IgG, IgA, IgM, IgE & IgD are produced.
- Acquired immune response is of two types namely humoral mediated response and cell-mediated response.
  (a) Humoral or Antibody-Mediated Response/Antibody-Mediated Immunity (AMI)
    - Antibodies are found in blood plasma. So, it is called as humoral immune response.
    - It includes B-lymphocytes and T-lymphocytes. The latter help the former to produce antibodies.
  (b) Cell-Mediated Response/Cell-Mediated Immunity (CMI)
    - It is T-lymphocytes (T-cells) mediated (CMI).
    - CMI causes Graft rejection.
    - The body can differentiate 'self' and 'non-self'.
    - Tissue matching and blood group matching are essential before undertaking any graft / transplant. After this, the patient has to take immune-suppressants for all his life.

► Types of Acquired Immunity: Acquired immunity is of two types i.e., active and passive Immunity.

(a) Active Immunity

- The immunity in which antibodies are produced in a host body when the host is exposed to antigens (e.g., living or dead microbes or other proteins) is known as active immunity.
- It is a slow process.
- It is produced in 2 ways:
  (i) Natural Active Immunity: During natural infection by microbes.
  (ii) Artificial Active Immunity: Injecting the microbes deliberately during immunization.

(b) Passive Immunity:

- Here, ready-made antibodies are directly given to protect the body.
- It is of two types-:
  (i) Natural Passive Immunity-: e.g., Antibodies (IgG) from mother → Placenta → Foetus → Antibodies (IgA) in colostrum → infants.
  (ii) Artificial Passive Immunity-: e.g., Anti-tetanus serum (ATS).

► **Immunization**

- This is based on the 'memory' of the immune system.
- It is of two types namely active immunization and passive immunization.
  (a) Active Immunization (Vaccination)
    - A preparation of vaccine (antigenic proteins of pathogen or inactivated pathogen) is introduced into the body.
    - The antibodies produced in the body against the antigens neutralize the pathogenic agents during actual infection.
    - The vaccines also generate memory B and T-cells that recognize the pathogen quickly e.g., Polio vaccine, Hepatitis B vaccine, DPT vaccine etc.
    - Vaccines are produced using DNA recombinant technology (e.g., Hepatitis B vaccine produced from Yeast). Such vaccines are called as second-generation vaccines.
    - The vaccines produced by conventional methods e.g., small pox-vaccines are called first-generation vaccine and those which are synthetic vaccine are the third generation vaccine.

(b) Passive Immunization

- It is the direct injection of preformed antibodies or antitoxin. It is for quick immune response e.g., Immunization against tetanus, snake venom, etc.

► **Allergies**

- It is the exaggerated or hypersensitive response of the immune system to certain antigens present in the environment.
- Allergens are substances causing allergy e.g., mites in dust, pollens, animal dander, fur, etc.
- Antibodies produced against the allergens are of IgE type.
- Allergy is due to the release of chemicals like histamine and serotonin from the mast cells.

- **Symptoms:** Sneezing, watery eyes, running nose, difficulty in breathing, etc.
- Determination of cause of allergy: The patient is exposed to or injected with very small doses of possible allergens and the reactions studied.
- Treatment, Drugs like anti-histamine, adrenaline and steroids quickly reduce the symptoms of allergy.
- Modern-day lifestyle results in lowering of immunity and more sensitivity to allergens.
- Asthma is a respiratory disease due to allergy.

Auto Immunity

- It is caused due to genetic and other unknown reasons. The body attacks self cells. This results in auto-immune disease.
- It is memory-based acquired immunity evolved in higher vertebrates based on the ability to differentiate foreign organisms (e.g., pathogens) from self-cells e.g., Rheumatoid arthritis.

AIDS (Acquired Immunodeficiency Syndrome)

- Syndrome is a group of symptoms.
- AIDS is the deficiency of the immune system.
- It is caused by HIV (Human Immunodeficiency Virus), a retrovirus having an RNA genome.
- AIDS was first reported in America (1981).
- **Mode of Transmission:**
  - **(a)** Sexual contact with an infected person.
  - **(b)** Transfusion of contaminated blood and blood products.
  - **(c)** Sharing of infected needles.
  - **(d)** From infected mother to her child through the placenta.
- **High risk of getting HIV includes**
  - **(a)** Individuals with multiple sexual partners.
  - **(b)** Drug addicts who take drugs intravenously using infected syringes.
  - **(c)** Individuals who require a repeated blood transfusion.
  - **(d)** Children born to an HIV infected mother.
- **HIV does not spread by touch or physical contact.**
- It spreads only through body fluids.
- There is always a time-lag (from few months to 5-10 years) between the infection and appearance of symptoms.
- **Life Cycle of HIV Virus:**
- HIV enters into body → To macrophages (acts as HIV factory) → RNA genome replicates in presence of Reverse transcriptase to form viral DNA → Viral DNA incorporates into host DNA → Infected cells produce virus particles → HIV enters into helper T-cells (T_H) → Replicates and produce progeny viruses → Attack another helper T-cells → T-cells decrease → Weaken immunity.
- HIV infected person may be infected with *Mycobacterium*, viruses, fungi and parasites like *Toxoplasma*.
- **Diagnosis of AIDS:** ELISA test (Enzyme-Linked Immune-Sorbent Assay) PCR-Test, western blotting, etc.
- **Treatment of AIDS**
- Anti-viral drugs partially effective.
- They can only prolong the life of the patient.
- **Prevention of AIDS**
  - **(i)** Educate people about AIDS.
  - **(ii)** Making blood (from blood banks) safe from HIV.
  - **(iii)** Use of disposable needles and syringes.
  - **(iv)** Advocating safe sex and free distribution of condoms.
  - **(v)** Controlling drug abuse.
  - **(vi)** Regular check-ups for HIV in a susceptible population.

Cancer

- Cancer is an abnormal and uncontrolled multiplication of cells resulting in the formation of tumour (masses of cells).
- Normal cells show a contact inhibition (contact with the other cells inhibits their uncontrolled growth). Cancer cells do not have this property.
- Tumours are of two types namely Benign tumour and Malignant tumour.
  - **(a) Benign Tumour**
    - It is confined to the place of its origin and does not spread to other parts of the body.
    - It is harmless or causes less damage to the body.
  - **(b) Malignant Tumor**
    - It spreads and invades nearby tissues.
    - It is harmful.
- **Metastasis:** The spread of cancer cells from one part of the body to another.
- **Types of Cancer**
- **Carcinoma:** cancer of epithelial cells.
- **Sarcoma:** cancer of connective tissues.
- **Melanoma:** cancer of melanocytes.
- **Leukemia:** blood cancer.
- **Lymphomas:** cancer of spleen and lymph nodes.

Causes of Cancer (Carcinogens)

(a) Physical agents: e.g., Ionizing radiations like X-rays and gamma rays and non-ionizing radiations like UV.

(b) Chemical agents: Tobacco smoke (a major cause of lung cancer), vinyl chloride, caffeine, nicotine, mustard gas, etc.

(c) Biological agents: e.g., oncogenic viruses, cellular oncogenes (c-onc) or proto oncogenes, etc. When a C-onc in normal cells is activated, the cells becomes oncogenic.

- **Cancer Detection and Diagnosis**
  - **(a) Biopsy:** A thin piece of the suspected tissue is stained and examined under a microscope (histopathological studies).
  - **(b) In case of leukaemia:** Biopsy and histopathological studies. Blood and bone marrow tests for increased cell counts.
  - **(c) Radiography (use of X-rays)**: CT (Computerized Tomography) scan and MRI (Magnetic Resonance Imaging).
  - **(d) Use of antibodies** against cancer-specific antigens.
  - **(e) Techniques of molecular biology** to detect genes related to cancer. Such individuals may be advised to avoid exposure to particular carcinogens (e.g., tobacco smoke).
- **Treatment of Cancer**
  Most cancers are treated by a combination of surgery, radiotherapy and chemotherapy.
  - **(a) Radiation therapy:** Tumour cells are irradiated lethally without damaging surrounding normal tissues.
  - **(b) Chemotherapy:** Use of chemotherapeutic drugs. Many drugs have side effects like hair loss, anaemia, etc.
  - **(c) Immunotherapy:** The patients are given biological response modifiers (e.g., α- interferon) which activates their immune system and helps in destroying the tumour.

Mnemonics

1. Concept: Helminth diseases
Mnemonic: He **F**inished **A**ssignment
Interpretation: Helminth, Filariasis, Ascariasis
2. Concept: Viral diseases
Mnemonics: Vice **C**hancellor
Interpretation: Viral, Common cold
3. Concept: Protozoan diseases
Mnemonic: Pre **M**edical **A**ssociation
Interpretation: Protozoa, Malaria, Amoebiasis

IMPORTANT DIAGRAMS:

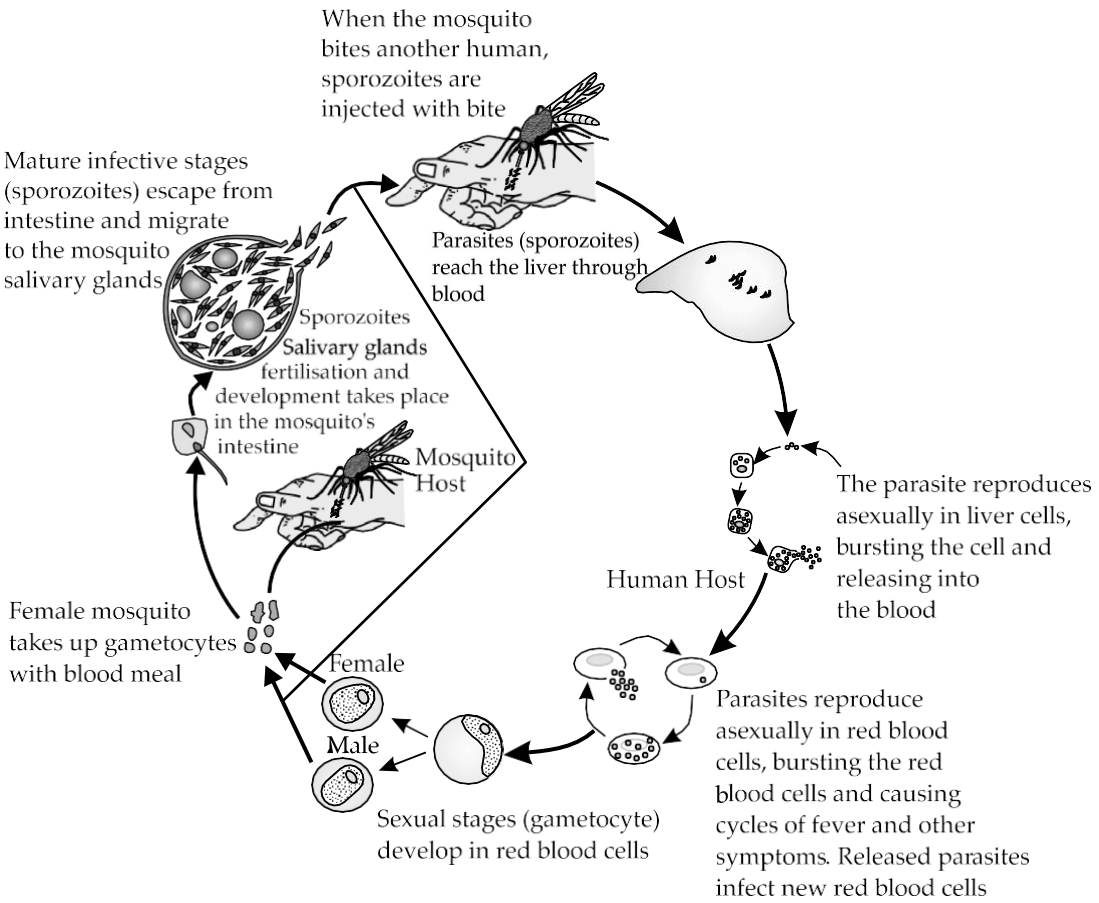

Fig. 7.1: Stages in the Life Cycle of *Plasmodium*

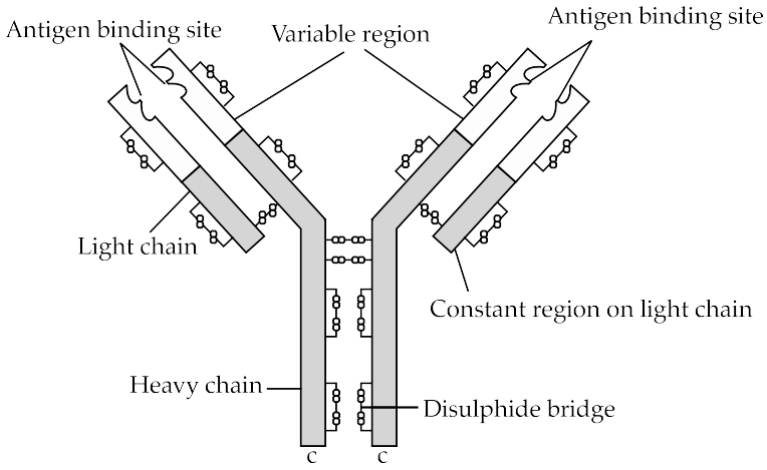

Fig. 7.2: Structure of an antibody molecule

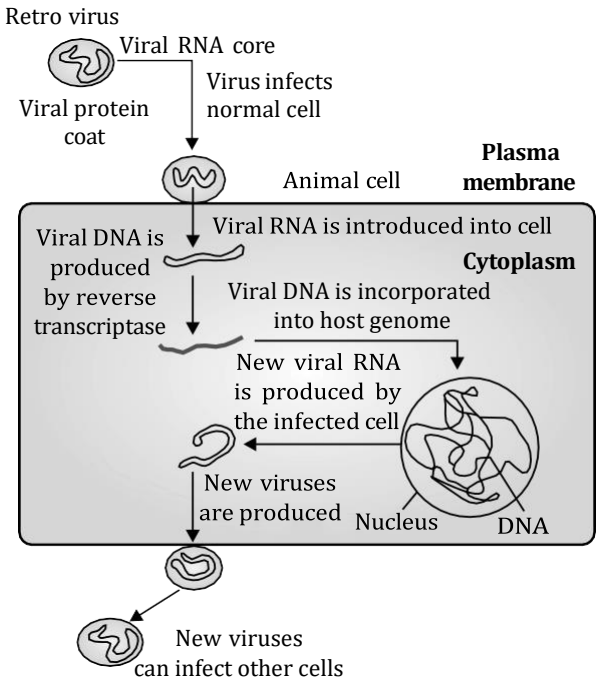

Fig. 7.3: Replication of Retrovirus

Example 1

Q. **(i) Name any two helminths which are known to be pathogenic to human.**

(ii) List two symptoms of the diseases caused by any one of them.

Sol. Ans. (i) The two helminths that are pathogenic to humans are:

(a) *Ascaris:* Causing ascariasis disease in humans.

(b) *Wuchereria bancrofti* & *W. malayi* causing Filariasis or elephantiasis in humans.

(ii) The symptoms of the pathogenic diseases caused by helminths are as follow:

(a) Symptoms of Ascariasis: Internal bleeding, muscular pain, anaemia, blockage of intestinal passage.

(b) Symptoms of Filariasis: Chronic inflammation of lymphatic vessels of lower limbs and gross deformities of genital organs.

Topic-2 Drugs and Adolescence

Concepts Covered • *Drugs and their types, Effects of drugs and alcohol.*

Revision Notes

Drugs and their effects

- **Drugs**
  - These can alter the activity of the nervous system.
  - They are also called as psychotropic drugs or mood-altering drugs or neurological drugs.
  - These drugs change the mood, feelings, behaviour and power of perception.
  - The sources of most of the drugs are mainly flowering plants and some fungi.
- **Types of Drugs**
  - The drugs, which are commonly abused are opioid, cannabinoids and coca alkaloids.
  - These drugs are of the following main types:

1. **Depressants**
   - Depress brain activity.
   - They include
     - **(a) Sedatives:** Give calmness and relaxation. High doses induce sleep. e.g., Barbiturates (sleeping pills).
     - **(b) Tranquilizers:** Lower tension and anxiety without inducing sleep. e.g., Benzodiazepines (e.g., Valium).
2. **Opiate Narcotics (Pain killers)**
   - Drugs that bind to specific opioid receptors in CNS and gastrointestinal tract.
   - They are analgesic and depressant (lower tension, anxiety, B.P and respiration rate and reduce visual activity) e.g., Opium and its derivatives (Opiates or Opioids).
   - Opium is obtained from dried latex of unripe capsules of Poppy plant (*Papaver somniferum*).

- **Opium Derivatives**
  - **(a) Morphine:** Strong **analgesic** and **sedative** extracted from the latex of poppy plant. Useful during surgery.
  - **(b)** Brown sugar
  - **(c) Heroin (Diacetyl morphine/smack):** Most dangerous, white, odourless, bitter crystalline compound produced by acetylation of morphine. It is a depressant and slows down body functions. It is taken by snorting and injection.

Key Words

Analgesic: Drug used as pain reliever.

Sedative: Drugs are meant for inducing sleep. Drug is CNS (Central Nervous System) depressants.

Hallucination: An experience in which we see, hear, feel or smell something that actually does not exist. It could be due to side effect of some drug or any disease.

  - **(d) Codeine:** Mild analgesic. Used in cough syrups.

3. **Stimulants**
   - Stimulates CNS e.g., Cocaine, Caffeine (cardiac stimulant), amphetamines (synthetic).
   - Amphetamines & anabolic steroids are misused by some athletes.
   - Coca alkaloid (Cocaine or coke / crack): Obtained from the coca plant (*Erythroxylum coca*).
   - Interferes the transport of neurotransmitter dopamine.
   - Cocaine is usually snorted.
   - Stimulate CNS producing euphoria and energy.
   - Excessive dosage causes **hallucination**.
4. **Hallucinogens**
   - Cause **hallucinations**, changing thoughts, feelings and perceptions e.g., Mescaline, Psilocybin, Cannabinoids and LSD (Lysergic Acid diethylamide).
   - Atropa belladonna & Datura are plants with hallucinogenic property.
5. **Cannabinoids**
   - Drugs (a group of chemicals) that interact with cannabinoid receptors in the brain.
   - Generally taken by inhalation and oral ingestion.
   - Natural cannabinoids are obtained from *Cannabis sativa* (Hemp plant). It's flower tops, leaves & resin are used to produce bhang, ganja, charas (hashish), marijuana, etc.
   - Affects the cardiovascular system.

- **Alcoholism**
  - Alcohols include beverages and spirits.

(a) **Beverages:** Wine, beer and toddy (5-15% alcohol).
(b) **Spirits:** Whisky, brandy, rum, gin, arrack, etc. (more than 50% alcohol).

- The victims of alcoholism are known as alcoholics.

- **Effects of Alcoholism**
  (a) Affects thinking ability, speech, movements, reflexes, etc.
  (b) Amnesia, blurred vision, loss of body balance, nausea, vomiting, headache, etc.
  (c) **Cirrhosis** and fatty liver.
  (d) Alcoholic polyneuritis and loss of appetite.
  (e) Cardiovascular diseases and hypertension.
  (f) Ulcer, pancreatitis and gastritis.
  (g) Loss of sexual drive and necrospermia.
  (h) Foetal alcohol syndrome (FAS or Alcohol Embryopathy).
  (i) Family and social problems.

Key Facts

- It is estimated that around 1% of the world population has a drug use disorder.
- The U.S. has the highest overdose rates from all three leading illicit drugs: opioids, cocaine and amphetamine.
- Opiods are responsible for largest number of overdoses from illicit drugs.
- Illicit drugs are those drugs that have been prohibited under international drug control treaties.

- **Effects of Alcoholism on Traffic Accidents**
  (a) Affects co-ordination and correct judgment of distance.
  (b) Affects vision causing Tunnel vision.
  (c) Increases reaction time.
  (d) Affects behaviour.
- **De-alcoholism**
- Medical treatment.
- Social methods of treatment (Group therapy).
- Aversion therapy (Behavioural treatment).

- **Smoking**
  - Tobacco is smoked, chewed or used as a snuff.
  - Tobacco contains nicotine (an alkaloid) which stimulates the adrenal gland to release adrenaline and nor-adrenaline causing high BP and heart rate.
  - Smoking causes cancers of lung, urinary bladder and throat, bronchitis, emphysema, coronary heart disease, gastric ulcer, etc. Tobacco chewing causes oral cancer.
  - Smoking increases CO (Carbon monoxide) content in blood and reduces oxyhaemoglobin. This causes O_2 deficiency in the body.

- **Adolescence**
  - It is 'a period' and 'a process' during which a child becomes mature in terms of his / her attitudes and beliefs for effective participation in society.
  - Adolescence is a bridge linking childhood and adulthood (period of 12-18 years of age). It is very a vulnerable phase of mental and psychological development.
  - **Causes of Drug or Alcohol use in Adolescence period**
    (a) Curiosity and experimentation.
    (b) Need for adventure and excitement.
    (c) To escape facing problems.
    (d) Stress from pressure to excel in academics or examination.
    (e) Television, movies, newspapers, internet, etc.
    (f) Unstable or unsupportive family structures and peer pressure.

- **Addiction**
  - It is a psychological attachment (euphoria and a temporary feeling of well being) with drugs and alcohol.
  - With repeated use of drugs, the tolerance level of the receptors increases. Thus, the receptors respond only to higher doses leading to greater intake and addiction.

Key Word

Cirrhosis: It is a disease of liver, marked by degeneration of cells.

- **Dependence**
  - It is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if a regular dose of drugs / alcohol is abruptly discontinued.
  - This results in anxiety, shakiness, nausea and sweating.
  - Dependence leads to social adjustment problems.
- **Effects of Drug or Alcohol Abuse**
  (a) Reckless behaviour, vandalism and violence.
  (b) Coma and death due to respiratory failure, heart failure or cerebral haemorrhage.
  (c) Drugs together with alcohol may cause death.
  (d) Drop in academic performance and absence from school.
  (e) Lack of interest in personal hygiene.
  (f) Withdrawal and isolation.
  (g) Depression, fatigue, aggressive and rebellious behaviour, the deteriorating relationship between family and friends.
  (h) Loss of interest in hobbies.
  (i) Fluctuations in sleeping, eating habits, weight, appetite, etc.
  (j) Social problems like stealing and the spread of infectious diseases (e.g., AIDS, hepatitis B).
  (k) Damage of the nervous system and **cirrhosis.**
  (l) Use of drugs and alcohol by pregnant woman adversely affects the foetus.
  (m) Misuse of drugs by athletes (e.g., narcotic analgesics, anabolic steroids, diuretics and certain hormones to increase muscle strength and bulk and to promote aggressiveness).
- **Side Effects of Anabolic Steroid in Females**
  (a) Masculinisation
  (b) Mood swings and depression
  (c) Excessive hair growth
  (d) Deepening of voice
  (e) Increased aggressiveness
  (f) Abnormal menstrual cycle
  (g) Enlargement of clitoris
- **Side Effects of Anabolic Steroid in Males**
  (a) Acne
  (b) Mood swings and depression
  (c) Increased aggressiveness
  (d) Reduced testicles
  (e) Decreased sperm
  (f) Kidney and liver dysfunction
  (g) Breast enlargement
  (h) Premature baldness
  (i) Enlargement of the prostate gland
- **Side Effects in the Adolescent, Male and Female**
  - Severe facial and body acne.
  - Premature closure of the growth centres of the long bones resulting in stunted growth.
- **Prevention and Control**
  (a) Avoid undue peer pressure.
  (b) Education and counselling.
  (c) Seeking help from parents and peers.
  (d) Looking for danger signs.
  (e) Seeking professional and medical help.
  (f) Psychologists and psychiatrists.
  (g) De-addiction and rehabilitation programs.

Example 2

Q. A team of students are preparing to participate in the interschool sports meet. During a practice session you find some vials with labels of certain cannabinoids.

(i) Will you report to the authorities ? Why ?

(ii) Name a plant from which such chemicals are obtained.

(iii) Write the effect of these chemicals on human body.

Sol. (i) Yes, I would report the matter to the authorities because vials might have been abused by the sports persons. Moreover, cannabinoids are classified under drugs and drug abuse is an illegal practice.

(ii) Cannabinoids can be obtained from a plant called *Cannabis sativa*.

(iii) These chemicals increase athletic performance of the sports persons but they have many harmful side effects. The cannabinoids bind to cannabinoid receptors present in the brain and affect the cardiovascular system.