

[TOPIC 1] Health, Common Diseases in Human and Immunity

SBG STUDY

1.1 Health

Health is defined as a state of complete physical, mental and social well-being.

- (i) The factors which affect human health are:
 - (a) Genetic disorders
 - (b) Infections
 - (c) Lifestyle
- (ii) Balanced diet, personal hygiene and regular exercise are very important to maintain good health.
- (iii) Awareness about diseases and their effect on different body functions, vaccination against infectious diseases, proper disposal of wastes, control of vectors, maintenance of hygienic food and water resources are necessary for achieving good health.

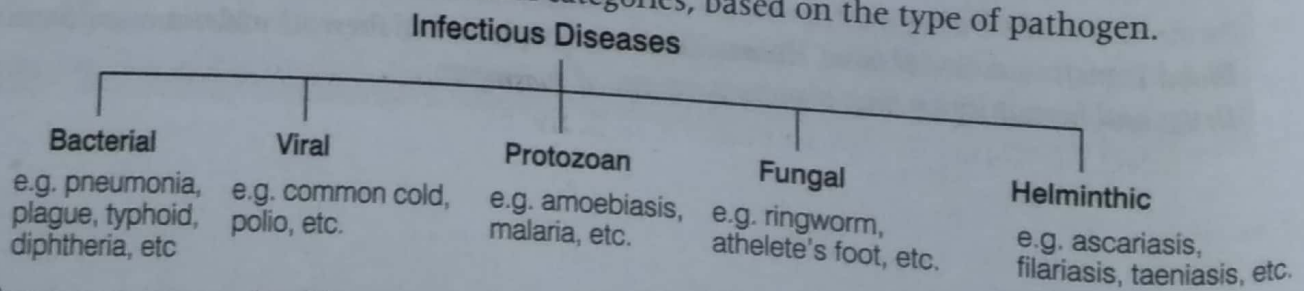
1.2 Disease

Disease involves adversely affected functioning of one or more organs or systems of the body which is characterised by various signs and symptoms. Diseases can be divided broadly into the following two categories depending on the modes of transmission.

- I. **Infectious diseases** which can easily transmit from one affected person to another healthy person. These diseases are usually caused by bacteria, viruses, fungi, etc., e.g. AIDS, common cold, etc.
- II. **Non-infectious diseases** which do not transmit from one person to another, e.g. cancer, diabetes, etc.

Pathogens

- (i) Disease causing organisms are called **pathogens**, e.g. bacteria, viruses, fungi, protozoans, helminthes, etc.
- (ii) The above described pathogens enter the body by direct contact, contaminated food and water, droplet infection, etc. The pathogens multiply in body cells and interfere with normal vital activities, due to which morphological and functional damage is caused.
- (iii) Pathogens have to adapt to the life within the environment of the host. For example, to survive in the acidic pH of stomach and in the presence of digestive enzymes.
- (iv) Infectious diseases can be divided into certain categories, based on the type of pathogen.



Some diseases are transmitted by vectors, i.e. mosquitoes, e.g. dengue (*Aedes aegypti*); chikungunya (*Aedes aegypti*, *Aedes albopictus*) and malaria (*Anopheles*) are caused by certain mosquitoes.

1.3 Common Infectious Diseases

Bacterial Diseases

- (i) **Typhoid** is caused by bacterium named *Salmonella typhi*.
- (a) *S. typhi* enters the small intestine through food and water contaminated with them and migrates to other organs through blood.
 - (b) Intestinal perforation and death may occur in severe cases.
 - (c) **Widal test** is a confirmation test for typhoid.
 - (d) **Symptoms** are high fever (39-40°C), weakness, stomach pain, constipation, headache and loss of appetite.
 - (e) Typhoid Mary was a cook by profession and was a typhoid carrier who spread typhoid for several years through the food she prepared.
- (ii) **Pneumonia** is caused by *Streptococcus pneumoniae* and *Haemophilus influenzae*.
- (a) These bacteria infect alveoli of the lungs. The alveoli get filled with fluid causing decrease in respiratory efficiency of the lungs.
 - (b) Pneumonia spreads by inhaling droplets/aerosol from infected individuals or even by sharing glasses and utensils with patients.
 - (c) **Symptoms** of pneumonia are fever, chills, cough, headache, increased pulse and respiratory rates, etc.
 - (d) In severe cases, the lips and finger nails may turn gray to bluish in colour.
- (iii) **Dysentery, plague, diphtheria**, etc. are some other examples of bacterial diseases.

Viral Diseases

- (i) **Common cold** occurs due to a group of viruses called Rhinoviruses.
- (a) These viruses infect the nose and respiratory passage but not the lungs.
 - (b) Common cold is characterised by nasal congestion and discharge, sore throat, hoarseness, cough, headache, tiredness, etc. which generally last for 3-7 days.
 - (c) The infection occurs due to cough or sneezes of an infected person, either inhaled directly or transmitted through contaminated objects such as pens, books, cups, computer's keyboard or mouse, etc.
- (ii) Polio, Dengue, Chikungunia, Mumps and Measles, etc. are some other examples of viral diseases.

Protozoan Diseases

- (i) **Malaria** is caused by a protozoan, *Plasmodium* sp. (*P. vivax*, *P. malariae* and *P. falciparum*).
- (a) *P. falciparum* causes most serious kind of malaria, i.e. malignant malaria, which can be fatal.
 - (b) Female *Anopheles* mosquito is the vector of *Plasmodium*, which transfers the sporozoites (infectious form) in human body through the bite.

(c) Life cycle of *Plasmodium* is given in the figure below.

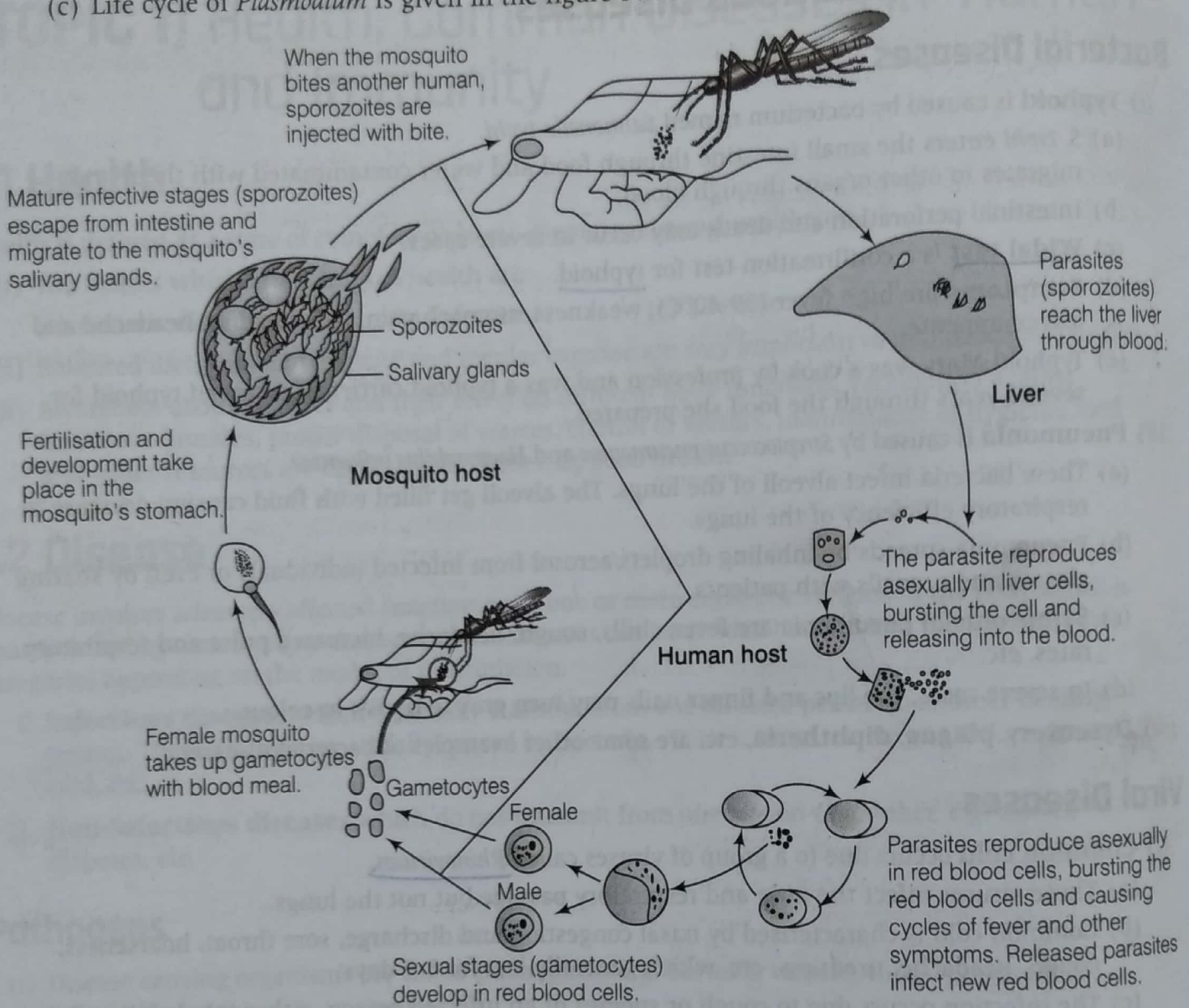


Figure 8.1 Stages in the life cycle of *Plasmodium*

- The malarial parasite requires two hosts to complete its life cycle, i.e. human and mosquito.
- *Plasmodium* enters the human body as sporozoite, through the bite of infected female *Anopheles* mosquito.
- Parasites initially multiply within the liver cells and then attack the Red Blood Cells (RBCs) causing their rupture.
- Rupture of RBCs release a toxic substance called **haemozoin** which causes chill and high fever, recurring every 3-4 days.
- When a healthy female *Anopheles* mosquito bites an infected person, gametocytes enter the mosquito's body and undergo further development to form male and female gametes.
- These gametes fuse and form zygote, which further divides to form many sporozoites in the intestine of mosquito.
- These sporozoites are stored in the salivary glands of mosquito.
- When these mosquitoes bite a human, the sporozoites are introduced into his/her body, initiating the events mentioned above.

- (d) **Antimalarial drugs** used for the treatment are quinine and chloroquin.
 - (e) Malaria can be prevented by killing mosquitoes by spraying DDT, BHC, etc., and using insect repellents, mosquito nets, etc.
- (ii) **Amoebiasis** (amoebic dysentery) is caused by an intestinal endoparasite, *Entamoeba histolytica*, which is found in the large intestine of humans.
- (a) Carrier of pathogen is housefly. It transmits the parasite from faeces of infected person to the food, thereby contaminating them.
 - (b) Infection takes place mainly through the contaminated food and water.
 - (c) **Symptoms** are abdominal pain, constipation, cramps, faeces with excess mucous and blood clots.
- (iii) **Kala-azar, Sleeping sickness, Ascariasis,** etc. are some other protozoan diseases.

Fungal Disease

Ringworm is caused by many fungi of genera *Microsporium*, *Trichophyton* and *Epidermophyton*.

- (i) Infection occurs through contact with an infected person or from soil and through the use of towels, clothes, combs, etc., of an infected person.
- (ii) Heat and moisture help these fungi to grow in regions like skin folds as in groin or between the toes.
- (iii) **Symptoms** of ringworm are appearance of dry, scaly lesions on various parts of the body such as skin, nails and scalp accompanied by intense itching.

Helminthic Diseases

- (i) **Ascariasis** is caused by an intestinal endoparasite of human, *Ascaris lumbricoides* commonly called as **roundworm**.
- (a) Infection occurs as the eggs of parasite are excreted along with the faeces of infected person, which contaminate water, soil, plants, etc.

- (b) Infection reaches to human beings through contaminated vegetables, fruits and water, etc. Eggs of parasite give rise to larva, which spreads in the body with the blood.

- (c) **Symptoms** include disease are abdominal pain, indigestion, muscular pain, fever, anaemia, nausea, headache and blockage of intestinal passage.

(ii) **Filariasis/Elephantiasis** is caused by filarial worms, *Wuchereria bancrofti* and *Wuchereria malayi*. It is chronic inflammation of the organs.

- (a) *Culex* mosquito (female) is the vector.
- (b) Genital organs also get affected leading to their deformation.
- (c) **Symptoms** include inflammation of organs in which they live for many years, normally affect lymph vessels of lower limbs resulting in swelling hence, called **elephantiasis**.

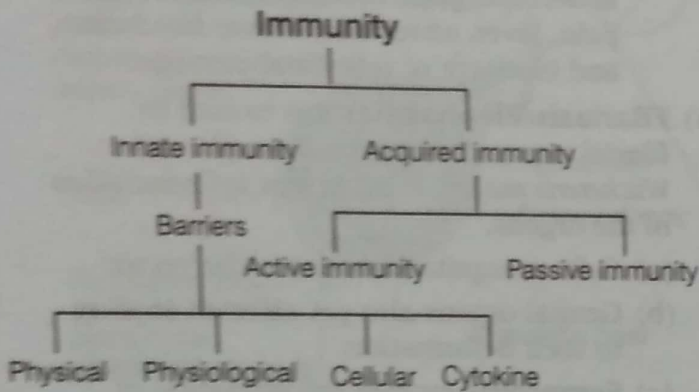
Prevention Measures

Prevention measures to avoid infectious diseases are:

- (i) Maintenance of personal and public hygiene is important.
- (ii) Personal hygiene includes keeping the body clean, consumption of clean drinking water, food, vegetables, fruits, etc.
- (iii) Public hygiene includes proper disposal of waste, excreta, periodic cleaning and disinfection of water reservoirs, pools, cesspools and tanks.
- (iv) Eradication of vectors and destroying their breeding sites, can prevent those diseases which require vectors for their transmission, such as malaria, dengue and filariasis, etc.
- (v) In order to kill vectors, natural predators can also be used, e.g. *Gambusia* is a fish that feed on mosquito larvae.
- (vi) Mosquito nets, repellants should be used.
- (vii) Vaccination and immunisation programmes for diseases should be strictly followed, e.g. in smallpox, polio, diphtheria.
- (viii) Use of antibiotics and other drugs can significantly keep away infectious diseases.

1.4 Immunity

Immunity is the ability of an organism to resist or defend itself from the development of a disease. It is of following types, as shown below:



Innate Immunity

Innate immunity is present from birth and is inherited from the parents.

- (i) It is non-specific.
- (ii) It consists of following types of barriers:

- (a) **Physical barriers** prevent entry of microorganisms in the body, e.g. skin, mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts. Mucus traps the microbes entering our body.
- (b) **Physiological barriers** prevent microbial growth in the body, e.g. acid in the stomach, saliva in the mouth and tears from eyes.
- (c) **Cellular barriers** phagocytose and destroy microbes. For example, some WBCs like Polymorphonuclear Leukocytes (PMNL), monocytes and natural killer cells (type of lymphocytes) in the blood as well as macrophages in tissues.
- (d) **Cytokine barriers** are virus-infected cells, which secrete proteins called **interferons**. They protect non-infected cells from further viral infection.

Acquired Immunity

Acquired immunity is not present from birth and develops during an individual's life time.

- (i) It is pathogen specific, can differentiate between self and non-self cells and characterised by memory.
- (ii) When it encounters a pathogen for the first time, it produces a response called **primary response**, which is of low intensity and takes time.
- (iii) Further encounter with same pathogen produces highly intensified **secondary** or **anamnestic response** due to the memory of first encounter.
- (iv) **Cells of Immune Response** Immune responses are produced by two types of lymphocytes:
 - (a) **B-lymphocytes or B-cells** produce an army of proteins (in response to pathogens) called **antibodies** in blood. B-lymphocytes are formed in bone marrow and their maturation also takes place in bone marrow.
 - (b) **T-lymphocytes or T-cells** help B-cells to produce antibodies. T-lymphocytes are formed in bone marrow but their maturation takes place in thymus gland.
- (v) **Antibodies** are immunoglobulin molecules (Ig). These are of five types: IgA, IgM, IgE, IgG and IgD.

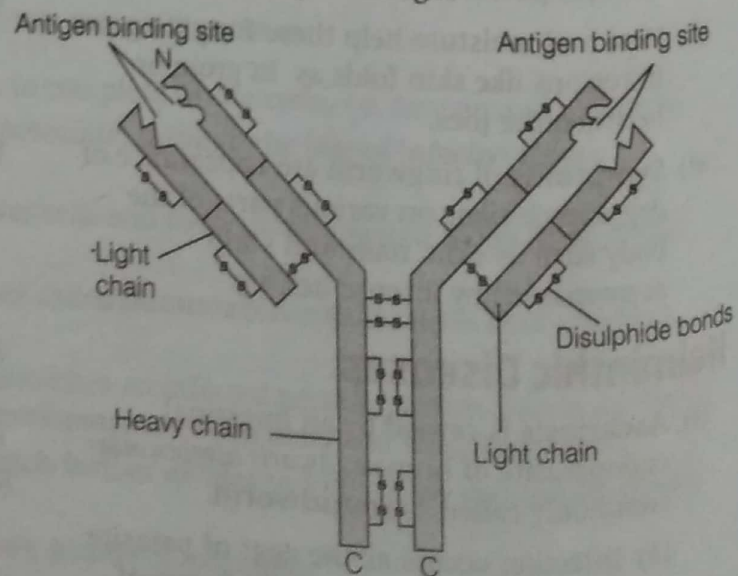
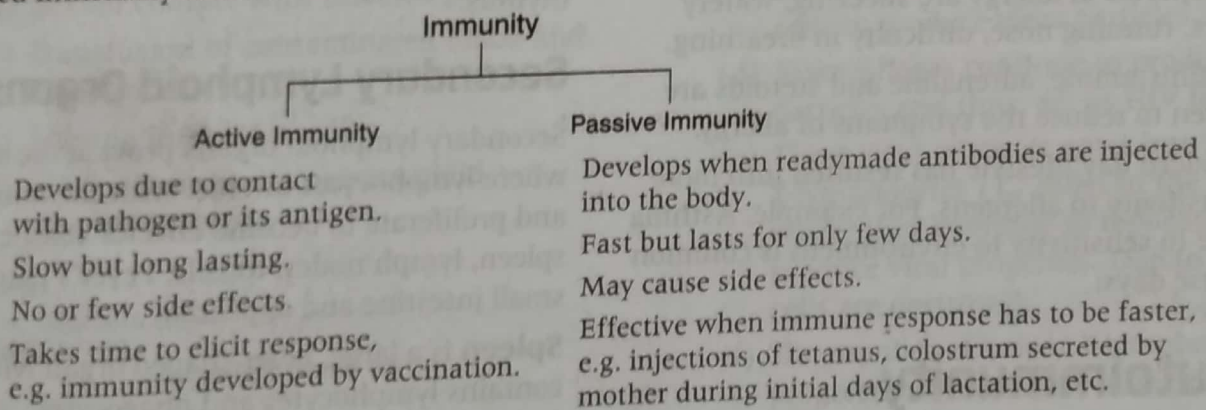


Figure 8.2 Structure of an antibody molecule

- (a) Each antibody molecule has four peptide chains, i.e. two small called **light (L) chains** and two longer called **heavy (H) chains**. Hence, an antibody is represented as H_2L_2 . These chains are connected by disulphide bonds.
- (b) An antibody appears like a Y-shaped structure.
- (c) IgG can cross the mother's placenta.
- (vi) Types of acquired immune responses or immunity developed in the body are as follows:

- (a) **Humoral immune response or Antibody Mediated Immunity (AMI)** It is mediated by antibodies present in blood and lymph. When a pathogen enters in body, the B-cells encounter them and give rise to different types of antibodies which are released in the blood.
- (b) **Cell-mediated immune response or Cell Mediated Immunity (CMI)** It is mediated by T-lymphocytes. Here antibodies are not produced by T-lymphocytes instead they recognise the non-self cells. These T-lymphocytes then act by their phagocytic ability to kill the pathogen. The graft rejection during organ transplantation occurs, because of the ability of T-lymphocyte to differentiate between self and non-self, due to the cell-mediated immunity. That is why blood group and tissue matching are essential before organ transplantation.

Acquired immunity is of following two types:



- Colostrum contains IgA antibody. IgA protects the infant in its initial days from microbes and infection.

Vaccination and Immunisation

Vaccination and Immunisation are based on the property of memory of immune system.

- (i) **Vaccination** is the process of introduction of weakened or inactivated pathogens or proteins (vaccine) into a person to provide protection against a disease.
- (ii) **Immunisation** is a process by which the body produces antibodies against the vaccine (primary response) and develops the ability to neutralise pathogens during actual infection (secondary response), i.e. the body becomes immune to that antigen or infection.
- (iii) Vaccine generates memory B and T-cells that recognise the pathogens on subsequent exposure and produce an intense immune response.
- (iv) In case of requirement of quick immune response like tetanus infection, preformed antibodies are injected into the patient. Even in the cases of snake bite, preformed antibodies or antitoxin is injected. This is called **passive immunisation**.
- (v) Recombinant DNA technology has produced antigenic polypeptides of pathogen in bacteria or yeast. This allowed large scale production of vaccine, e.g. hepatitis-B vaccine produced from yeast, etc.

1.5 Allergy

Allergy is a hypersensitive reaction of the immune system to certain antigens present in the environment. Those agents which cause allergy are known as **allergens**.

- (i) Allergens produce immune response in an individual, e.g. pollen grains, animal dander, dust, feathers, etc.
- (ii) IgE antibodies are produced in response to allergens. IgE binds to allergen and then both bind on mast cell.
- (iii) Allergy occurs when chemicals like histamine and serotonin are released from the mast cells. These chemicals cause inflammatory reaction in the body.
- (iv) Symptoms of allergy are sneezing, watery eyes, running nose, difficulty in breathing.
- (v) Antihistamine, adrenaline and steroids are taken to reduce the symptoms of allergy.
- (vi) Modern day lifestyle has resulted into more sensitivity to allergens. For example, Asthma due to sensitivity to environment is common these days.

1.6 Autoimmunity

Autoimmunity is an abnormal immune response in which immune system of the body starts rejecting its own body cell or self cells and molecules. The diseases caused due to autoimmunity are called **autoimmune diseases**, e.g. Rheumatoid arthritis. Autoimmunity is caused due to genetic reason or due to unknown reason.

1.7 Human Immune System

Human immune system includes (i) lymphoid organs (ii) immune cells (iii) soluble molecules like antibodies (iv) lymphoid tissues.

Lymphoid organs These are the organs where origin, maturation and proliferation of lymphocytes occur.

They are of following two types:

Primary Lymphoid Organs

Primary lymphoid organs are the sites where lymphocytes differentiate and mature to become antigen-sensitive, e.g. bone marrow and thymus. In bone marrow, all blood cells including lymphocytes are produced and B-lymphocytes mature.

Thymus is a lobed organ, located near the heart and beneath the breastbone.

It reduces in size as the age of an individual increases. T-lymphocytes develop and mature in thymus.

Secondary Lymphoid Organs

Secondary lymphoid organs provide the sites where lymphocytes interact with the antigen and proliferate to become effector cells, e.g. spleen, lymph nodes, tonsils, Peyer's patches of small intestine and appendix.

Spleen is a large, bean-shaped organ which contains lymphocytes and phagocytes. It acts as a filter to trap blood-borne microbes and contains a large pool of erythrocytes. So, it is known as **blood bank of body**.

Lymph nodes are small solid structures along the lymphatic system. Their function is to trap microorganisms or other antigens that enter the lymph and tissue fluid.

Mucosal Associated Lymphoid Tissue (MALT) is formed of the masses of lymphoid tissue, located within the lining of mucosa of respiratory, digestive and urogenital tracts. About 50% of lymphoid tissue in human body is formed by MALT.

1.8 AIDS or Acquired Immunodeficiency Syndrome

AIDS was first reported in **1981** in **USA**. Here syndrome means group of symptoms.

- (i) The causative agent is **Human Immunodeficiency Virus (HIV)**.
- (ii) HIV belongs to a group of viruses called **retrovirus**. It has RNA genome enclosed in an envelope. This RNA is *ss*RNA which forms DNA *via* reverse transcription process using enzyme reverse transcriptase.
- (iii) HIV is transmitted by
 - (a) Sexual contact with infected person.
 - (b) Transfusion of contaminated blood and blood products.
 - (c) Sharing infected needles.
 - (d) Infected mother to unborn child through placenta.

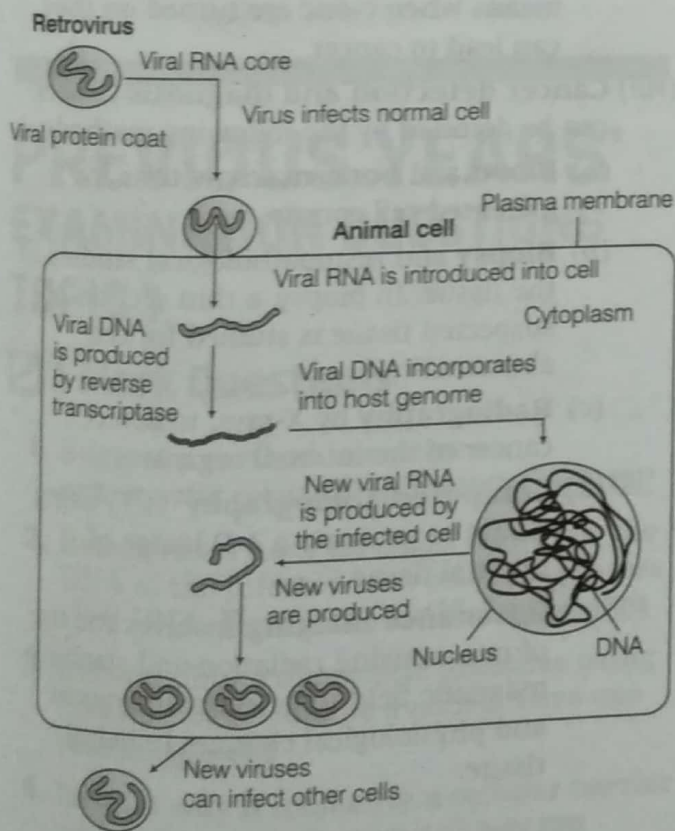


Figure 8.3 Replication of retrovirus

NOTE Infected cell can survive, while viruses are being replicated and released.

- (iv) People who are susceptible to infection are:
 - (a) Drug addicts, who take intravenous drug injections.
 - (b) Individuals who are involved with multiple sexual partners.
 - (c) Individuals who require repeated blood transfusion.
 - (d) Children born to HIV positive mother.
- (v) **Modes of HIV infection:**
 - (a) Virus enters the macrophages, after entering into the body of a person.
 - (b) RNA gets replicated to form viral DNA by enzyme reverse transcriptase. This process is known as **reverse transcription**.
 - (c) Viral DNA gets incorporated into the host cell DNA and directs the infected cells to produce virus particles.
 - (d) Macrophages continue to produce virus particles and thus, act as HIV factory.
 - (e) These virus particles enter into helper T-lymphocytes (T_H cells) in the blood, where they continue to replicate and produce viral progenies. Due to this, T_H cells are destroyed.
 - (f) The number of helper T-lymphocytes progressively decreases in the body of the infected person.
 - (g) As the number of T-cells decrease, the immunity also decreases. As a result, person cannot produce any immune response even against common bacteria like *Mycobacterium*, parasite like *Toxoplasma*, viruses and fungi.
 - (f) **ELISA** (Enzyme Linked Immuno Sorbent Assay) is a widely used diagnostic test for AIDS.
 - (i) Treatment with anti-retroviral drugs is only partially effective.

Prevention of AIDS

Certain preventive measures taken to prevent HIV infections are:

- (i) National AIDS Control Organisation (NACO) setup in 1991 and other NGOs educate people about AIDS.

- (ii) Role of WHO in preventing HIV infection:
- Ensure use of disposable syringes and needles.
 - Ensure that blood banks are safe from HIV.
 - Free distribution of condoms.
 - Prevention of drug abuse.
 - Discouraging unsafe sex and encouraging regular check-up.

Cancer

Cancer can be defined as an uncontrolled abnormal growth or proliferation of cells without any differentiation.

- (i) In our body, cell growth and differentiation is highly controlled and regulated. New cancer cells are known as **neoplastic cells**.
- (ii) The cancer cells divide repeatedly with uncontrolled cell divisions. They do not require extracellular growth factors. Cancer cells are under the control of cell cycle.
- (iii) Cancer cells have lost the property of **contact inhibition** shown by normal cells in which contact with other cells inhibit their uncontrolled growth.
- (iv) The repeated division of cancerous cells, form a large mass of cells called **tumors**.
- (v) Cancer cells move from tumor to new sites through blood for forming secondary tumors. This invasion of cancer cells from one part to other parts by the body fluids is called **metastasis**.
- (vi) Types of tumor and differences between them are as follows:

Benign tumor	Malignant tumor
It is non-cancerous.	It is cancerous.
Does not show metastasis.	Shows metastasis and invades other body parts.
Growth stops after reaching a certain size.	Growth occurs indefinitely.
Less fatal.	Highly fatal.

(vii) **Causes of cancer** include certain cancer causing agents, viruses and genes.

- (a) **Carcinogens** are cancer causing agents. They may be
- **Chemicals** As in cigarette smoke, benzopyrene, dyes, paints, etc.
 - **Biological** Oncogenic viruses, some parasites, etc.
 - **Physical** Ionising radiation like X-rays and γ -rays, non-ionising radiations like UV-rays.
- (b) Cancer causing viruses are called **oncogenic viruses**. They have genes called **viral oncogenes**. At the time of viral infection these genes are transferred and can lead to cancer.
- (c) Normal cells have genes called **cellular oncogenes** (c-onc.) or **proto-oncogenes**, which are present in inactive state, but under certain conditions (like mutation) could lead to oncogenic transformation of the cells. It means when c-onc are turned on they can lead to cancer.
- (viii) **Cancer detection and diagnosis** Cancer can be detected by the following methods:
- (a) **Blood and bone marrow** tests for increased cell counts.
- (b) **Biopsy** and histopathological studies of the tissue. In biopsy, a thin section of suspected tissue is studied for cell abnormality.
- (c) **Radiography** by X-rays, to detect cancer of the internal organs.
- (d) **Computed Tomography (CT)** using X-rays to generate a 3-D image of internal tissue.
- (e) **Resonance imaging** involves the use of non-ionising radiation and strong magnetic field to detect pathological and physiological changes in living tissue.

- (f) **Monoclonal antibodies** against cancer-specific antigens are also used for cancer detection. These antibodies bind to agents which are released by cancerous cells in the body.

Treatment of Cancer

It involves following methods:

- (i) **Surgery** Tumours are removed by surgery to check further spread of cancer cells.
- (ii) **Radiation therapy** Tumour cells are irradiated by lethal doses of radiation, such as cobalt 60 taking care to protect the surrounding normal cells.
- (iii) **Chemotherapy** Several chemotherapeutic drugs are used to kill cancer cells. But, their side effects like hair loss, anaemia etc. are also reported. Most cancers are treated by the combination of the above three.
- (iv) **Immunotherapy** Biological modifiers like α -interferons are used to activate the immune system and help in destroying the tumour.

[TOPIC 2] Adolescence and Drug/Alcohol Abuse

2.1 Drugs and Alcohol

When taken for the purpose other than medicinal or taken in amount or frequencies that disturbs the physical, physiological or psychological functions, is called **drug abuse** and **alcohol abuse**, respectively.

Statistics show that the use of drugs and alcohol has been on a rise especially among the youth. Proper education and guidance would help youth to safeguard themselves against these dangerous behaviour patterns and follow healthy life styles.

Drugs which are commonly abused belong to the following categories:

(i) Opioids

(ii) Cannabinoids

(iii) Coca alkaloids or cocaine

(iv) Hallucinogens

(v) Tobacco

(vi) Alcohol

Opioids

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

Heroin is a common opioid also called as **smack**. It is chemically diacetylmorphine, which is white, odourless, bitter crystalline compound.

- (i) Heroin is obtained from acetylation of morphine. **Morphine** is extracted from the latex of **poppy plant**, *Papaver somniferum*.
- (ii) It is taken by snorting and injection.
- (iii) Heroin is a depressant, which slows down the body functions.
- (iv) Morphine is an effective sedative, analgesic and pain killer.

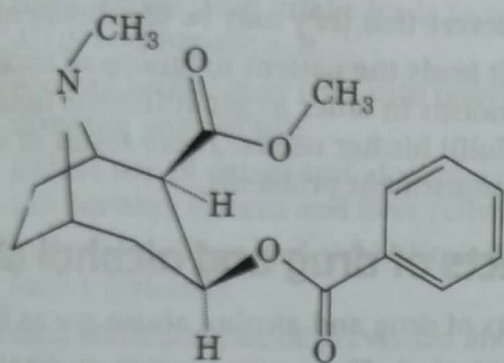


Figure 8.4 Chemical structure of morphine

Cannabinoids

Cannabinoids are a group of chemicals, which interact with cannabinoid receptors present mainly in the brain.

- (i) Cannabinoids are obtained from the inflorescences of plant *Cannabis sativa*.
- (ii) Leaves, flower tops, resins of *C. sativa* in various combinations produce hashish, charas, marijuana and ganja.
- (iii) These are inhaled or ingested orally.
- (iv) These drugs affect cardiovascular system of the body.

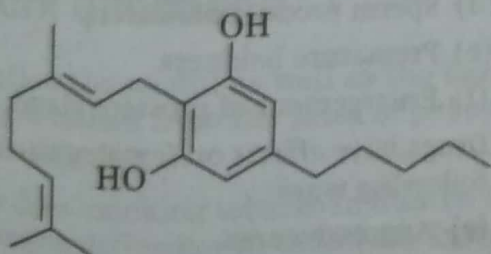


Figure 8.5 Skeletal structure of cannabinoid molecule

Coca alkaloids or Cocaine

Cocaine has a potent stimulating action on central nervous system, producing a sense of euphoria and increased energy.

- (i) Cocaine is derived from the leaves and young branches of a South American plant called *Erythroxylum coca*.
- (ii) Its mode of intake is sniffing and snorting.
- (iii) It is a strong stimulant. When taken in high doses it causes headache, convulsions, hallucination and death due to cardiovascular or respiratory failure.
- (iv) Commonly called **coke** or **crack**.

Hallucinogens

Hallucinogens are **psychedelic drugs**, because of their effect on the cerebrum and sense organs.

- (i) These are obtained from the plants like *Atropa belladonna* and *Datura* sp.
- (ii) **Lysergic Acid Diethylamide (LSD)** is derived from the fungus *Claviceps purpurea*.
- (iii) Effect of these drugs occurs on thoughts, feelings and perceptions of an individual. Medically these are prescribed to cope with depression and insomnia.
- (iv) Drugs like barbiturates, amphetamines, benzodiazepines that are used to treat depression and insomnia are also abused.

Tobacco

Tobacco contains nicotine, which stimulates the adrenal gland to release adrenaline and noradrenaline which in turn increases the blood pressure and heart rate.

- (i) It is obtained from tobacco plant.
- (ii) Its mode of intake is smoking, chewing or as a snuff.
- (iii) Tobacco can induce lung cancer, bronchitis, emphysema, coronary heart disease, throat cancer, oral cancer and cancer of urinary bladder, etc.
- (iv) Smoking of tobacco leads to increase in carbon monoxide content of blood and reduces the concentration of haem-bound oxygen. This leads to oxygen deficiency in the body.

Alcohol

Alcohol has an anaesthetic effect on nervous system, affecting cerebrum, cerebellum and other parts.

- (i) It is taken orally.
- (ii) Effect of alcohol is euphoria, peptic ulcer, gastric carcinoma, hepatitis, liver failure, liver cell carcinoma, etc.

Adolescence and Alcohol/ Drug Abuse

Adolescence is a period during which a child becomes mature in terms of his/her attitudes and beliefs for independent participation in the society.

- (i) Age between 12-18 years of age is called **adolescent period**.
- (ii) Adolescence is accompanied by several biological and behavioural changes. It is a vulnerable phase of mental and psychological development of an individual.
- (iii) In this age, use of drugs or alcohol occurs out of curiosity or experimentation, which later turns to addiction.
- (iv) Adolescents take drugs/alcohol due to:
 - (a) Social pressure
 - (b) Curiosity and need of adventure, excitement and experiments.
 - (c) Avoid stress, depression and frustration.
 - (d) Overcome hardships.
 - (e) Avoid unsupportive family structure.

Addiction

Addiction is a psychological attachment to certain effects – such as euphoria and a temporary feeling of well-being associated with drugs and alcohol. These drive people to take them without need or even when it becomes self-destructive.

- (i) With repeated uses, the tolerance level increases.
- (ii) Consequently, receptors respond only to higher doses leading to greater intake and addiction.
- (iii) In the absence of any guidance or counselling, the person gets addicted and become dependent on their use.

Dependence

Dependence on drug/alcohol is the tendency of the body to manifest a characteristic and unpleasant **withdrawal syndrome**, if regular dose of drugs/alcohol is discontinued abruptly.

- (i) Withdrawal symptoms are characterised by anxiety, shakiness, nausea and sweating.
- (ii) Sometimes, withdrawal symptoms can be so severe that they may be life threatening.
- (iii) It leads the patient to ignore all social norms in order to get sufficient funds to fulfil his/her needs. These result in social adjustment problems.

Effects of drug and alcohol abuse

Effects of drug and alcohol abuse are as follows:

- (i) Alcohol affects nervous system as given below:
 - (a) Loss of thinking power and self-control.
 - (b) Loss of emotional control and moral sense.
 - (c) Visual problems, staggering and incoherence in speech occurs.
 - (d) Neuritis may occur due to inflammation of axon of neurons.
- (ii) Drugs exert following effects on males:
 - (a) Acne.
 - (b) Aggressiveness.
 - (c) Reduction in size of testes.
 - (d) Sperm production lowers.
 - (e) Premature baldness.
 - (f) Enlargement of prostate gland.
- (iii) Drugs have effects on females also in the following ways:
 - (a) Aggressiveness.
 - (b) Masculinisation (features like males)
 - (c) Mood swings.
 - (d) Depression.
 - (e) Irregularities in menstrual cycles.
 - (f) Excessive growth of facial and body hairs.

(iv) Serious effects of drug and alcohol abuse in adolescents are:

- (a) Academic performance decreases.
- (b) The absence from school/college.
- (c) Isolation, fatigue, depression and aggressiveness occur in behaviour.
- (d) No coordination with family members and friends.
- (e) Weight fluctuates frequently.
- (f) Intravenous drug intake leads to risk of AIDS and hepatitis-B.
- (g) Alcohol intake may turn into heavy drinking later in life.
- (h) Excess use of drugs and alcohol damage the nervous system and liver (cirrhosis).
- (i) In females, drug and alcoholism affect foetus seriously.

Drugs/alcohol addiction can be prevented and controlled by the following ways:

- (i) Avoid undue peer pressure.
- (ii) Avoid disappointments and failures in life.
- (iii) Discuss and seek help of parents and elders.
- (iv) Discourage friends to take drugs/alcohol.
- (v) Take medical help whenever required.