30. Human Health and Diseases

1. Introduction

1.1 Health

is defined as a state of complete physical, mental and social well being and not merely the absence of disease or infirmity. Good health is a state of optimum physical fitness, mental maturity and alertness with freedom from anxiety, social well being with freedom from social tensions.

1.2 Health is affected by

(1) **Genetic Disorders :** Deficiencies with which a child is born and deficiencies/defects which the child inherits from parents from birth.

(2) **Infections**

(3) **Life Style :** Including food and water we take, rest and exercise we give to our bodies, habits that we have or lack etc.

Balanced diet, personal hygiene and regular exercise are very important to maintain good health. Yoga has been practiced since time immemorial to achieve physical and mental health. Awareness about diseases and their effect on different bodily functions, vaccination (immunization) against infectious diseases, proper disposal of wastes, control of vectors and maintenance of hygienic food and water resources are necessary for achieving good health. Different diseases can be recognized by their symptoms, signs or syndromes they produce in the body.

1.3 Symptom

A symptom is a sensation or change in health experienced by a patient e.g., fatigue, pain or nausea etc. Clinically recognizable features discovered by a physician indicating the nature of the disease is called signs e.g., elevated blood pressure, abnormal appearance of the retina etc.

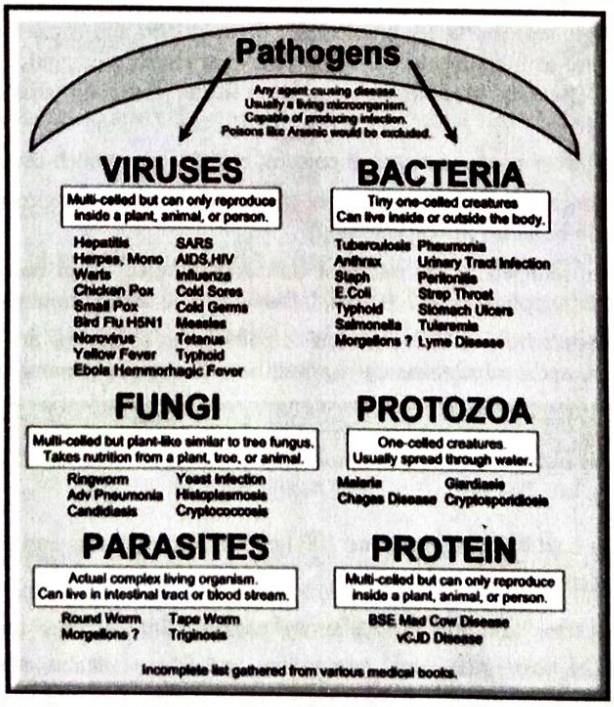
1.4 Syndrome

Syndrome refers to the association of several clinically recognizable features, signs, symptoms, phenomena or characteristics which occur together so that the pressure of one feature alerts the physician to the presence of the others.

1.5 Disease

When the functioning of one or more organs or systems of the body is adversely affected, characterized by various signs and symptoms, we say that we are not healthy, i.e., we have a disease.

2. Disease and its Classification



2.1 Pathogens

A wide range of organisms belonging to bacteria, viruses, fungi, protozoans, helminthes etc. could cause diseases in man. Such disease causing organisms are called pathogens.

2.2 Types of Diseases

(1) **Acquired Diseases :–** Acquired diseases are contracted after birth due to various reasons like infection, degeneration, diet, addition, depression, cancer etc. These diseases are of further two types : Communicable and non-communicable disease.

- **Communicable (infectious) Diseases :–** Infectious diseases are caused by microscopic germs or parasites referred to as pathogens namely, viruses, rickettsia's, bacteria, fungi, protozoans and worms. These can pass from once infected person to a healthy one. So, these are termed as communicable disease. These are of further two types depending upon the mode of contraction.
  - **(a) Contagious Diseases :–** Infective agent i.e., pathogen is transferred to a healthy person through contact. e.g., ringworm, conjunctivitis.
  - **(b) Non-contagious Diseases :–** The infective agents spread through a vector (e.g., dengue, malaria) or vehicle, blood serum (e.g., AIDS), food (e.g., typhoid).
- **Non-communicable (non-infectious) Diseases :–** Non-communicable diseases remain confined to the persons who develop them and do not spread to others. These diseases are caused by agents other than pathogens. These are of the following kinds :
  - **(a) Deficiency Diseases :–** These diseases are produced by deficiency of nutrients, minerals, vitamins, and hormones which are essential for the body e.g., kwashiorkor, beri-beri, goiter, diabetes etc.
  - **(b) Organic (degenerative) Diseases :–** These diseases are due to malfunctioning of some of the important organs or due to senescence or old age e.g., cardiovascular diseases (heart diseases), brain diseases (epilepsy) etc.
  - **(c) Allergy :–** These are caused when the body becomes hypersensitive to certain foreign substances e.g., rhinitis.
  - **(d) Addictions :–** The diseases are due to drug abuse, alcohol and tobacco e.g., liver cirrhosis.
  - **(e) Mental Disorders :–** They are related to depression, anxiety, mental disability, neurosis, schizophrenia and psychosis.
  - **(f) Cancers :–** These are caused by an uncontrolled growth of certain tissues, crushing and starving normal cells and vital organs e.g., breast cancer, lung cancer, etc.

(2) **Congenital Diseases :–** Congenital diseases are diseases which a person has already contracted at birth. Congenital diseases can be of two basic types:

- **Hereditary or Genetic Diseases :–** These diseases can be caused by, A single gene mutation e.g., alkaptonuria, phenylketonuria, albinism, sickle cell anaemia, haemophilia, colour blindness, etc. Chromosomal aberration e.g., Down's syndrome Klinefelter's syndrome, Turner's syndrome, etc.
- **Diseases due to environmental factors**
  - **(a) Transplacental transmission e.g., Measles, syphilis etc.**
  - **(b) Developmental defects e.g., cleft palate, hare lip etc.**

  These are caused due to influence during the development of the fetus in the womb of the mother.

2.3 The ways pathogens cause diseases

Pathogens produce diseases in two ways: tissue damage and toxin secretion.

(1) **Tissue Damage :–** The bacteria responsible for tuberculosis, damage cells and cause lesions in the lungs. Blood oozes from the lesions into the air sacs, leading to hemorrhages. The bacteria that cause meningitis attack the protective membranes, called meninges, covering the brain. The virus of rabies destroys brain tissue. The polio virus damages motor nerve cells in the spinal cord.

(2) **Toxin Secretion :–** Many microbes produce powerful poisons, called toxins, which cause diseases. Toxins are of 2 types–

- **Exotoxins :–** These are released as soon as they are produced. The diseases brought about by exotoxins include tetanus, scarlet fever, diphtheria and botulism (food poisoning).
- **Endotoxins :–** These are retained in the bacterial cells and released when bacteria die and disintegrate. The diseases caused by endotoxins include typhoid fever, cholera, bubonic plague and dysentery.

A few representative members from different groups of pathogenic organisms are discussed here along with the diseases caused by them. Preventive and control measures against these diseases in general, are also briefly described

3. Disease caused by Viruses

3.1 Common Cold

(1) **Causative Agent :–** Common cold is caused by some 100 types of Rhino viruses and small bacterium *dialister pneumosintes*. It is one of the most common infectious diseases in human.

(2) **Symptoms :–** Viruses infect nose and upper respiratory passage (but not the lungs) causing inflammation of mucous membranes There is irritation of nasal tract, nasal congestion, and flow of mucus, sneezing, sore throat, hoarseness, cough, tiredness, headache and slight fever. It is cured automatically after 3-7 days. Droplets resulting from cough sneezes of an infected person are either inhaled directly or transmitted through contaminated objects such as pens, books, cups doorknobs, computer keyboard or mouse, etc. and cause infection in a healthy person

3.2 Mumps

(1) **Causative Agent :–** Mumps or infectious parotiditis is caused by a *paramyxovirus* (RNA virus) or *Myxovirus parotiditis*, virus generally affects the children between the age of 5 and 12 years. It is highly infectious and spreads through droplet infection or direct contact with the mucous membranes of mouth.

(2) **Symptoms :–** Mumps causes inflammation of the parotid glands behind ears. It also affects testes and ovaries in adults leading to sterility. One attack gives a life long immunity. There is no specific medicine for mumps.

(3) **Treatment :–** MMR vaccine is used against measles, mumps and rubella (German measles).

3.3 Measles (Rubeola Diseases)

(1) **Causative Agent :–** Measles is a highly infectious childhood disease occurring between 3-6 years of age. It is caused by *Rubeola virus / polynosa morbillorum*.

(2) **Symptoms :–** The disease causes eruptions of small red spots (rubeola) in the form of rash all over the face and body along with itching. Inflammation of respiratory passage from mouth to bronchi occurs, sometimes may affect conjunctiva. Single attack gives a life long immunity.

(3) **Treatment :–** Edmonson B vaccination is also available to provide active immunity.

German measles is caused by Rubella virus. It is known to cause congenital problems resulting in eye defects, deafness and cardiac problem.

3.4 Poliomyelitis or polio (infantile paralysis)

(1) **Causative Agent :–** Polio is highly infectious disease of infants and children and is caused by an *enterovirus* or polio virus (RNA virus). Earlier polio was regarded as disease of infants and children, but, it is now known that the disease may occur at any age. Polio virus multiplies in alimentary canal then passes to lymph, blood and finally to CNS (Central nervous system) in dorsal horn cells of spinal cord and brain stem resulting in paralysis in children. Hence called infantile paralysis.

(2) **Symptoms :–** It produces inflammation of the nervous system. There is inability of bending the head forward, stiffness of the neck, paralysis of skeletal muscles, fever, headache, chillness and pain all over the body. Incubation period is of 7-14 days. Oral polio drops is given on 6^{th}, 10^{th} and 14^{th} week of the child and booster dose before the age of 3 and 4 years gives immunity.

(3) **Treatment :–** Vaccine for polio is killed Salk's vaccine and live Sabin's oral vaccine.

3.5 Influenza (Flu)

(1) **Causative Agent :–** Influenza (also called flu) is an acute respiratory tract infection caused by influenza virus. Influenza virus, *Myxovirus influenzae* is a ribovirus (RNA virus) with fragmented genome. It is epidemic, endemic and pandemic. Endemic influenza is caused by *Haemophilus influenzae*, a gram (-) ve bacterium influenza virus has three forms – A, B and C.

(2) **Symptoms :–** Influenza is characterised by bronchitis, coughing sneezing, ear infection and pneumonia etc., through inflammation of respiratory tract. Incubation period of influenza virus is 2-3 days.

(3) **Treatment :–** Vaccine is available against influenza virus A. Avian flu is a viral disease caused by *H5N1 virus*, which was first of all reported in China.

3.6 Dengue fever (break bone fever)

(1) **Causative Agent :–** Dengue fever is caused by RNA containing *arbovirus* (arthropod borne virus) of *flavivirus* group which also causes yellow fever. The virus of dengue fever is transmitted by the bite of tiger mosquito, *Aedes aegypti*. *Aedes aegypti* is primarily a daytime feeder and mainly bites in the morning or late in the afternoon. Incubation period is of 3-8 days. There are two types of dengue fever : classical dengue fever and dengue hemorrhagic fever.

- **Classical Dengue Fever :–** It is an acute infection caused by at least 4 serotypes (1, 2, 3, and 4) of dengue virus.The **Symptoms** - Abrupt onset of high fever, severe frontal headache, pain behind the eyes which worsens with eye movement, muscles and joint pains, los of sense of taste and appetite, measles-like rash over chest and upper limbs, nausea and vomiting.
- **Dengue Hemorrhagic Fever :–** Dengue haemorrhagic fever (DHF) is a severe form of dengue fever, caused by infection with more than one dengue virus. The severe illness is thought to be due to double infection with dengue viruses-the first infection probably sensitizes the patient, while the second appears to produce an immunological catastrophe.

  Symptoms of this fever are similar to classical dengue fever in addition to the following : Bleeding from the nose, mouth, gums and skin bruising, severe and continuous stomach pains, frequent vomiting with or without blood, pale cold or clammy skin, excessive thirst (dry mouth), rapid weak pulse, difficulty in breathing, restlessness and constant and constant crying.

  Dengue fever can be prevented by eliminating mosquito breeding places by covering small water containers, water tanks, changing the water of cooler every week, and applying mosquito repellants. No vaccine for dengue fever is available.

3.7 Chikungunya

(1) Causative Agent :– It is caused by chikungunya virus and spreads through mosquitoes, *aedes aegypti* and *aedes albopictus*. Incubation period is 1-12 days.

(2) Symptoms :– sudden onset of fever, rash joint pains, headache, nausea, vomiting and partial loss of taste and conjunctivitis.

(3) Treatment :– Its prevention is same as of dengue. No vaccine for chikungunya is available

3.8 Viral Hepatitis

Symptoms. It is commonly called jaundice. Viral hepatitis is the most important form of hepatitis. In early stage the liver is enlarged and congested. In later stage the liver becomes smaller, yellowish or greenish. The symptoms in early phase include fever, anorexia, nausea, vomiting, epigastric discomfort, pains in muscles and joints. The urine is dark and stool is pale. Splenic enlargement is sometimes present.

Types. There are 6 types of viral hepatitis. These are Hepatitis A, Hepatitis B, Hepatitis C. Hepatitis D. Hepatitis E and Hepatitis G. These (except Hepatitis G) are given below in table form. There is no Hepatitis F.

Feature	* Hepatitis A	Hepatitis B	Hepatitis C	Hepatitis D	Hepatitis E
1. Name of virus	HAV	HBV	HCV	HDV	HEV
2. Nucleic Acid present in virus	RNA	DNA	RNA	RNA	RNA
3. Transmission	Faecal oral Route	*Parenteral; (Blood, Needle, Body secretion, Placenta, Sexual contact)	Parenteral; (Blood)	Parenteral; (Blood, cointection with hepatitis B)	Faccal oral Route
4 Symptoms	Fever, headache, gastro intestinal disturbance, dark urine, jaundice	Similar, to HAV but no headache Severe liver damage, yellowish eyes, light coloured stools,	Similar to HBV more likely to become chronic	Severe liver damage, high mortality rate	Similar to HAY but pregnant women may have high mortality
5 Incubation Period	2-6 weeks	6 weeks 6 months	2-22 weeks	6-26 weeks	2-6 weeks
6. Vaccine	Hepatitis A virus vaccine	Genetically modified vaccine	No	HBV vaccine is protective	No
7. Chronic Hepatitis	None	Yes	Yes	Yes	No

A brief view of viral diseases

Disease	Pathogen	Mode of Transmission / Incubation Period	Symptoms	Control Measures / Treatment
Dengue / break bone fever	Arbo virus	Aedes aegypti / 3-8 dyas	Fever, headache, muscular and joint pain, nausea, vomiting	Elimination of mosquito breeding places
Yellow fever	Flavivirus fibricus	Aedes aegypti	Fever, vomiting, skin becomes yellow in colour	Fluid replacement, vaccination
Chikungunya	Alpha virus	Aedes aegypti, aedes	Rashes, fever, conjunctivitis, arthritis	Elimination of mosquito breeding places
Common cold	Rhino virus	3-7 days	Nasal irritation, couth, fever	-
Mumps	Paramyxo virus	Droplet infection / 12-26 days	Inflammation of parotid gland	MMR vaccine
Measles	Rubeola virus	10-14 days	Respiratory tract	Edmonstan B vaccine / antibiotics
Chicken pox	Varicella zoster	14-21 days	Rashes, fever aches	Boric acid, calamine, zoster immunoglobulins
Small pox	Variola virus	12 days	High fever, aches, rashes	vaccination
Poliomyelitis	Enterovirus	7-14 days	Paralysis of skeletal muscles, fever, pain	Oral polio drops, salk's vaccine, sabin's oral vaccine
Influenza	Myxovirus influenza	2-3 days	Sneezing, sore throat, cough muscle pain	-
Rabies	Rhabdo virus	Dog/10 days-1 year	Hydrophobia, anxiety, choked throat, fatigue	Antirabies serum
AIDS	HIV virus	6 months to 10 years	Headache, fever, pharyngitis, rashes	No proper vaccine but zidovudine, didanosine are used to treat AIDS patient

4. Disease caused by Bacteria

4.1 Typhoid

A classic case in medicine, that of Mary Mallon nicknamed typhoid Mary, is worth mentioning here. She was a cook by profession and was a typhoid carrier who continued to spread typhoid for several years through the food she prepared.

(1) **Causative Agent :–** *Salmonella typhi*, a rod like bacterium causes these contagious diseases of intestines. The organism of the diseases is present in the stool and urine, therefore, carried by contaminated food and water. Bacterium enters via mouth, line in the intestine and causes lesions in the intestinal walls. Incubation period of the bacterium is 1-3 weeks.

(2) **Symptoms :–** Sustained high fever (39° to 40°C), weakness, stomach pain, constipation, headache and loss of appetite are some of the common symptoms of this disease. Intestinal perforation and death may occur in severe cases.

(3) **Diagnosis :–** Typhoid fever could be confirmed by widal test.

4.2 Pneumonia

Pneumonia is a serious disease of lungs characterised by accumulation of mucus/fluid in alveoli and bronchioles to that extent that breathing becomes difficult.

(1) **Causative Agent :–** It is caused by streptococcus pneumonia or diplococcus pneumonia, and haemophilus influenza.

(2) **Symptoms :–** The onset of pneumonia is usually sudden with a single shaking chill, followed by fever, pain with breathing on the side of lung involved, increased pulse and respiratory rates and cough. In severe cases the lips and finger nails turn gray to bluish in colour. A healthy person acquires the infection by inhaling the droplets/aerosols released by an infected person or even by sharing glasses and utensils with an infected person.

(3) **Treatment :–** Drugs against pneumonia are erythromycin, tetracycline and sulphonamide. If untreated pneumonia leads to death.

4.3 Dysentery

Dysentery is an infection of the intestinal tract causing severe diarrhea with blood and mucus.

(1) **Causative Agent :–** Bacillary Dysentery is caused by bacteria of the genus *shigella* and is spread by contact a patient or carrier or through food or water contaminated by their faeces. Epidemics are common in overcrowded unsanitary conditions.

(2) **Symptoms :–** Symptoms, which develop 1-6 days after infection, include diarrhea, nausea, cramp, and fever and they persist for about a week. An attack may vary from mild diarrhea to an acute infection causing serious dehydration and bleeding from the gut. In most cases, provided fluid losses are replaced, recovery occurs -within 7-10 days;

(3) **Treatment :–** antibiotics may be given to eliminate the bacteria.

4.4 Tuberculosis (T.B.)

(1) **Causative Agent :–** T.B. is caused by *mycobacterium tuberculosis* and infects any part of the body. It could be bones, brain or lungs and lymph nodes. Lung T.B. is the most common. The bacterium releases a toxin tuberculin which destroys the tissues it infects. Is spreads through sneezing, coughing contaminated food, water or clothes. Incubation period is 3 to 6 weeks or may be years.

(2) **Symptoms :–** Constant cough and in severe cases sputum with blood, pain in chest while coughing, loss of body weight and gradual weakening of the body, low grade fever throughout the day are the symptoms of lung T.B

(3) **Treatment - Direction observation treatment (DOT)** is a programme under WHO for treatment of T.B. across the world. Some of the antituberculosis drugs are streptomycin, rifampicin, isoniazid, thiatazone, PAS (Paraamino salicyclic acid) etc. BCG (Bacillus Calmette Guerin) Vaccine for T.B. was obtained from bovine bacillus by Calmette and Guerin in 1921.

4.5 Cholera

(1) **Causative Agent :–** Cholera is water borne disease. This is caused by the bacterium vibrio cholera infecting intestines and digestive tract. Robert Koch discovered the cholera. It is spread through contaminated food and drinks. The causative bacterium secretes cholera toxin, enterotoxin which induces excessive secretion of an isotonic electrolyte solution by the intestinal mucosa. Incubation period varies from a few hours to 2-3 days.

(2) **Symptoms :–** Cholera is mainly characterized by sudden onset of profuse, effortless, rice like stools, vomiting and rapid dehydration loss of minerals and muscular cramps. Fluid and salt lost is restored by Oral rehydration solution (ORS). It is water with a small amount of sugar and salt.

(3) **Treatment :–** Cholera vaccine is effective for six months only. Proper sanitation and hygienic conditions are the best methods to prevent the spread of this disease.

4.6 Diphtheria

Diphtheria is an acute infectious disease of mostly children, characterised by the development of a grey adherent false membrane over the upper respiratory tract or throat.

(1) **Causative Agent :–** It is caused by toxigenic strains of *corynebacterium diphtheria* (Gram+ve bacterium). Endotoxin produced by pathogen causes nasal diphtheria, pharyngeal diphtheria and laryngotracheal diphtheria it is spread through coughing and sneezing.

(2) **Symptoms :–** Fever, sore throat, epithelial necrosis by endotoxin and oozing of semisolid material in the throat which develops into a grey false but tough membrane. The membrane chokes the air passage. Sometimes, bacterium infects the heart leading to fatal heart blockage. In severe cases, respiratory tract is blocked causing difficulty in breathing and even death due to choking.

(3) **Treatment :– DPT Vaccine –** Diphtheria, pertussis and tetanus vaccine is given as immunization within six weeks of birth.

(4) **Diagnosis- 'Schick Test' :–** tests the presence of antitoxin and the state of hypersensitivity of diphtheria toxin.

A brief view of Bacterial Diseases

Disease	Pathogen	Mode of Transmission / Incubation Period	Symptoms	Control Measures / Treatment
Anthrax	Bacillus anthracis	Domestic animals	Difficulty in breathing cough, fever	Penicillin, tetracycline, fluoroquinolones
Tuberculosis	Mycobacterium tuberculosis	3-6 weeks	Constant cough, pain in chest	BCG, streptomycin, rifampicin, PAS
Diphtheria	Corynebacterium diphtheriae	2-5 days	Fever, sore throat	DPT vaccine
Whooping cough or pertussis	Bordetella pertussis	Direct contact / 10-18 days	Cough, breathlessness and vomiting	DPT vaccine
Cholera	Vibrio cholera	Contaminated food and water / 2-3 days	Vomiting, dehydration, muscular cramps	ORS, proper sanitation
Diarrhea	E.coli, shigella, campylobacter, salmonella, clostridium	Contaminated food & drink	Frequent stool with blood, dehydration	ORS, proper sanitation
Leprosy (Hansen's disease)	Mycobacterium leprae	Direct contact / 2-5 years	Infection of skin, wasting of body parts, deformities of fingers, toes	Diaminodiphenyl sulphone ofloxacin
Typhoid	Salmonella typhi	Contaminated food and water / 1-3 weeks	Painful muscular spasms, fever, lock jaw	Antitetanus serum (ATS) tetanus toxoid, DPT
Pneumonia	Streptococcus pneumoniae, haemophilus influenza	1-3 days	Cough, fever, pain	Erythromycin, tetracycline
Plague (Black death)	Pasteurella / yersinea pestis	Xenopsylla cheopi 2-6 days	Painful buboes, fever, haemorrhages	Streptomycin, oral tetracycline

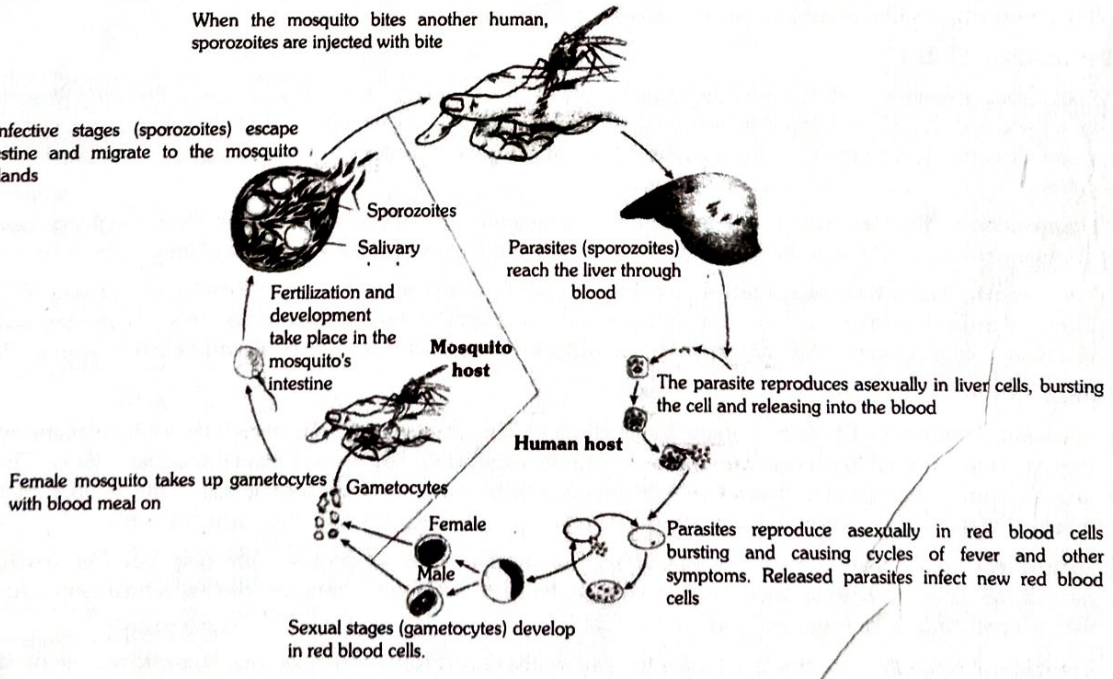


Figure :– Life cycle of Plasmodium

5. Disease caused by Protozoa

5.1 Malaria

(1) **Causative Agent :–** Malaria is caused by digenetic (have two hosts to complete its life cycle) and triphasic (having three phases of life cycle) protozoan parasite known as *plasmodium*. Sir Ronald Ross (1987), a doctor in Indian, Army, established that malarial parasite is transmitted by the bite of a *female anopheles* mosquito for which he got Nobel Prize in 1902.

(2) **Life Cycle of Plasmodium :–** Life cycle of plasmodium requires two hosts (digenetic) human and mosquitoes for completion. The malarial parasite, plasmodium enters the human body as sporozoites (infectious form) through the bite of infected female anopheles mosquito (vector). The sporozoites reach the liver cells via blood where they initially multiply. These then attack the red blood cells (RBCs) resulting in their rupturing.

The rupture of RBC is associated with the release of haemozoin, a toxin which causes the chill and high recurring fever every three to four days, the female anopheles mosquito when bites an infected human being, the malarial parasites enter into the mosquito's body and undergo further development to form sporozoites that finally move to the salivary glands of the insect.

The bite of these mosquitoes introduces the sporozoites inside the body, thus initiating the above mentioned cyclic process again. The attack of malaria is preceded by yawning, tiredness, headache and muscular pain. Malaria is characterised by recurring rigors lasting 6-10 hours. There are three stages :

(3) **Cold Stage :–** Chill and shivering.

(4) **Hot Stage :–** Temperature rise to 100°C

5.2 Amoebiasis or Amoebic Dysentery

(1) **Causative Agent** :– Amoebiasis is a protozoan infestation of upper part of large intestine which is caused by monogenic protozoan known as *entamoea histolytica*. The infection occurs by the cysts of entamoeba present in the stool of infected person, cat, dog, monkey, rat, rabbit etc. Inside the intestine, the cyst germinates and releases 4-8 entamoebae where they secrete an enzyme called cytolysin. The enzyme partially dissolves the wall of large intestine. The feeding stage of parasite is called trophozoite or magna. It stops feeding prior to cyst formation. The non feeding pre-cystic stage is called minuta form.

(2) **Symptoms :–** Amoebiasis is characterised by abdominal pain, mild diarrhea alternating with constipation, passing out of mucus, pieces of necrotic mucous membrane and blood in faces, and faces with cysts.

(3) **Treatment :–** This disease can be cured by administering drugs like emetine, stremetine Strychnine + emetine), carborsome, metronidozaole and tinidazole.

A brief view of Protozoan Diseases

Diseases	Pathogen	Mode of Transmission	Symptoms	Control Measures/Treatment
Amoebiasis	Entamoeba histolytica	Contaminated food	Abdominal pain, diarrhea, blood in faces	Emetine, stremetime, metrronidazole
Malaria	Plasmodium	Anopheles	Fever, acute chillness, sweating, nausea	Chloroquine, primaquine
African sleeping sickness or trypanosomiasis	Trypanosome	Glossina palpalis	Recurrent fever, anemia, patient falls asleep	Suramin sodium, atoxyl, tryparsamide, germanin
Kala-azar or dumdum fever	Leishmania donavani	Phlebotomus	High fever, spleen enlargement, anemia, darkening of skin	Sodium antimony tartrate, glyconate, urea stebamine
Ciliary dysentery (Balantidiasis)	Balanidium coli	Contaminated food and water	Diarrhea, vomiting, abdominal pain	Tetracycline and iodoquinol
Giardiasis	Giardia intestinalis	Contaminated food and water	Epigastric painheadache, diarrhea	Clean food and water

6. Diseases caused by Helminthes

Helminths are animals that belong to the phyla platyhelminthes and nematode (Nemathelminthes). Many parasitic forms of this group, popularly known as parasite worms, are endoparasites of gut and blood in human body which cause diseases, collectively called helminthiasis.

6.1 Ascariasis

(1) **Causative Agent :–** Ascariasis is caused by the common round worm *ascaris lumbricoides*. It is a giant intestinal worm, white in colour and female longer than the male.

(2) **Life Cycle of Ascaris :–** Female lays about 200,000 eggs daily that passes out with human faeces and remains alive in the soil for several days. There is no intermediate host of the parasite, so man acquires infection by directly ingesting ascaris eggs, containing the infective second stage rhabditoid larva with contaminated food or water.

(3) **Symptoms :–** Symptoms of these diseases include internal bleeding, muscular pain, fever, anemia and blockage of the intestinal passage. Worm sometimes bore the intestinal epithelium and lead to some vital organs like kidneys, spinal cord, brain or muscles causing injuries to the organs. A healthy person acquires infection through contaminated water, vegetables, fruits etc.

6.2 Filariasis or elephantiasis

(1) **Causative Agent** - *Wuchereria* (W. bancrofti & W. malayi), the filarial worms cause a slowly developing chronic inflammation of the organs is which they live for many years, usually the lymphatic vessels of the lower limbs, and the disease is called filariasis. The pathogen spread from one human being to another through mosquitoes like culex and to a less extent by anopheles and aedes. The parasite resides in lymph vessels, connective tissues and mesentery. The parasite is viviparous. The young ones are called microfilariae. They are hardly 2.5 mm long..

(2) **Life Cycle of Wuchereria-** Microfilariae enter the blood vessels and reach the skin area during night (8 pm to 4 am) for being picked by female mosquito for completion of life history and changing into infective stages, the infective parasites are deposited near the site of mosquito bite. They pass through the punctured skin and reach the lymphatic system.

The diseases pass through four stages in human beings: In the first stage, the patient has increased eosinosphils, enlarged lymph nodes and positive intradermal parasite test. Second or carrier stage is symptom less but the right blood examination can reveal the parasite. Third stage is characterized by filarial fever, inflammation of lymph nodes (lymphadenitis) and lymph vessels (lymphagiectasis) and reversible lymphedema (excess fluid in tissues due to obstruction of lymph vessels) in various body parts. The fourth or final stage is manifested by lymphedema accompanied by thickening of subcutaneous tissues and skin so that there is permanent swelling mostly of feet, legs, thighs, scrotal sacs, breast etc. it is called elephantiasis. The disease can be prevented by taking precautions against mosquito bites.

(3) **Symptoms-** Main symptoms of the disease are appearance of dry, scaly lesions on various parts of the body such as skin, nails and scalp. These lesions are accompanied by intense itching. In tinea cruris the groin and the perineum are involved. In tinea barbae, the beard areas of the face and neck are involved. Tinea pedis or athlete's foot is the ring worm of foot and tinea capitis is the ringworm of the scalp. Heat and moisture help these fungi to grow in the skin folds such as those in the groin or between the toes. The infection of ringworms is usually acquired soil or by using towels, clothes or comb of infected persons.

A brief view of helminthic diseases

Disease	Pathogen	Mode of Transmission	Symptoms	Control Measures/Treatment
Ascariasis	Ascaris lumbricoides	Contaminated food or water	Diarrhea, vomiting pneumonia, anemia	Chenopodium oil, alcopar, bendex
Ancylostomiasis	Ancylostoma duodenale, necato americanus	Through skin of hands and feet	Gastrointestinal disturbances, anemia, nervous disorder	Tetrachlorethane, carbontertrachloride
Enterobiasis (Oxyyuriasis)	Enterobius vermicularis	Contaminated hands	Itching around anus, loss of appetite, diarrhoea, nausea	Piperazine
Trichuriasis	Trichuris trichuria	Contaminated water, raw fruits	Nausea, vomiting, constipation, fever, anaemia	Osarsol, dithiazanine
Trichinosis	Trichinella spiralis	Raw or under cooked pork	Nausea, vomiting, oedema of face and eyelids, fever, muscular pain	No specific treatment
Filariasis (Elephantiasis)	Wucheria bancrofti	Culex, anopheles, aedes	Swelling of feet, legs, thighs, scrotal sacs, breast	Hetrazan, MSE, diethyl carbamazine
Opisthorchiasis	Opisthorchis sinensis	Raw or under cooked fish	Cirrhosis	Gentian violet, chloroquine
Fasciolopsiasis	Fasciolopsis fuelleborni	Eating infected water plants	Diarrhea, nausea, vomiting	Hexylresorcinol, antihelminthic crystalloids
Schistosomiasis	Schistosoma mansoni, Sjaponicum, S. haematabium	Penetration through skin	Asthmatic attacks, hepatitis, fever, sweating, diarrhea	Antimony compounds
Paragonimiasis	Paragonimus westermani	Raw or undercooked crabs and crayfish	Chronic cough, chest pain with pleurisy, fever	Emetine hydrochloride, sulpha drugs
Taeniasis	Taenia solium, taenia saginata	Raw or under cooked measly pork or beef	Pain in abdomen, nausea, anemia, indigestion, epilepsy	Camoquin, CCl_4, quinacrine, antiphon, dicholorophen
Hydatid disease	Echinococcus granulosus	Contaminated food and water	Inflammation of tissues	Treatment is same as teaniasis

7. Disease caused by Fungi

7.1 Ringworm

It is caused by Microsporum, Trichophyton and Epidermophyton, collectively called dermatophytes. Tinea is the most common skin disease of humans. Symptoms It is characterised by dry scaly lesions on the outer parts of the body such as skin, nails and scalp. Transmission The infection is generally acquired from soil or by using towels, clothes and even comb of the infected persons. Warmth and moisture helps in the growth of fungal organisms especially in skin folds. Treatment involves Griseofulvin (orally) and miconazole (topically).

8. Rickettsial Diseases

These are caused by rickettsiae. The Rickettsiae were formerly considered closely related to viruses. Example: Rocky Mountain spotted fever, Rickettsial pox, trench fever, Q fever, Epidemic typhus fever.

9. Non Communicable Diseases

9.1 Diabetes mellitus

(Gk. Diabainein-to pass through; mellitus with honey)

It is a disorder of carbohydrate metabolism. Glucose is main carbohydrate available to yield instant energy in the body. Diabetes is caused when glucose is no properly utilised by the cells of the body and the concentration of glucose increases in the blood. The increase in blood sugar levels is termed as hyperglycemia. It leads to accumulation of more glucose in the blood. The extra sugar (glucose) is excreted in urine, this condition is called glycosuria. The increased level of glucose in blood or diabetes is characterised by increase in frequency and volume of urine, excessive thirst, hunger, weight loss and weakness.

Diabetes is of two types

(i) Type I is Insulin Dependent Diabetes Mellitus (IDDM). Insulin injections are required to control this type of diabetes, because pancreas does not secrete insulin, hence it must be taken from an out source. It is also called juvenile onset diabetes.

(ii) Type II is a Non-Insulin Dependent Diabetes Mellit (NIDDM) and it occurs due to insulin resistance in the liver and skeletal muscles. In contrast to type I, it is also called adult onset diabetes. Untreated diabetes leads to ketosis, followed by acidosis with nausea and vomiting. Other serious complications include retinopathy, kidney disease and frequent infections. Treatments aimed in controlling diabetes are highly successful. A diet suited to the patient maintains normal body weight and limits intake of carbohydrates and fats. Mild regular exercise can help a diabetic person to lead a normal life.

9.2 Cardiovascular diseases

These diseases involve the heart and blood vascular system. Various harmful products of metabolism are carried through blood circulation to various organs to be expelled from the body. The diseases of the cardiovascular system may damage brain and heart itself and may be fatal.

Some of these diseases are described below:–

(1) Arteriosclerosis

It is a chronic disease in which there is an abnormal thickening and hardening of the walls of arteries. This results in the loss of elasticity. Arteriosclerosis occurs when there is too much pressure on the arterial walls throughout the body. Arteriosclerosis affecting blood vessels of brain interfere with blood flow into brain and cause stroke.

This may lead to a loss of consciousness followed by some degree of paralysis, a condition called transient ischaemic attack (TIA). Ischaemic attack can be in heart (heart attack) or it can be in the limbs (Deep Vein Thrombosis or DVT). The loss of elasticity of the blood vessels can also lead to the development of high blood pressure (hypertension) and impotence (erectile dysfunction).

Treatment involves lowering the blood pressure and thinning the blood serum. Drugs are used to reduce the blood pressure and decrease platelets that inhibit the ability of blood to clot.

(2) Atherosclerosis

It is most common form of arteriosclerosis. It occurs when fatty material (cholesterol) carrying lipoproteins in the circulating blood gets deposited on the inner linings of arterial wall.

This increases the formation of plaques and atheromas thereby narrowing the arteries and obstructing the flow of blood through them.

Scar tissue and calcification also add to the fatty deposition. As a result, the blood vessels become less elastic and narrow. This leads to increase in blood pressure. A blood clot (thrombus) may also form at the site of plaque obstructing the blood flow.

Atherosclerosis in coronary arteries (which supply oxygen rich blood to the heart muscles) decreases the blood flow to the heart itself and the oxygen supply to heart muscles also decreases. Narrowing of the vessels can affect any part of the body, i.e. eyes, kidneys and legs. It results in blindness, kidney failure and peripheral vascular disease.

Other coronary artery associated diseases are heart block, heart failure and ischaemic heart diseases. Together, they are called ischemic heart diseases Their treatment include coronary bypass surgery and balloon angioplasty.

(3) Hypertension

High blood pressure or hypertension is a condition in which blood pressure in blood vessels (arteries and veins is abnormally high. The normal blood pressure of a healthy adult is considered close to 120/80. Due to many reasons, the heart pumps more forcefully to move some amount of blood through the narrowed blood vessels into the capillaries. This results in increased blood pressure or high blood pressure. This high blood pressure, can damage the arterioles of liver, kidney or brain and even the overworked heart. Thus, hypertension presents an increased risk of death from congestive heart failure, kidney failure or stroke. It is further divided into

(i) **Essential or idiopathic hypertension** It is the most common form of hypertension. It is caused due to smoking, alcohol consumption, emotional and physical stress, life style and diabetes.

(ii) **Mild hypertension** It is caused due to excess secretion of epinephrine by adrenal medulla, aldosterone by cortex and renin by kidney. A less or no salt diet and a weight reducing diet, cessation of smoking, mild exercise and avoiding or better managing stress can yield wonderful results.

Treatment involves the use of vasodilator drugs (to dilate the arteries) can lower the blood pressure. The medical therapy for essential hypertension once started must continue for the rest of lifes.

9.3 Arthritis

It is an autoimmune disease in which there is an inflammation of joints. Acute arthritis is characterised by pain, inflammation, redness and swelling of joints. Arthritis can be classified into three groups

(1) Osteoarthritis

It is a degenerative joint disease that affects majority of persons who reach the age of 70 and above. There is excessive joint inflammation in this disease. Gradually, there is an increase in the stiffness and inflammation of joints that bear the weight of the body. Genetic factors also contribute to the degenerative process. Hip or knee replacements or joint debridement are the surgical procedures employed to relieve pain and improve joint function.

(2) Rheumatoid arthritis

It is an inflammatory disease of connective tissues of the body. Synovial membranes are the sacs, filled with fluid that lubricate the joints. Inflammation and thickening of synovia membranes results in the red and swollen joints. It is followed by scar tissue that protrudes over the surface of cartilage. The cartilage gets eroded and destroyed by this scar tissue. The bands of adhesion make the joints fixed (ankylosed), displaced and deformed. There is atrophy of skin, bones and muscles adjacent to the joint. White blood cells, mostly lymphocytes, accumulate in connective tissue of muscles and nerve bundles causing pressure and pain. There is a characteristic auto antibody, called the rheumatoid factor, in the blood of persons with rheumatoid arthritis. The drugs which are used to relieve the pain are aspirin, ibuprofen. If these anti-inflammatory drugs fail to relieve the pain, small doses of corticosteroids, such as predinisone may be used. Physical therapy also helps in relieving pain and reducing swelling in affected joints. Surgical replacement of destroyed hip, knee or finger joints with artificial substitutes is recommended in severe disability.

(3) Septic arthritis

It is the acute inflammation of one or more joints caused by infectious agents. Septic arthritis is of two types

(i) **Suppurative arthritis :** It is caused by bacteria, e.g. Streptococcus haemolyticus, Staphylococcus aureus, Pneumococcus or Meningococcus and characterised by swollen pus-filled joints and fever. Pus is the result of infection and causes erosion of cartilage. Antibiotic treatment, drainage of swollen joints and rest provide relief.

(ii) **Non-suppurative arthritis :** It may occur along with diseases such as tuberculosis, typhoid, German measles, gonorrhea, syphilis, fungal infections or rheumatic fever. Stiffness, swelling and pain on movements are the symptoms. Rest, drug therapy and orthopedic care if tuberculosis is accompanying disease is recommended.

10. Immunity

Everyday we are exposed to large number of infectious agents. However, only a few of these exposures result in diseases. Why? This is due to the fact that the body is able to defend itself from most of these foreign agents. This overall ability of the host to fight the disease-causing organisms, conferred by the immune system is called Immunity.

10.1 Immunity

Immunity is defined as the body's ability to destroy pathogens or other foreign materials and to prevent further cases of certain infectious diseases. This ability is of vital importance because the body is exposed to pathogens from the moment of birth.

10.2 History

Sir Mac Farlane Burnet defined immunity as "the capacity to recognize the intrusion of material foreign to the body and to mobilize cells and cell products to help remove that particular sort of foreign material with greater speed and effectiveness.

The study of body's defense mechanism against pathogens is called immunology.

Edward Jenner (1749-1823) is known as father of immunology.

Edward Jenner (1796) observed that milkmaids did not get small pox infection apparently because they were exposed to a similar but milder from of disease called cowpox. Edward Jenner infected first James Phipps, a healthy boy of 8 years with cowpox and two months later he infected the boy with small pox. The boy did not suffer from small pox. Jenner proposed that an induced mild form of a disease was the first to discover a safe and effective means of producing artificial immunity against small pox.

10.3 Antigens

Antigens are substances which, when introduced into the body, stimulate the production of antibodies. Thus all antibodies are immunoglobulins but all immunoglobulins are not antibodies. The antibodies may be bound to a cell membrane or they may remain free. Antibodies are produced by B lymphocytes and plasma cells. The mature plasma cell produces antibodies at an extremely rapid rate about 2000 molecules per second.

10.4 Types of Immunity/Defense Mechanism

(1) Innate/Inborn / Non-specific defense mechanism- Innate immunity is non-specific type of defense that is present at the time of birth. This is accomplished by providing different types of barriers to the entry of the foreign agents into our body. Innate immunity consists of four types of barriers. These are :

(i) **Physical Barriers :–** Skin of our body is the main barrier which prevents entry of the micro-organisms. Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes entering our body. Nasal hairs don't allow dust particles and microorganisms. Cilia occurring in nasal tract help in throwing out the entrapped microorganisms.

(ii) **Physiological Barriers :–** The oil and sweat secreted by sebaceous and sweat glands contain fatty acids and lactic acid, which make the skin surface acidic (pH 3 to 5). These have antibacterial and antifungal activity. Saliva also contains lysozyme which kills the microorganisms that are not the normal inhabitants of the antibacterial and antifungal activity.

Tears, a slightly saline fluid, secreted by the lacrymal glands over the eyes also contain lysozyme, which prevents eye infections.

Bile, a bitter alkaline (pH 8) secretion of the liver, checks the growth of foreign bacteria on semi digested food, the chyme, in the intestine.

Acidity of gastric juices kills most of the microorganisms entering the body through digestive tract.

Cerumen (ear wax), a bitter, brownish secretion from the ceruminous glands of external auditory meatus is an effective antibacterial component, repel insects and trap dust particles.

Certain bacteria (lactobacilli) normally live in the vagina. They produce lactic acid that kills the foreign bacteria and also maintain low pH.

(iii) **Cellular Barriers :–** Certain types of leukocytes (WBC) like polymorphonuclear leucocytes (PMNL), neutrophils and monocytes and natural killer (type of lymphocytes in the blood and macrophages) in tissues can engulf microbes, viruses and cellular debris etc.

Macrophages (big eaters) are large phagocytic cells that arise by enlargement of monocytes. They are of two types fixed and wandering.

Soldiers and Scavengers- The phagocytic cells-neutrophils and macrophages, besides destroying the microbes, also eat up the dead tissue cells. They are popularly called the soldiers and scavengers of the body.

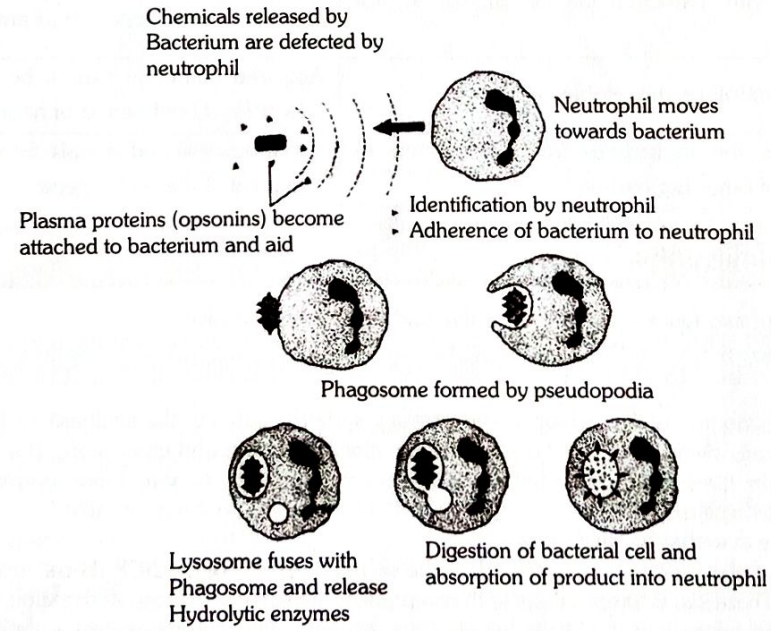
The wandering and fixed macrophage together form the reticuloendothelial system (RES).

The macrophages are among the first cells that respond to the infection. They engulf the lymphocytes.

Number of leucocytes increases in response to infection. Rise in WBC count is called leucocytosis. The leucocytes creep but of the capillaries by amoeboid movement into the intercellular spaces if there is an infection. The process is called diapedesis.

They help in different ways :

Neutrophils :– These cells seize, engulf and digest the microorganisms infecting the body tissues. They are called phagocytes, and the process is known as phagocytosis.



Monocytes : They are motile and occasionally show phagocytic activity. Generally they change into macrophages

(iv) **Cytokine barrier -** Virus infected cells secrete proteins known as interferons which protect non infected cells from further viral infections.

Fever may be brought about by toxins produced by pathogens and a protein called endogenous pyrogen (fever producing substance), also called interleukin released by macrophages. When enough pyrogens reach the brain, the body's thermostat is reset to a higher temperature, allowing the temperature of the entire body to rise. Mild fever strengthens the defense mechanisms by activating the phagocytes and by inhibiting the growth of microbes. A very high temperature may prove dangerous. It must be quickly brought down by giving antipyretics.

In addition to the above mentioned barriers, natural killer cells and the complement system also provide innate immunity.

(a) **Natural Killer Cells (NK cells) :–** Besides the phagocytes, there are natural killer cells in the body which kill virus-infected and some tumor cells. Killer cells produce perforins which create pores in the plasma membrane of the target cells, which then swell and burst. Cellular remains are eaten by phagocytes.

(b) **Complement System :–** It is a system of over 30 serum proteins which participate in both innate and acquired immunities in a cascade fashion. The complement proteins function in different ways. Some complement proteins rupture the cell membranes of the microbes, other make mast cells to release histamine that strengthens inflammatory reaction, still others attract the phagocytes to the infected area. Complement is an important component of our innate host defense.

(2) **Acquired/Adaptive/Specific defense mechanism :–** This is the immunity (also called specific defense mechanism) developed by an animal in response by an animal in response to a disease caused by infection of microbes. This immune system recognizes, attacks, destroys and remembers each foreign substance and pathogen that enters the body. It does this by making specialized cells and antibodies that make the pathogen useless. For each type of pathogen the immune system produces cells that are specific for that particular pathogen.

Unique Features of Acquired Immunity

- **Specificity :–** It is specific for each type of pathogen.
- **Diversity :–** Acquired of adaptive immunity can develop against all the diverse types pathogens, their toxins and other molecules.
- **Discrimination Between self and Nonself :–** It can differentiate foreign (nonself) and body (self) cells and molecules. Only the foreign or nonself materials are attacked.
- **Memory :–** The first encounter between the specific foreign agent or microbe and the body's immune system produces not only the immune response but also memory of this encounter. Because of it a second encounter with the same microbe brings about quicker and heightened response.

Different between innate immunity and acquired immunity

	Innate Immunity	Acquired Immunity
1.	It is present form birth.	It develops during life time.
2.	The immunity remains throughout remains throughout life.	The acquired immunity can be short lived or life long.
3.	Contact with pathogen or its antigen is not essential.	Contact with pathogen or its antigen is essential.
4.	Innate immunity is inheritable.	Acquired immunity cannot be passed to the next generation except for a brief period of neonates.
5.	It protects the individuals from contraction of diseases of other organisms.	It protects the individuals from pathogens present on other members of the same species.

11. Active and Passive Immunity

The acquired immunity is further of two types – (natural or) active and (artificial or) passive.

11.1 Active Immunity

This involves the active functioning of the person's own immune system leading to the synthesis of antibodies and/or the production of immunologically active cells. Active immunity is produced by clonal selection and expansion. This occurs because interaction of an antigen with its receptor on the lymphocytes surface stimulates cell division, so that more lymphocytes are available to combat subsequent exposure to the same antigen.

Clonal selection leads to the eventual production of -

A pool of antibody-secreting plasma cells : The antibody is the secreted version of the BCR (B-cell receptor for antigen.)

A pool of 'memory' cells : These are B lymphocytes with receptors of the same specificity as those on the original activated B cell.

Active immunity is slow and takes time to give its full effective response. Injecting the microbes deliberately during immunization or infectious organisms gaining access into body during natural infection induce active immunity.

11.2 Passive Immunity

Immunity is said to be passive when antibodies produced in other organisms are injected into a person who already has a potential antigen in his body passive immunity is developed to counteract snake venom, rabies, tetanus toxin and salmonella infection.

When ready-made antibodies are directly given to protect the body against foreign agents, it is called passive immunity

Important

Do you know why mother's milk is considered very essential for the new born infant? The yellowish fluid colostrums secreted by mother during the initial days of location have abundant antibodies (IgA) to protect the infant. The fetus also receives some antibodies from their mother, through the placenta during pregnancy. These are some examples of passive immunity.

Differences between active and passive immunity

	Active Immunity	Passive Immunity
1.	Exposure to antigen.	No exposure to antigen.
2.	It is developed when the person's own cells produce antibodies in response to infection or vaccine.	It is developed when antibodies produced in other organism are injected into a person to counteract antigen such as snake venom,
3.	It provides relief only after long period.	It provides immediate relief.
4.	It has no side effects.	It may cause reaction.
5.	It is long lasting.	It is not long lasting.

12. Immune Response

The specific reactivity induced in a host by an antigenic stimulus is known as the immune response. It is of two types - primary and secondary immune response.

12.1 Primary Immune Response

The reaction of the body's immune system to the first attack of microbes (antigen) is called primary immune response. It takes much longer time to develop because of the requirement of suitable receptor development. This response is feeble and declines rapidly. This however produces both receptors and memory cells.

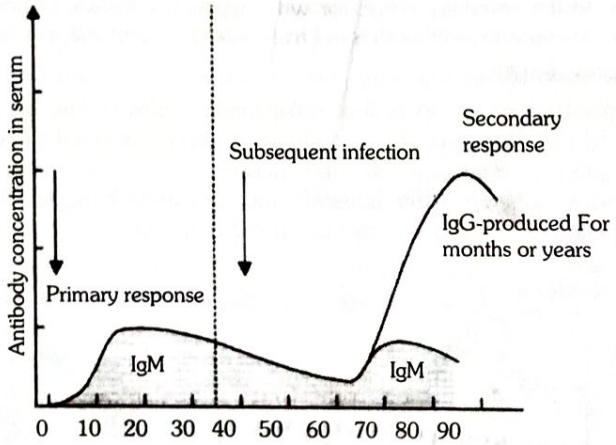


Figure :– Primary and secondary response to an initial and later dose of antigen. The secondary response is more rapid and intense than the first. IgM and IgG are two different types of antibodies (immunoglobulins). IgM is responsible for the primary response. IgG starts the secondary response.

Characteristics	B lymphocytes	T lymphocytes
Origin	Bone marrow	Bone marrow
Site of maturation	Bursa of fabricius of marrow	Thymus
Receptors for antigens	Antibodies inserted in plasma membrane (highly specific).	Surface receptors present but different from antibodies
Type of active cells	Plasma cell	Cytotoxic, helper and suppressor T cells
Type of immunity	Humoral antibody	Cell-mediated
Secretory product	Antibodies	Lymphokines
Function	Provide immunity against bacteria and virus	Lyses virus-infected and cancer cells, provides immunity against most viruses, fungi, and a few regulate bacteria and B cell in antibody formation
Reaction	Do not react against transplants and cancerous cells	React against transplants and the cancerous cells
Life span	Short	Long

12.2 Secondary immune response

The reaction of the body's immune system to any subsequent infection of the same microbe is termed secondary immune response. This response is quicker and more intense than the primary immune response.

This is so because the memory *B* cells are present to quickly deal with the invading microbes by forming antibodies. Body "remembers" that it previously encountered this type of infection.

The primary and secondary immune responses are carried out with the help of two special types of lymphocytes present in our blood. i.e., B-lymphocytes and T-lymphocytes.

Both types of cells develop from the stem cells found in the liver and yolk sac of the fetus and in the bone marrow cells during adult life. Lymphocytes that migrate to the thymus and differentiate under its influence are called 'T-cells', while those cells that continue to be in the bone marrow for differentiation are known as 'B-cells'

Thymus and bone marrow (or the bursa in birds) is the primary lymphoid organs. The final maturation of young lymphocytes occurs in secondary lymphoid tissues like lymph nodes, spleen and tonsils.

(1) Humoral and cell-mediated immunity

- **Humoral, or antibody mediated immune system (AMIS) :–** , B-cells produce the antibodies-about 20 trillions per day that take part in the humoral immunity. B-cells constitute about 30% of the recirculating part of small lymphocytes and their life span is short i.e., days or weeks. The ratio of the T-cells to B-cells is approximately 3 : 1. howeverThe B-lymphocytes and form humoral, or antibody mediated immune system (AMIS). Antibody-mediated (or humoral) immunity is associated with the appearance of antibodies, secreted by cells of the B-lymphocyte series, in the extracellular fluids such as plasma, lymph and external secretions.
- **Cell-mediated immune system (CMIS) :–** T-cells are responsible for cellular immunity, T-lymphocytes forms cell-mediated immune system (CMIS). Both the immune systems need antigens to come into action, but they respond in different ways. Cell mediated immunity is mediated by cells of the T-lymphocyte series with antigen-specific receptors on their surfaces. Reaction of the receptor with its antigen triggers the release of physiologically actise cytokines. Since the T-cells must be present on the spot to play their, role they are said to form cell-mediated immune system.

(2) Immunoglobulin (Ig) Antibody (Ab)

Immunoglobulins are glycoproteins made up of four polypeptide chains (linked by disulphide bonds) – two heavy (H) (440 amino acids) and two light (L) (220 amino acids). So antibody is also represented by H_2L_2.

Light and heavy chains are subdivided into variables and constant region. The variable portion is used for binding to antigen and a constant portion determines its adherence and diffusivity (i.e., for various biological functions), e.g., complement activation and binding to cell surface receptors.

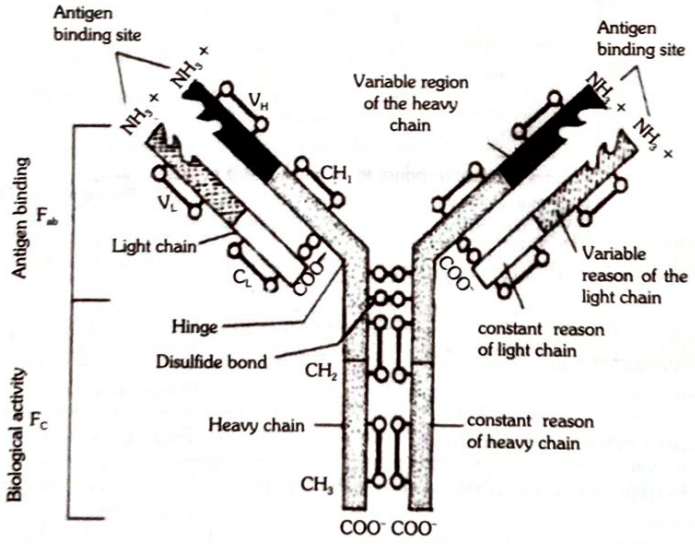


Figure :– Structure of an antibody molecule

Constant region of heavy chain define five classes of Igs. The term immunoglobulin is often used interchangeably with antibody (as it functions as antibody). The simplest antibody molecule is Y-shaped. Immunoglobulins are also called gammaglobulins.

- **Types of Immunoglobulins**

  IgG, IgM, IgA (IgA 1 and 2), IgD and IgE (IgE 1, 2, 3, ad 4) are the types of immunoglobulins.

  (a) IgG - Most abundant, found in blood, lymph and intestine. Predominant antibody in the secondary response. Only antibody to cross the placenta. Most abundant in new borne. Opsonizes i.e., enhance phagocytosis.

  (b) IgA :– (Secretory immunoglobulin) Heaviest antibody and second most abundant. Found in body secretions including saliva and tears.

  Prevent attachment of micro-organisms. Available in colostrums and mother's milk. When excreted through faecus, it is called coproantibody.

  Fight against invading microorganisms even before.

(c) **IgM :– (Macro immunoglobulin)** Largest and first to reach the site of infection. Produced early in the primary response. Earliest Ig to be synthesized by the fetus. Most efficient in agglutination. Does not cross placenta. Antigen receptor on the surface of B cells. It increases IgG production. Also called "natural antibody".

(d) **IgD :–** Uncertain Functions as antigen receptor. Present on surface of B cells and in serum. Activates B-cells

(e) **IgE :–** Least abundant. Mediate immediate hypersensitivity. Main host defense against helminthes infection

13. Organ Transplantation

It is the implantation of an organ or tissue form one part of the body to another or from one person (donor) to another (recipient). Success for transplantation depends on the degree of compatibility between donor and graft.

Grafts from just any source-an animal, another primate, or any human beings cannot be made since the grafts would be rejected sooner or later.

- Tissue matching, blood group matching are essential before undertaking any graft/transplant and even after this the patient has to take immune-suppressants all his/her life. The body is able to differentiate 'self' and 'nonself' and the cell-mediated immune response is responsible for the graft rejection.
- Very often, when some human organs like heart, eye, liver, and kidney fail to function satisfactorily, transplantation is the only remedy to enable to patient to live a normal life.
- The success of tissue and organ transplants depends on the donor's and recipient's human leucocyte antigens (HLA) encoded by the HLA genes. These proteins are alloantigens, i.e., they differ among members of the same species. If the HLA protein on the donor's cells differs from those on the recipient's cells, an immune response occurs in the recipient.
- The genes for the HLA proteins are clustered in the major histocompatiblity complex (MHC), located on the short arm of chromosome 6.

13.1 Types of Transplant

(1) **Autograft :–** Tissue grafted from one area to another on the same individual. Rejection is not a problem. This can be used in skin grafting.

(2) **Isograft :–** A graft between two genetically identical individuals such as identical twins. Again there is no problem of rejection.

(3) **Allograft :–** A tissue grafted from one individual to a genetically different individual of the same species.

(4) **Xenograft :–** A graft between individuals of different species such as from pig to human. It is always rejected by an immunocompetent recipient.

13.2 Ways to prevent rejection of transplanted organs or tissue

(1) By use of immunosuppressant.

(2) By taking transplanted organ from the siblings.

(3) By use of X-irradiation on bone marrow and lymph tissue.

(4) Skin for grafting over burns is taken from another part of the body of the same person.

(5) The graft is not vascularised.

To reduce the chance of rejection of transplanted tissue, immunosuppressive measures, e.g., cyclosporine A, tarcolimus (FK 506), corticoids, azathioprine, OKT3 antibody and radiations are used.

14. Vaccination and Immunization

- The principle of immunization or vaccination is based on the property of 'memory' of immune system. In vaccination, a preparation of antigenic proteins of pathogen or inactivated / weakened pathogen (vaccine) is introduced into the body.
  The antibodies produced in the body against these antigens would neutralise the pathogenic agents during actual infection. The vaccines also generate memory –B and T-cells that recognize the pathogen quickly on subsequent exposure and overwhelm the invaders with a massive production of antibodies.
- Vaccine is suspension or extract of weakened (attenuated / dead) germs of disease which when injection into healthy person provides it active acquired immunity to the disease.
  A vaccine stimulates the antibody production and formation of memory cells without causing the disease. Safe and pure vaccine can be obtained through separation of antigen (from surface of infecting agent), multiplying it with the help of rDNA technique (e.g., vaccine against hepatitis B-virus).
- The pathogens given in a vaccine are unable to cause the disease, but are sufficient to stimulate the formation of antibodies by host's cells. Now vaccines are also available for diphtheria, cholera, typhoid, whooping cough, tetanus, tuberculosis, plague, measles, mumps and polio.

14.1 Vaccines are also classified as follows

(1) **First Generation Vaccines :–** These vaccines are produced by conventional technique using whole microorganisms. These are never of uniform quality and produce side effects.

(2) Second Generation Vaccines :– These vaccines are prepared by recombinant DNA technique / genetic generation. Examples : Hepatitis B virus vaccine, herpes virus vaccine, pneumonia vaccine. The yeast – derived recombinant hepatitis B virus vaccine is the first commercially available human vaccine produced by the genetic commercially available human vaccine produced by the genetic engineering technology. The hepatitis B vaccine is produced form transgenic yeast by recombinant DNA technology.

(3) Third Generation Vaccines (synthetic vaccines) :–These are chemically synthesized multivalent vaccine. These vaccines have high purity. Examples : vaccine against diphtheria toxin developed by audibert et al, 1981, leukemia virus vaccine.

14.2 Passive Immunization

(1) It is used when exposure to pathogen has already occurred and there is not enough time to induce active protective immunity or prophylactically in children with inherited immune deficiencies or undergoing cancer chemotherapy (which suppresses the immune system).

(2) It involves giving preformed antibodies to a person (or animal there is not enough tie mot induce active protective immunity or prophylactically in children with inherited immune deficiencies or undergoing cancer chemotherapy (which suppresses the immune system).

(3) It involves giving preformed antibodies to a person (or animal) in response to vaccination or environmental exposure to the pathogen. These antibodies are gradually broken down by the normal processes of protein catabolism, so this form of immunity is temporary.

(4) Examples include antivenin for snake bite, rhogam (human anti-Rh) to block formation of IgG anti-Rh antibodies in Rh negative mothers to Rh positive erythrocytes from their babies, and human gamma globulin gives to children who have humoral immune deficiencies. Passive immunization can be natural or artificial.

(i) Natural Passive Immunization :– In includes the passage of maternal IgG across the mammalian placenta. In humans, IgA is transmitted to the baby's gut via colostrums and milk.

(ii) Artificial Passive Immunization :– It is effected immune-deficient patients are given doses of antibodies from a donor, travelers to the tropics may be given 'pooled $^{\gamma}$-globulins' (antibodies) from donors who live in the visited areas; hopefully, the cocktail of donated antibodies may protect them from endemic disease. Genetic engineering techniques are being pursued to develop high-affinity antibodies against rubella (German measles virus), etc.

14.3 Vaccine

- A vaccine is a biological preparation that provides active acquired immunity to a particular disease. A vaccine typically contains an agent that resembles a disease-causing microorganism and is made from killed forms of the microbe, its toxins, or one of its surface proteins. The agent stimulates the body's immune system to recognize the agent as a threat, destroy it, and to further recognize and destroy any of the microorganisms associated with that agent that it may encounter in the future.
- The administration of vaccines is called vaccination. Vaccination is the most effective method of preventing infectious diseases, widespread immunity due to vaccination is largely responsible for the worldwide eradication of smallpox and the restriction of diseases such as polio, measles, and tetanus from much of the world.
- The terms *vaccine* and *vaccination* are derived from *Variolae vaccinae* (smallpox of the cow), the term given by Edward Jenner in 1798 to denote cowpox. In 1881, to honor Jenner, Louis Pasteur proposed that the terms should be extended to cover the new protective inoculations then being developed.

(1) The efficacy or performance of the vaccine is dependent on a number of factors:

(i) the disease itself (for some diseases vaccination performs better than for others)

(ii) the strain of vaccine (some vaccines are specific to, or at least most effective against, particular strains of the disease)

(iii) whether the vaccination schedule has been properly observed.

(iv) idiosyncratic response to vaccination; some individuals are "non-responders" to certain vaccines, meaning that they do not generate antibodies even after being vaccinated correctly.

(v) assorted factors such as ethnicity, age, or genetic predisposition.

(2) Types of Vaccines :– Vaccines are dead or inactivated organisms or purified products derived from them. There are several types of vaccines in use. These represent different strategies used to try to reduce the risk of illness while retaining the ability to induce a beneficial immune response.

(i) Inactivated :– Some vaccines contain inactivated, but previously virulent, micro-organisms that have been destroyed with chemicals, heat, or radiation. Examples include the polio vaccine, hepatitis A vaccine, rabies vaccine and some influenza vaccines.

(ii) Attenuated :– Some vaccines contain live, attenuated microorganisms. Many of these are active viruses that have been cultivated under conditions that disable their virulent properties, or that use closely related but less dangerous organisms to produce a broad immune response.

Although most attenuated vaccines are viral, some are bacterial in nature. Examples include the viral diseases yellow fever, measles, mumps, and rubella, and the bacterial disease typhoid.

The live *Mycobacterium tuberculosis* vaccine developed by Calmette and Guérin is not made of a contagious strain but contains a virulently modified strain called "BCG" used to elicit an immune response to the vaccine. The live attenuated vaccine containing strain *Yersinia pestis* EV is used for plague immunization.

Attenuated vaccines have some advantages and disadvantages. They typically provoke more durable immunological responses and are the preferred type for healthy adults. But they may not be safe for use in immunocompromised individuals, and on rare occasions mutate to a virulent form and cause disease.

Vaccine type	Vaccines of this type on U.S. Recommended Childhood (ages 0-6) Immunization Schedule
Live, attenuated	Measles, mumps, rubella (MMR combined vaccine) Varicella (chickenpox) Influenza (nasal spray) Rotavirus
Inactivated/Killed	Polio (IPV) Hepatitis A
Toxoid (inactivated toxin)	Diphtheria, tetanus (part of DTaP combined immunization)
Subunit /conjugate	Hepatitis B Influenza (injection) *Haemophilus influenza* type b (Hib) Pertussis (part of DTaP combined immunization) Pneumococcal Meningococcal

Vaccine type	Other available vaccines
Live, attenuated	Zoster (shingles) Yellow fever
Inactivated/Killed	Rabies
Subunit/conjugate	Human papillomavirus (HPV)

15. Allergies

Allergy is inappropriate immune response of a person to harmless substances coming in contact with the body or entering the body from the environment, or in food, or in medicine. The substances which cause allergic reaction are called allergens. They are generally weak antigens. The common allergens are dust, dust mites, cat saliva, pollen mould spores, feathers, fur, venom, food (milk, egg, fish), and drugs.

15.1 Symptoms of Allergy

Allergic reaction depends on the nature of the allergen. The common allergic reactions (symptoms) are inflammation of mucous membranes, sneezing, gasping, running eyes, irritation of upper respiratory tract (throat, trachea), itching, skin rash and many more. To cure allergy, its specific allergen must be found out, and this is not an easy job.

15.2 Cause of Allergy

Allergy involves mainly IgE antibodies and histamine. It causes marked dilation of all the peripheral blood vessels and the capillaries become highly permeable so that large amounts of fluid leak out from the blood into the tissues. The blood pressure decreases drastically often resulting in the death of the individual within a short time.

15.3 Types of Allergy diseases

(1) Hay fever

(2) Asthma

(3) Anaphylaxis (Anaphylatic shock)

We see that allergy is due to the release of chemicals like histamine and serotonin from the mast cells. For determining the cause of allergy, the patient is exposed to or injected with very small doses of possible allergens, and the reactions studied. The use of drugs like anti-histamine, adrenaline and steroids quickly reduce the symptoms of allergy. Somehow modern-day life style has resulted in lowering of immunity and more sensitivity to allergens-more and more children in metro cities of India suffer from allergies and asthma due to sensitivity to the environment. This could be because of the protected environment provided early in life.

16. Auto Immunity

Autoimmunity is a condition in which structural or functional damage is produced by the action of immunologically competent cells or antibodies against normal components of the body. In other words the immune system of the body goes off the track and starts behaving against the own body or self which leads to a variety of disorders.

(1) Autoimmunity literally means 'protection against self'. It actually implies injury to self and, therefore, the term 'Autoallergy' has been suggested as an acceptable alternative. However, the term autoimmunity is widely used.

(2) Two consequences of this ability are to be understood :

(i) Higher vertebrates can differentiate between foreign molecules and foreign organisms. Most of the experiments of immunology are dealt with this aspect.

(ii) Sometimes, due to genetic and other unknown reasons, the body attack self-cells. This causes the damage to the body and is known as auto-immune disease.

(3) Causes : Increases helper T-cell and decreased suppressor T-cells functions have been suggested as causes of autoimmunity.
(4) Examples of auto immune disease are rheumatoid arthritis, insulin-dependent diabetes, chronic anemia, chronic hepatitis, Hashimoto's disease, and Myasthenia gravis etc
Examples of auto immune disease are rheumatoid arthritis, insulin-dependent diabetes, chronic anemia, chronic hepatitis, Hashimoto's disease, and Myasthenia gravis etc

17. Immune system in the Body

The human immune system comprises lymphoid organs, tissue cells and soluble molecules such as antibodies. The immune system protects the body. This also plays an important role in allergic reaction, auto-immune disease and organ transplantation.

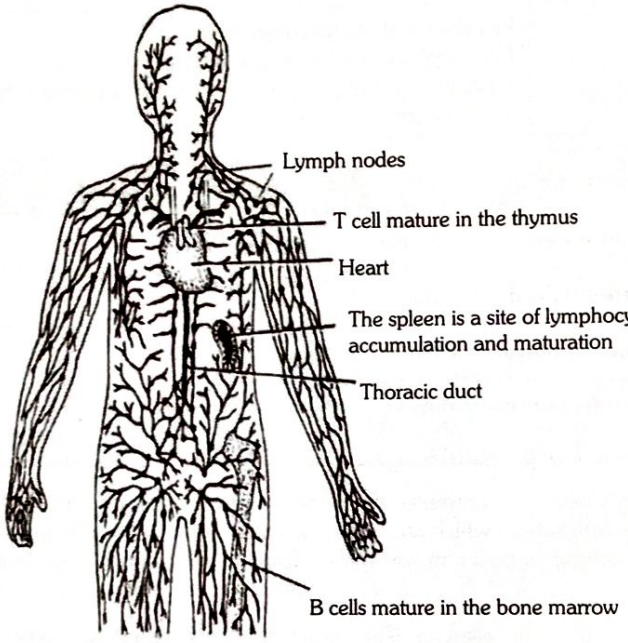


Figure :– Human lymphatic system

17.1 Lymphoid Organs

Lymphoid Organs are those organs where the maturation and proliferation of lymphocytes take place. There are two types of lymphoid organs : Primary lymphoid organs and secondary lymphoid organs :

(1) Primary lymphoid organs (Central lymphoid organs) :– The primary lymphoid organs are those organs where T lymphocytes and B lymphocytes, mature and acquire their antigen specific receptors. Thymus and bursa of Fabricus of birds are primary lymphoid organs. The bone marrow of mammals is considered equivalent to avian bursa of Fabricus.

- Bone marrow is the main lymphoid organ where all blood cells including lymphocytes are formed.
- Thymus is the site of T lymphocyte maturation and bone marrow is the site of B lymphocyte maturation. The thymus is a lobed organ located near the heart and beneath the breastbone. The thymus is quite large at the time of birth but keeps reducing in size with age and by the time puberty is attained it reduces to a very small size.

(2) Secondary Lymphoid Organs :– After maturation the lymphocytes migrate to secondary lymphoid organs like spleen, lymph nodes, tonsils, Peyer's patches of small intestine and appendix. The secondary lymphoid organs provided the sites for interaction of lymphocytes with the antigen, which then proliferate to become effector cells. The location of various lymphoid organs in the human body is shown in the given figure.

- **Spleen :–** The spleen is a large bean-shaped organ. It mainly contains lymphocytes and phagocytes. It acts as a filter of the blood by trapping blood-borne micro-organisms. Spleen also has a large reservoir of erythrocytes.
- **Lymph Nodes :–** The lymph nodes are small solid structures located at different points along the lymphatic system. Lymph nodes serve to trap the micro-organisms or other antigens, which happen to get into the lymph and tissue fluid. Antigens trapped in the lymph nodes are responsible for the activation of lymphocytes present there and cause the immune response.
- **Lymphoidal Tissue :–** There is lymphoid tissue also located within the lining of the major tracts (respiratory, digestive and urogenital tracts) called mucosal associated lymphoid tissue (MALT). It constitutes about 50 per cent of the lymphoid tissue in human body.

Important-

Why some disease that attacks in childhood does not attack again?

This can be explained in terms of memory cells (Primed cells). After the infection disappears as a result of antigen-antibody interaction and killer T-cell nonself cell interaction, some of the specific lymphocytes remain in lymphatic tissue as "memory or primed cells" which are ready to produce the antibodies and killer cells if the same antigen reappears. This is why the second attack of the infectious disease elicits quick and abundant antibody formation. The memory cells can give rise to more effector cells and memory cells in case of a second attack of antigens. Whereas the effector cells have a life of a few-days only, and the memory cells live long, some even for whole life. The memory cells are stored in the spleen and lymph nodes

18. Cancer

18.1 Cancer

Cancer is a dreadful disease is one of the chief killers today. It commonly originates in the tissues in which the cells are regularly replaced by mitosis. Cancer or malignant neoplasm is a disease of uncontrolled proliferation of cells without any differentiation. The cancer cells invade and destroy the surrounding tissues. Due to uncontrolled divisions, an abnormal growth called tumour occurs.

18.2 Tumour

Tumour is any abnormal swelling, lump or mass in the body. The term tumour is synonymous with neoplasm, specially solid neoplasm. Neoplasm is the scientific term to describe an abnormal proliferation of genetically altered cells. Neoplasm or tumour is of two types :

(1) **Benign Neoplasm or Tumour :–** This is a solid neoplasm or tumour that stops growing by itself and does not invade other tissue and remain confined to a particular site. It causes limited damage to the body and is non-cancerous. It divides in an uncontrolled manner, through. Depending on their location, they can be just as life threatening malignant lesions. An example is a benign tumour in the brain, which can grow and occupy space within the skull, leading to increased pressure on the brain.

(2) **Malignant Neoplasm or Tumour :–** The malignant tumours, on the other hand area mass of proliferating cells called neoplastic or tumour cells. These cells grow very rapidly, invading and damaging the surrounding normal tissues. As these cells actively divide and grow they also starve the normal cells by competing for viral nutrients. Cells sloughed from such tumours reach distant sites through blood, and whenever they get lodged in the body, they start a new tumour there. This property called **metastasis** is the most feared property of malignant tumours.

18.3 Characteristics of Cancer Cells

(1) The cancer cells do not require extracellular growth factors to grow and divide.
(2) There is no control over the cell cycle so, the cells continue to divide repeatedly.
(3) Due to repeated divisions, cells form a large mass of undifferentiated tumour.
(4) The cells pass out from the tumour to new sites for forming secondary tumours. This spreading of cancerous cells from one part to other parts through circulation or by forming secondaries is called metastasis.
(5) The nucleus of the cells becomes irregular, hypertrophied and granular, and the numbers of lysosomes increase in cancer cells.
(6) Melanin, mucus and fat droplets are more and the mitochondrial cristae become fewer in cancer cells.
(7) The cells do not undergo differentiation although divide continuously.
(8) To support their growth, cancer cells release a growth factor that causes neighbouring blood vessels to branch into the cancer tissues. This phenomenon is called vascularisation.
(9) The ability to induce blood vessel formation which is known as angiogenesis is well pronounced in cancerous cells.
(10) Cell death is inhibited so they are immortal cells.

18.4 Types of cancer

(1) **Sarcomas** arise from the tissues derived from mesoderm such as connective tissues (bones, cartilages, tendons, adipose tissue), lymphoid tissue and muscles. They are of the following types :

- **Lymphomas :–** Lymphomas are the cancers of the lymphatic tissues.
- **Osteoma :–** It is the cancer of bones.
- **Lipomas :–** Lipomas are tumours formed in the adipose tissue.

(2) **Carcinomas affect** the epithelial and glandular tissues. They include breast cancer, pancreatic cancer and stomach cancer.

(3) **Leukaemias are** commonly called as blood cancers. Leukaemias result from excessive formation of WBCs in the bone marrow and lymphatic nodes, increasing their number in the blood upto 2,00,000-10,00,000/mm^3 and also immature/myeloid stem cells. In common type of leukemia, WBCs infilterate bone marrow, spleen, liver lymph nodes and other organs causing damage and increasing their size.

18.5 Causes of Cancer

Chemical and physical agents that can cause cancer are called carcinogens. The causes of cancer are as follows

(1) **Overexposure** to **ionizing radiations** like X-rays, UV-rays, gamma rays etc. Which literally punches holes in the DNA, breaking the correct genetic sequences.

(2) **Chemicals** like nicotine, caffeine, steroids, and arsenic air pollutants may cause cancers of lungs, brain, breast or blood.

(3) **Chronic physical abrasions** of skin produce skin cancer.

(4) **Irritation** to buccal epithelium by chewing betel leaves or tobacco or irritation to lung epithelium by heavy smoking may cause cancer of mouth and lung respectively.

(5) **Constant Heat :–** Kashmiris have a higher frequency of abdominal-skin cancer. This is perhaps due to the irritation caused by **Kangri** (an earthen pot containing burying coal) which they keep close to their abdomen under the gown in winter.

(6) **Biological Agents :–** Biological agents may be viral or bacterial. Viruses that cause cancer include the human papilloma virus (implicated in cervical cancer), the human T cells lymphocytic virus (implicated in lymphoma), and hepatitis B virus (implicated in liver cancer). Known bacterial agents are helicobacter pylori (which causes gastric ulcers), implicated in stomach cancer.

(7) **Cancer Genes :–** Multiple mutations are needed to create the typical cancer cell. These mutations are in the genes that regulate cell growth, protect the individual by killing damaged or unneeded cells, repair the DNA, determine cellular characteristic, and genes to promote angiogenesis. Two major factors of gene known to cause cancer are : oncogenes and tumour suppressor genes.

- An oncogene is a gene that sustained some genetic damage and, therefore, produces a protein capable of cellular transformation. Oncogenes are described as viral oncogenes (c-onc) present in viruses and cellular oncogenes (c-onc) present in host cells. Often the genes present in are not oncogenic and are also described as proto-oncogenes.

  A proto-oncogene is a gene whose protein product has the capacity to induce cellular transformation, given it sustains some genetic mutation. The process of activation of oncogenes from protooncogenes can include retroviral transduction or retroviral integration, point mutations, insertion mutations, gene amplification, chromosomal translocation and /or protein interactions.
- Tumour suppressor gene normally keeps mitosis in check and prevents cancer from occurring. This gene is inactivated or removed to eliminate controlled of cell cycle and initiate cancer.

(8) **Hormonal Imbalances :–** Some hormones may act in a similar manner to non-mutagenic carcinogens in that they may stimulate excessive cell growth. A well established example is the role of hyperestrogenic state in promoting endometrial cancer.

Carcinogens and Organs Affected

	Carcinogens	Organs Affected
1.	Soot	Skin, lungs
2.	Coal tar (3, 4-benzopyrene)	Skin, lungs
3.	Cigarette smoke (N-nitrosodimethylene)	Lungs
4.	Cadmium oxide	Prostate gland
5.	Aflatoxin (a mould metabolite)	Liver
6.	2-naphthylaminje and 4-aminobiphenyl	Urinary bladder
7.	Mustard gas	Lungs
8.	Nickel and chromium compounds	Lungs
9.	Asbestos	Lungs, pleural membrane
10.	Diethylstilbestorol (DES)	Vagina
11.	Vinyl chloride (VC)	Liver

(9) **Apotosis :–** Programmed cell death or apoptosis plays an important role in controlling cancer. If a cell is unable to undergo apoptosis, due to mutation or biochemical inhibition, it can continue dividing and develop into a tumour. E.g., infection by papilloma viruses causes a viral gene to interfere with the cell's p53 protein, an important member of the apoptotic pathway. This interference in the apoptotic capability of the cell plays a critical role in the development of cervical cancer.

18.6 Detection and diagnosis of cancer

It depends upon histological features of malignant structure :

(1) Bone marrow biopsy and abnormal count of WBCs in leukemia.

(2) Biopsy of tissue, direct or through endoscopy. Pap test (cytological staining) is used for detecting cancer of cervix and other parts of genital tract.

(3) Techniques such as radiography (use of X-rays), CT Scan (computed tomography), MRI Scan (magnetic resonance) imaging) are very useful to detect cancers of the internal organs. In CT Scan X-rays are used to generate a three dimensional image of internal organs. In MRI strong magnetic fields and non-ionizing radiations are used to detect pathological and physiological changes in the living tissue. Techniques of molecular biology can be applied to detect genes in individuals. Mammography is radiographic examination of breasts for possible cancer.

(4) Monoclonal antibodies coupled to appropriate radioisotopes can detect cancer specific antigens and hence cancer.

18.7 Treatment of Cancer

Since cancer is not a single disease but causes wide spread effects, so far there is no single treatment and numbers of therapies are used simultaneously. Cancer is at present treated in many ways on the basis of type of cancer, location of tumours and extent or stage of the disease. The therapies are :

(1) **Chemotherapy :–** In chemotherapy a variety of anti-cancer drugs are used that produce more injury to cancer cells than to normal cells. These drugs interfere with the cell division and growth and affect both normal and cancerous cells.

Vincristine and vinblastine from catharanthus roseus (Vinca rosea) are effective in leukaemia control. Taxol is another anticancer drug obtained from taxus baccata. Tetrathiomolybdate is the new anticancer drug. It arrests the tumour growth by starving cancer cells of copper.

(2) **Radiotherapy :–** It is used in addition to chemotherapy. The basic principle there is to bombard cancer cells with rays that damage or destroy the ability of cancer cell to grow and divide by damaging the DNA within the tumour cells, but produce minimum damage to the surrounding normal tissue.

(3) **Surgery :–** It is removal of the cancerous cells surgically and has only limited usefulness. In breast tumour and uterine tumour, it is most effective but other treatments are also given to kill any cells that may have been left

(4) **Supportive therapy :–** In supportive therapy the antibiotics are used to prevent infection or transfusions are given to check anaemia.

(5) **Blood and Marrow Transplant :–** High dose chemotherapy or radiation therapy can destroy bone marrow's ability to make blood cells. A blood or marrow transplant can be used to replace marrow stem cells which produce blood cells.

(6) **Hormone Therapy :–** The growth of some cancers can be inhibited by providing or blocking certain hormones. Common examples of hormone sensitive tumours include certain types of breast and prostate cancers. Removing or blocking estrogen or testosterone is often an important additional treatment. In certain cases, administration of hormone agonists such as progestogens may be therapeutically beneficial.

(7) **Angiogenesis Inhibitor :–** Angiogenesis inhibitors prevent the extensive growth of blood vessels (angiogenesis) that tumours require to survive. E.g., a monoclonal antibody bevacizumab, has been approved as angiogenesis inhibitor

19. AIDS

The word AIDS stands for Auto Immune Deficiency Syndrome. This means deficiency of immune system, acquired during the lifetime of an individual indicating that it is not a congenital disease. 'Syndrome' means a group of symptoms. AIDS was first reported in 1981 and in the last twenty-five years or so, it has spread all over the world killing more than 25 million persons.

AIDS is a disorder of cell mediated immune system of the body. There is a reduction in the number of helper T cells which stimulate antibody production by B-cells. This results in the loss of natural defense against viral infection.

19.1 Causative Agent

The virus of AIDS was officially named Human Immunodeficiency Virus (HIV) in 1986 by the international committee on viral nomenclature. HIV is a retrovirus that attacks helper T cells.

19.2 Structure of HIV Virus

The virus is spherical with a diameter of about 90-120 nm. Its genome consists of a single-stranded RNA filament segmented into two identical filaments and associated with a reverse transcriptase enzyme.

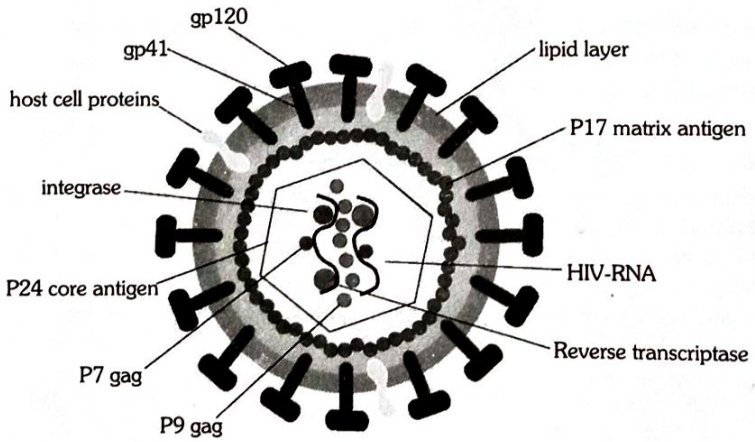


Figure :– Anatomy of the AIDS virus

After the entrance of the virus into the body of the person, the virus enters into macrophages where RNA genome of the virus replicates to form viral DNA with the help of reverse transcriptase enzyme. This viral DNA gets incorporated into the cell's DNA and directs the infected cells to produce viruses.

The macrophages produce virus and act like an HIV factory. Simultaneously HIV virus enters into helper T lymphocytes where it replicates and produces other viruses. This is repeated so that the number of T lymphocytes decreases in the body of the infected person. During this period, the infected person suffers from fever, diarrhea and weight loss.

Since the number of helper T lymphocytes decreases in the body, the person starts suffering from infections of bacteria especially Mycobacterium, viruses, fungi and even parasites like toxoplasma. The patient gets immune deficiency and he/she is unable to protect himself/herself against these infections.

19.3 Modes of Transmission

(1) Transfusion of infected blood or blood products :
(2) Use of contaminated of needles and syringes to inject drugs or vaccines.
(3) Use of contaminated razors.
(4) Sexual intercourse with an infected partner without a condom.
(5) From infected mother to child through placenta.
(6) Artificial insemination.
(7) Organ transplant.

The incubation period of AIDS ranges between 6 months to 10 years.

19.4 Diagnosis

AIDS can be diagnosed by ELISA test and Western blotting test. Western blotting test is employed for confirmation of ELISA positive cases.

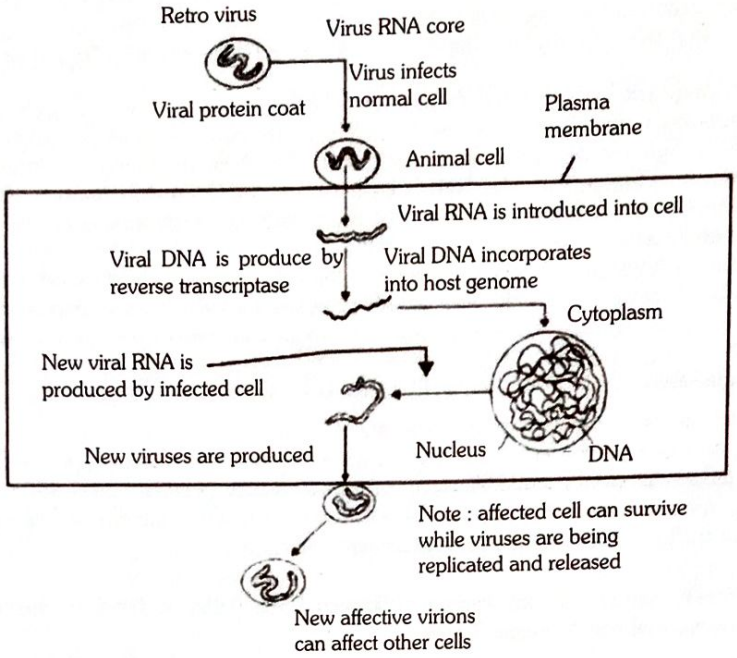


Figure :– Showing made of action of AIDS virus

19.5 Treatment

Although there is no cure for AIDS, use of certain drugs can prolong the life of AIDS patient. Zidovudine or AZT (3′-azidoz, 3′-dideoxythymidine) was the first drug used and continues to be the drug of choice for the treatment of AIDS.

Didanosine (dideoxyionosine, DDI) is another drug employed to treat AIDS.

No vaccine has been prepared so far against AIDS virus.

19.6 The following steps may help in preventing the AIDS.

(1) People should be educated about AIDS. Every year, December 1 is recalled as the world AIDS Day. It is one of the methods of educate the people about AIDS.

(2) Blood test must be done in blood donors, donors of semen, donors of organs (kidney, lung, liver) patients undergoing hemodialysis and pregnant women.

(3) Disposable needless and syringes should be used. Used needless and syringes must be destroyed.

(4) In sexual relationship one should be monogamous.

NACO (National AIDS control organisation) and other NGOs (Non-government organizations) are doing good work to educate people about AIDS. AIDS-related complex (ARC) or prodromal AIDS is mild form of AIDS and is characterised by swollen lymph nodes, fever, sweating at night and weight loss. Patients with ARC have a high possibility of early development of AIDS. Infection with HIV or having AIDS is something that should not by hidden-since then, the infection may spread too many more people. HIV/AIDS-infected people need help and sympathy instead of being shunned by society. Unless society recognizes it as a problem to be dealt with in a collective manner-the chances of wide spread of the disease increase manifold, it is a malady that can only be tackled, by the society and medical fraternity acting together, to prevent the spread of the disease

20. Drug Dependence

Certain drugs are prescribed by physicians for the prevention or treatment of diseases, or for increasing the physical and mental performance and are withdrawn as soon as the desired effect is achieved. Repeated use of certain drugs on a periodic or continuous basis may make the body dependent on them. This is called drug dependence. The term "drug-dependence" is now-a- days preferred to "drug-addiction or drug habituation" (WHO, 1964). Some people start taking drugs without medical advice due to one reason or the other and become drug dependent.

20.1 Types

Drug dependence is of two types Psychological and Physical or Physiological.

(1) Psychological dependence :– it refers to the person's belief that the normal state of well being can be attained only with the drug's action.

(2) Physical (Physiological) Dependence :– It refers to the person's state when intake of a drug becomes essential to maintain physiological equilibrium. In such a case, the nervous system functions normally in the presence of the drug only. The physical dependence is, therefore, also called neuroadaptation.

20.2 Types of Habituating Drugs

The habituating drugs are grouped into two main categories: Psychotropic drugs and psychedelic drugs.

(1) Psychotropic Drugs :– These drugs act on the brain and alter behaviour, consciousness and capacity of perception Hence, they are also termed mood-altering drugs. The repeated use of the psychotropic drugs makes the body dependent on them. The psychotropic drugs are classified into four groups: tranquillizers, sedatives and hypnotics, opiate narcotics and stimulants.

- **Tranquillisers :–** The tranquillizers decrease tension and anxiety, and promote calmness and soothing without sedating or depressant affect and do not induce sleep.

  Examples : phenothiazines and benzodiazepines.
- **Sedatives and Hypnotics :–** The sedatives depress ('switch off') the activities of the central nervous system. They reduce excitement and give a feeling of calmness, relaxation or drowsiness. Higher doses induce sleep. The sleep-inducing drugs are also called hypnotics.

  Examples : Barbiturates and benzodiazepines.
- **Opiate Narcotics :–** The opiate narcotics are drugs that suppress brain activity and relieve pain. They are popularly called pain killers. They also have sedative effect. The opiate narcotics are also used for cough relief and for treatment of vomiting and diarrhea.

  Example : The opiate narcotics are briefly called opiates or opioids. They include opium and its derivatives: certain semisynthetic compounds, namely heroin and smack; and some synthetic drugs such as pethidine and methadone.
- **Stimulants :** The stimulants temporarily stimulate the nervous system: make a person more wakeful, alert and active; and cause excitement. The stimulants do not cause physical dependence because no withdrawal symptoms appear, psychological dependence is very likely to occur as withdrawal causes depression, anxiety and restlessness, and The stimulants include caffeine, cocaine, crack, beetelnut and amphetamines.

(2) Psychodelic Drugs:

- **Hallucinogens :** The hallucinogens act mainly on CNS and greatly alter one's thoughts, and feelings and perceptions. The are known as psychedelic drugs (G. psycho=mind, soul; deloum = to manifest). They cause optical or auditory hallucination, i.e., illusions, apparent perception of external objects or sounds not actually present. The illusion may be pleasant or unpleasant. The hallucinogens are also called vision-producing drugs.

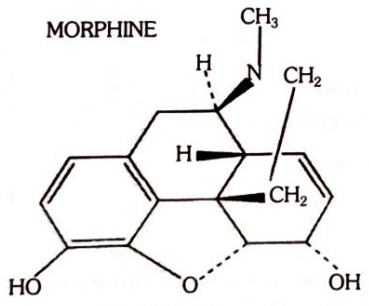


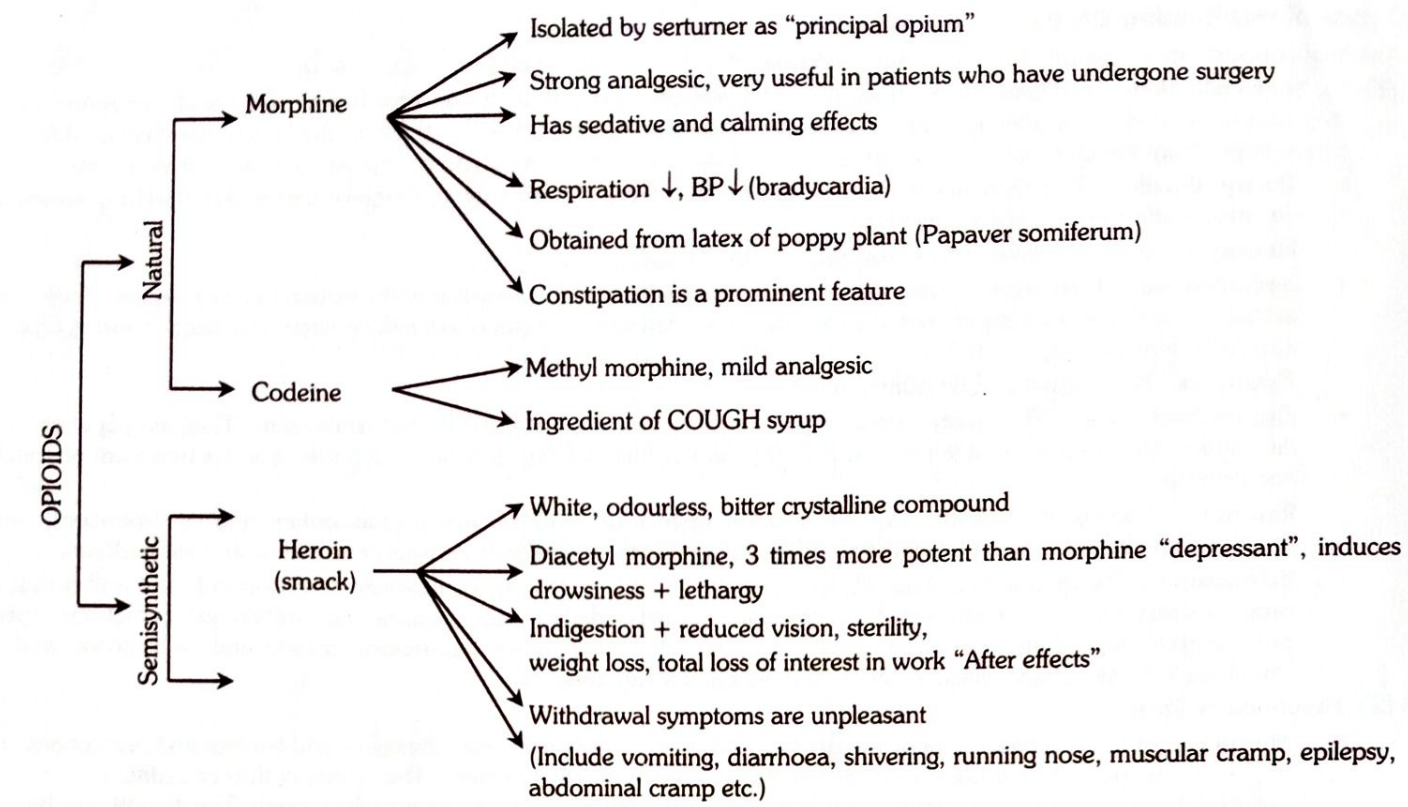
Figure :– Chemical of morphine

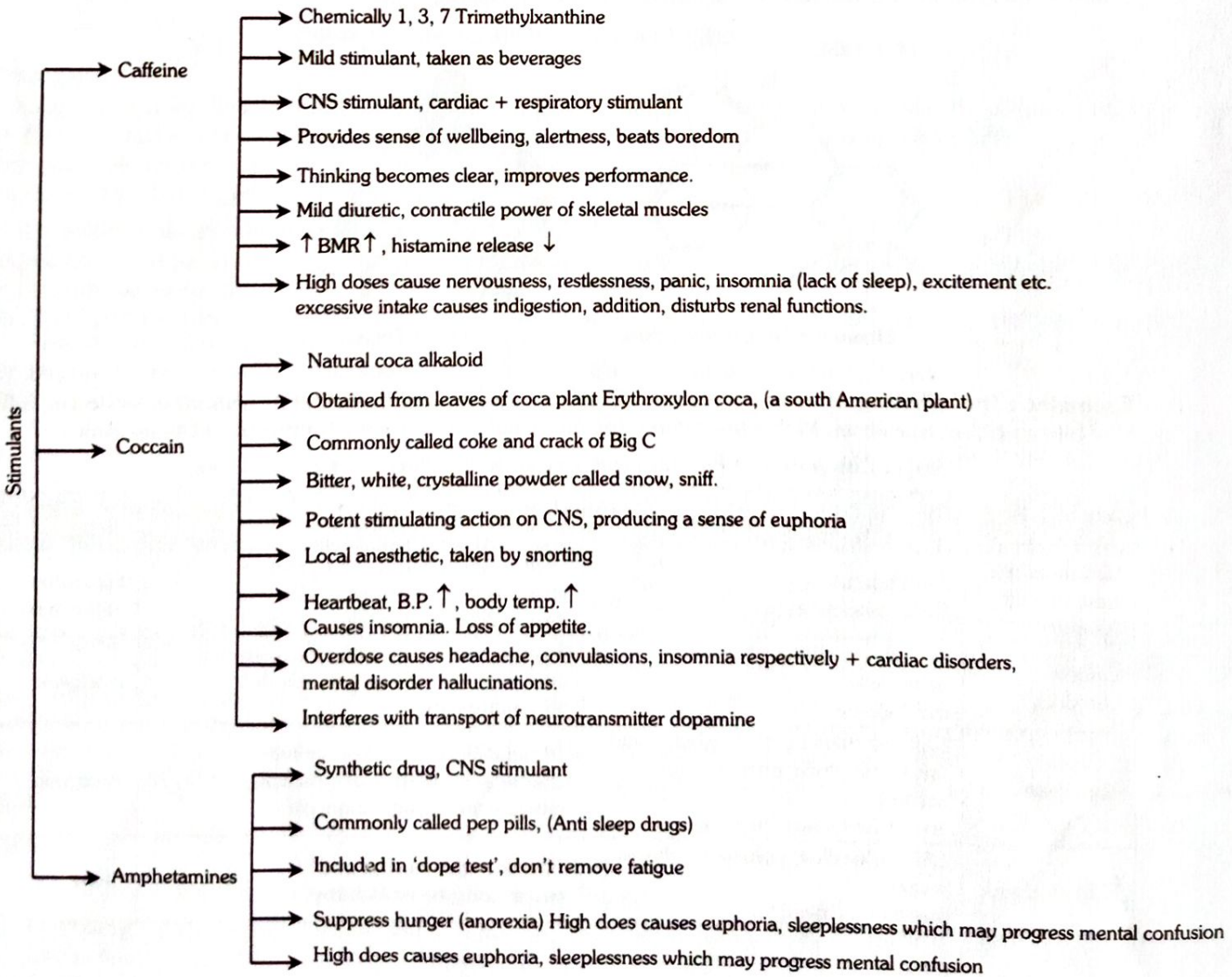
Opium Poppy

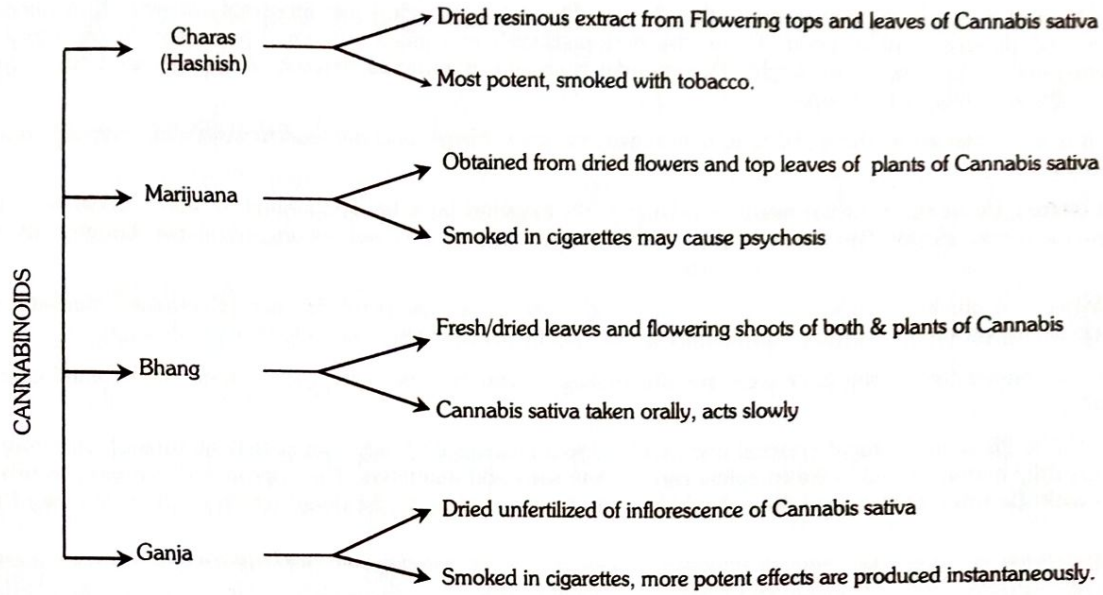
Examples : The hallucinogens include chemicals such as LSD (lysergic acid diethylamide), mescaline, psilocybin, psilocin, PCP (phencyclidine piperidine), MDMA (methylenedioxy methamphetamine) and other products of hemp plant.

Major Categories of Psychotropic Drugs, their Effects and clinical Uses

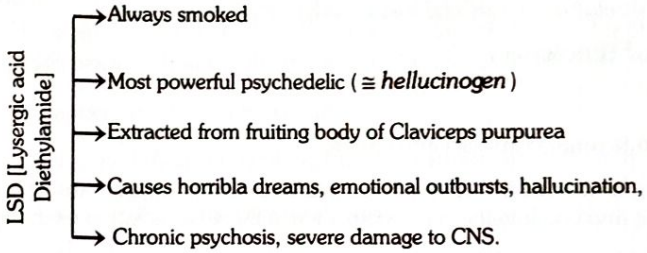
Type of Drug	Examples	Effects	Clinical Uses
Sedatives and tranquilizers (depressant)	Barbiturates Benzodiazepines (e.g. Valium)	Depress brain activity and produce feelings of calmness, relaxation, drowsiness and deep sleep, (high doses)	Hypnotic, antianxiety
Opiate narcotics	Opium, morphine, Heroin, pethndine, methadone	Suppress brain function, relieve intense pain (physical and mental), product temporary euphoria	Analgesic
Stimulants	Caffeine (very mild), amphetamines (including dexamphetamine), cocaine and its derivative Novocain	Stimulate brain (function, relive intense pain physical and mental), produce temporary, euphoria	Analgesic
Hallucinogens	LSD, mescaline, psilocybin, charas, hashih, marijuana (bhang)	Alter thought, feelings and perceptions; hallucinations	None


OPIOIDS
Natural
Morphine
Isolated by serturner as "principal opium"
Strong analgesic, very useful in patients who have undergone surgery
Has sedative and calming effects
Respiration ↓, BP↓ (bradycardia)
Obtained from latex of poppy plant (Papaver somiferum)
Constipation is a prominent feature
Codeine
Methyl morphine, mild analgesic
Ingredient of COUGH syrup
Semisynthetic
Heroin (smack)
White, odourless, bitter crystalline compound
Diacetyl morphine, 3 times more potent than morphine "depressant", induces drowsiness + lethargy
Indigestion + reduced vision, sterility, weight loss, total loss of interest in work "After effects"
Withdrawal symptoms are unpleasant
(Include vomiting, diarrhoea, shivering, running nose, muscular cramp, epilepsy, abdominal cramp etc.)


Stimulants
Caffeine
Chemically 1, 3, 7 Trimethylxanthine
Mild stimulant, taken as beverages
CNS stimulant, cardiac + respiratory stimulant
Provides sense of wellbeing, alertness, beats boredom
Thinking becomes clear, improves performance.
Mild diuretic, contractile power of skeletal muscles
↑ BMR ↑, histamine release ↓
High doses cause nervousness, restlessness, panic, insomnia (lack of sleep), excitement etc. excessive intake causes indigestion, addition, disturbs renal functions.
Coccain
Natural coca alkaloid
Obtained from leaves of coca plant Erythroxylon coca, (a south American plant)
Commonly called coke and crack of Big C
Bitter, white, crystalline powder called snow, sniff.
Potent stimulating action on CNS, producing a sense of euphoria
Local anesthetic, taken by snorting
Heartbeat, B.P. ↑, body temp. ↑
Causes insomnia. Loss of appetite.
Overdose causes headache, convulasions, insomnia respectively + cardiac disorders, mental disorder hallucinations.
Interferes with transport of neurotransmitter dopamine
Amphetamines
Synthetic drug, CNS stimulant
Commonly called pep pills, (Anti sleep drugs)
Included in 'dope test', don't remove fatigue
Suppress hunger (anorexia) High does causes euphoria, sleeplessness which may progress mental confusion
High does causes euphoria, sleeplessness which may progress mental confusion



Cannabinold receptors present principally in the brain.
Cannabinoid generally taken by inhalation and oral ingestion, these mainly affect cardiovascular system of body.
Atropa belladone and Datura also have hallucinogenic properties.



20.3 Combination of Drugs

Some addicts use mixtures of the drugs to have immediate 'kick' or 'charge' Simultaneous use of drug (hemp derivatives, barbiturates, aspirin or antihistamines) and alcohol may produce dangerous effects, including death When barbiturates and alcohol are taken together, each doubles the effect of the other. A mixture of cocaine and heroin, called speed ball, gives spontaneous kick of cocaine and prolonged pleasure of heroin.

Interaction of Alcohol and other substances of Abuse with some Common Drugs

Drugs	Effects
Alcohol and other depressants, e.g., barbiturates	Dramatically increased depressant effect
Alcohol + Antihistamines	Marked drowsiness (normally little or no sedative effect)
Alcohol + Benzodiazepines	Rapid increase in sedative effect; often dramatic
Alcohol + Marijuana of Hashish	Decreased coordination, increased reaction time, impaired judgment
Alcohol + Aspirin	Increased risk of damage to gastric mucosa

21. Adolescence Their Problems

The transition period between 8-18 years for girls, and 7-19 years for boys is called the adolescence. It is poised between- childhood and adulthood which is characterized by rapid growth, and physical and mental development. This period is marked by attainment of sexual maturity (puberty) and increased production of hormones, including sex hormones. This results in frequent shifts of moods and emotional turbulence.

21.1 The most common problems of all adolescents of both sexes are

(1) Acne : is the most common problem of almost all adolescents of both the sexes. It results from clogged pores of skin due to the influx of sex hormones particularly testosterone. It increases self-consciousness, especially if it appears on the face.

(2) **Hypochondria** : Most of them are concerned about their health. The eating disorders are abnormal patterns of handling food for fear of obesity and disfigurement of body. These disorders predominantly affect women. They resort to voluntary food restrictions or dieting and try to loose body weight. This disorder is known as anorexia nervosa which may start other types of body complications due to heavy loss of weight.

(3) **Neurasthenia** : It is characterized by the inability to concentrate or enjoy things, and my lead to irritability, fatigue, insomnia, depression and headache.

(4) **Post-Traumatic Stress Disorder** : mental health condition that's triggered by a terrifying event — either experiencing it or witnessing it. Symptoms may include flashbacks, nightmares and severe anxiety, as well as uncontrollable thoughts about the event.

(5) **Addiction** : Addiction to alcohol, drugs, tobacco smoking and chewing is also common. Advertisements, curiosity, peer-pressure, frustration and depression, feeling of independence, etc, may be some of the reasons for such addictions.

(6) **Phobias** : These are intense fear of things or creatures like snakes, or situation like vast open places, closed small chamber, crowded places etc

Adolescent is a period (12 to 20 years) of rapid physical and psychological changes and they should seek all sorts of help from their parents. The parents specially mothers should take complete care of their sons and daughters. The approach of parents towards their growing up children should be more friendly and they should be able to discus most of the issues which come in the life of every young individual.

22. Smoking

Smoking of tobacco dried and cured leaves of plant *nicotiana tobacum* and *N. rustica* in the form of cigar, Cigarettes bidies etc. is very toxic to body. Smoke of tobacco contain about 300 compounds. The main compounds are "Nicotine". *CO, HCN*, Polycyclic aromatic hydrocarbons, certain other stimulating products. Nicotine in the blood stimulates the nervous system, relax the muscles, release adrenalin hormone. In pregnant ladies growth of foetus decreases and loss of weight may takes place.

22.1 Diseases and Disorders of Smoking

(1) **Lung cancer**

(2) **Bronchitis** : Inflammation in respiratory tract and alveoli.

(3) **Emphysema** : Deposition of mucous in the alveoli causes decrease in oxygen absorption considerably and thus tension in the alveoli causes the coughing and break in the respiratory surface there by reducing exchange of gases.

(4) **Heart Disease** : Lumen of blood vessels become narrow which increases the blood pressure. (hypertension)

(5) **Intestinal ulcer and other irregularities of Gut.**

23. Alcohol and Alcoholism

Ethyl alcohol is consumed as fermented beverages with low content of alcohol (beer, wine) and as distilled beverages with a relatively high alcohol percentage (Brandy, Rum, Whisky, Gin). This alcohol is rapidly absorbed from the wall of stomach and enters the blood stream within minutes of ingestion. In the liver alcohol is converted into a more toxic substance acetaldehyde.

23.1 Effects of Alcohol Drinking-

(1) Lowering of blood sugar level (Hypoglycemia)

(2) Alcohol drinking affects the cerebellum part of brain so control and coordination of the body affected.

(3) **Effects on Liver** : The liver is the organ most affected by alcohol.

(4) Excess alcohol in the blood causes increase in the synthesis of fat which is deposited in the liver cell and bile ducts. This results in "Fatty liver syndrome"

(5) The further stages of this are "Liver cirrhosis" and "Billiary cirrhosis diseases". Liver become fibrous.

(6) **Amnesia** : Loss of memory

(7) **Gastritis** : It causes the inflammation in the wall of stomach. In chronic cases the gastric ulcers usually develop.

(8) **Resistance of the Body** : Body resistance against disease is reduced.

(9) Alcohol psychosis.

24. Mental health

Mental Health is important for the maintenance of physiological health, and social effectiveness. Mental illness is characterized by the following symptoms:

(i) depression,

(ii) insomnia (lack of sleep) or excessive sleeping,

(iii) compulsive actions,

(iv) feeling of hopelessness

(v) Serious thoughts of suicide,

(vi) unreasonable phobias,

(vii) partial or complete loss of memory,

(viii) self-destructive behaviour, e.g. excessive gambling drinking, drug abuse, over-eating and extreme dieting,

(ix) delusion (false beliefs) and hallucinations, and

(x) vocational and social dysfunctioning on a day-to-day basis.

Hallucination is a subjective disorder of sensory perception, in which one of the senses involved in the absence of external stimulations.

24.1 Types of Mental Disorders

Mental disorders are of many kinds. There are three main types: Psychosis, neurosis or psychoneurosis, and personality and character disorders.

(1) Psychosis : It is a severe mental disorder. It arises in the mind itself. In involves gross disorganization of a person's mental capacity and effective response. The patient is "insane" (mad) and out of touch with reality. He cannot cope with the ordinary demands of everyday life. He does not know is ill and refuses to get treatment. Psychosis may be associated with physical ailments such as in diabetes, high blood pressure, tuberculosis and brain disorders.

Psychosis is of many types. Some common types are mentioned.

(i) Alcohol Physhosis : It is a mental disorder resulting from alcoholism. It involves organic brain damage as in delirium.

(ii) Senile Psychosis : It is a mental disturbance occurring in old age.

(iii) Toxic Psychosis : It is caused by some toxic substances, whether endogenous exogenous.

(vi) Traumatic Psychosis : It results from physical injury or emotional shock.

(2) Neurosis : It is a mild mental disorder. It arises as a result of environmental factors on the patient, it involves behavioural disorder. The patient is unable to react normally to life situations. There are excessive or prolonged emotional reactions (anxiety, fear, sadness, tension, vague aches) to stresses, A neurotic is not considered "insane" by his associates. He is aware of his problem and seeks help.

(3) Personality and Character Disorders : These include epilepsy, mental retardation and childhood behavioural problems. These are minor Mental illness.

(4) Psychological Disorders

(i) Anxiety Disorders : Neurotic anxiety develops when there is an over-reaction to stressful events. It is associated with a range of unpleasant bodily symptoms, including palpitation sweating, nausea, trembling, diarrhoea and muscular tension. The commonest anxiety states seen in childhood and adolescence are separation anxiety disorder and school phobia.

(ii) Obsessive- Compulsive Disorders : It is Neurotic disorder. Affected persons manifest overwhelming obsessions and compulsions. They are compelled to perform an action or an idea despite their own attempt to resist it (compulsion). The most common obsession is violence. (Self destructive)

(iii) Attention Deficit Disorder : It is a neurotic mental health problem among children. It observed more in boys than in girls. As a result of this disorder, the boys exhibit under achievement, behavioural problems and a tendency to be disliked by other children.

(vi) Mood Disorders : These are the occasional bouts of high or low mood, i.e., elevation and depression. Depression is a neurotic mood disorder characterized by sadness, hopelessness, low self-esteem, decline in interest, energy, concentration and changes in sleep pattern and appetite. The cause may be a death in the family, failure in examination or interview, or losing of a job, this disorder, can be bipolar, i.e. depressed mood may alternate with exaggerated arousal and over activity, like non-stop and quick talking.

(v) Schizophrenia : It is psychotic disorder

(a) Distorted thoughts,

(b) Laughing or crying at completely inappropriate times.

(vi) **Borderline Personality Disorder (BPD)** : This disorder is an emotionally unstable personality disorder, which is characterized by impulsivity, unpredictable moods, and outbursts of emotion, behavioural explosions, quarrelsome behaviour, and conflicts with others. These individuals are highly reactive, and generally experience episodic depression, anxiety, and irritability. They also have problems with anger and anger expression. Individuals with BPD often attempt to injure, mutilate or kill themselves.

25. Community Health

This is the sum total of all the programmes, which help in protection, maintenance and improvement of health of people. It is also defined as the branch of science that helps in promoting physical and mental health, preventing disease and prolonging lifespan through the organised community attempts. The major community health services are

1. **Health centres**
2. **National programmes**
3. **Blood banks**

25.1 Health centres

These are the centres run by the governments to take care of the health of the people in cities, town and villages.

Health centres provide following activities.

1. **Environmental sanitation**

   These are as follows:

   (i) Treatment of domestic sewage by chemicals,

   (ii) Prevention of air pollution.

   (iii) Proper waste disposal through soak pits, composite pits, kitchen garden and smokeless chullah.

   (iv) Providing supply of germ free and safe drinking water.

   (v) Elimination of breeding of insect vectors.

2. **Control of communicable diseases**

   These are as follows

   (i) Vaccination against the communicable diseases such as TB, measles, smallpox, whooping cough, diphtheria, polio, tetanus and cholera.

   (ii) Careful treatment of diseased person.

   (iii) Malaria eradication.

   (iv) Regular supervision of food and trade.

   (v) Eradication of disease spreading vectors.

   (vi) Inoculation of water storing reservoirs by larvicidal fishes, plants, bacteria, etc.

   (vii) Isolation of patients from contagious disease.

3. **Health education**

   People should be provided education regarding transmission, prevention and mechanism of control of communicable diseases. It can be achieved through personal contact, posters, pamphlets, audio-visual aids, seminars, newspapers, TV, radio, etc.

4. **School dealt services**

   These include

   (i) Check up of children before admission and after then regular medical check up at definite interval of time.

   (ii) Education regarding health should be included in syllabus.

   (iii) Immunisation of the students from communicable diseases.

   (iv) Clean classroom and fresh drinking water should be provided to the children.

5. **Maternity and child health services**

These are as follows

(i) Routine checking of pregnant women.

(ii) Care should be taken during delivery of child.

(iii) Training of midwife.

(iv) Prophylaxis against deficiency of vitamins and anaemia disease.

(v) Proper family planning.

6. **Nutrition education**

These are as follows

(i) To educate the people about the balanced diet.

(ii) To educate them about the various deficiency diseases, importance of green and yellow vegetation, availability of nutrients in common food.

7. **Mental health**

It includes guidance to mentally ill persons.

8. **Collection and cross checking of statistics**

Accurate picture of health conditions in an area can be obtained by accurate data of birth, death and infectious diseases.

9. **Family planning**

These provide free family planning advices to newly wedded couples and also provide guidance and facilities in having a small family.

25.2 National programmes

Some national programmes have been started by Indian Government to eradicate major communicable diseases general awareness, civic sense and willingness to help them are main schemes of these programmes.

These programmes are as under

1. National Malaria Eradication Programme (NMEP)
2. National Cholera Control Programme (NCCP)
3. National Leprosy Control Programme (NLCP)
4. National Smallpox Eradication Programme (NSEP)
5. National Filaria Control Programme (NFCP)
6. Family Planning Programme, cancer, AIDS, tuberculosis, Venereal Diseases (VD), blindness are also being undertaken at national level.

25.3 Blood bank

It is a well developed specialised medical centre for collection, storage, processing and supply of blood. Fantus (1936) coined the term blood bank and established the first blood bank in Cooks Country Hospital, Chicago.

Functions of blood bank

These are as follows

(i) To collect blood from the donors.

(ii) Screening of blood from pathogens.

(iii) Grouping and labelling of blood according to ABO and Rh-factor.

(iv) Preservation of blood.

(v) Proper distribution of blood wherever and whenever required.

Note: Sodium citrate is used to prevent clotting of blood in blood banks.

25.4 Blood transfusion

It is the transfer of blood from an individual called donor to another individual called recipient. Blood can be transferred from a donor to a recipient of the same blood type without any complication

This is because there will be no antibodies present in the plasma of recipient which could cause agglutination of the cells being transfused. A healthy person can donate about 300 mL of blood without any ill effect.

30. Human Health and Diseases – Multiple Choice Questions

1. General

1. Which one of the following provide non specific pathogen defense for the body
(a) T-cells (b) B-cells
(c) Phagocytes (d) Stem cells

2. Only one of the following four ways through which AIDS can spread
(a) Infected needles and syringes
(b) Through mosquito bites
(c) Looking after AIDS patient
(d) Shaking hands, coughing, sneezing, hugging

3. When an organ is transplanted and is rejected by the body, the lymphocytes are produced by
(a) Cytotoxic T cells (b) NK cells
(c) Suppressor T cells (d) B cells

4. Immunodeficiency makes a person highly susceptible to infection. It is caused by
(a) Lack of *B* cells
(b) Lack of *T* cells
(c) Lack of both *B* and *T* cells
(d) None of the above

5. Which *Ig* is produced in primary immune response
Or
Which antibody is first to be released into blood following an infection
(a) *IgA* (b) *IgE*
(c) *IgG* (d) *IgM*

6. T–cells are lymphocytes which produce the cellular immunity. These are developed from
(a) Thymus
(b) Liver
(c) Spleen
(d) Endothelium of blood vessels

7. B.C.G. vaccine is used against
(a) T.B. (b) Leprosy
(c) Food poisoning (d) None of these

8. AIDS is caused by
(a) Blood cancer (b) HTLV–III
(c) Bacterium (d) TMV

9. Immunoglobulins are proteins that show _____ structure
(a) Primary (b) Secondary
(c) Tertiary (d) Quaternary

10. After infection of germs immunity acquired is
(a) Active immunity (b) Passive immunity
(c) Natural immunity (d) Both (a) and (b)

11. Study of interaction of antigens and antibodies in the blood is
(a) Cryobiology (b) Serology
(c) Haematology (d) Angiology

12. People administered with preformed antibodies get
(a) Active immunity (b) Innate immunity
(c) Auto immunity (d) Natural immunity
(e) Passive immunity

13. Antibodies are produced by
(a) Erythrocytes (b) Thrombocytes
(c) Monocytes (d) Lymphocytes

14. Which cell of immune system cause pore formation at the surface of the plasma membrane
(a) Helper T-cell (b) Killer T-cell
(c) Suppressor T-cell (d) B-cell

15. Which of the following organs is not involved in the elicitation of immune response
(a) Brain (b) Lymph nodes
(c) Spleen (d) Thymus

16. People, who are at the high risk of getting *HIV* infection
(a) Individuals who have multiple sexual partners
(b) Drug addicts who take drugs intravenously
(c) Individuals who require repeated blood transfusions
(d) All of the above

17. Antibodies resemble which of the following shape
(a) X (b) Y
(c) Z (d) O

18. The most commonly used marker enzyme in clinical diagnosis of prostate cancer is
(a) Amylase (b) Alkaline phosphatase
(c) γ -GTPase (d) Acid phosphatase

19. When an apparently healthy person is diagnosed as unhealthy by a psychiatrist, the reason could be that
(a) The patient was not efficient at his work
(b) The patient was not economically prosperous
(c) The patient shows behavioural and social maladjustment
(d) He does not take interest in sports

20. Transplantation of tissues/organs to same certain patients often fail due to rejection of such tissues/organs by the patient. Which type of immune response is responsible for such rejections
(a) Auto immune response
(b) Humoral immune response
(c) Physiological immune response
(d) Cell-mediated immune response

21. Which of the following vaccines are injected to babies at the age of 1½, 2½ and 3½ months
(a) DPT–Hip.B and Polio (b) Polio and BCG
(c) BCG and DPT–Hib (d) BCG and Hepatitis B
(e) Polio and DPT–Hip.B

22. The protein $\alpha - 1$ antitrypsin is used to treat the disease
(a) Cancer
(b) Rheumatoid arthritis
(c) Alzheimer's disease
(d) Emphysema
(e) ADA deficiency disease in children

2. Diseases caused by viruses

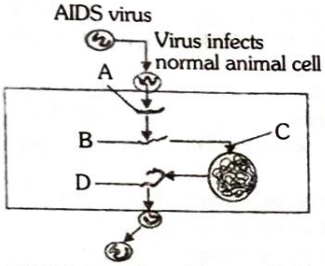
1. 'Polio' is caused by
(a) A bacteriophage
(b) A virus with single strand RNA
(c) A virus with single strand DNA
(d) A virus with double strand DNA

2. Which of the following is a carrier of 'dengue fever'
Or
Dengue is transmitted by
(a) Anopheles (b) Culex
(c) Aedes (d) Musca

3. 'Hydrophobia' (Rabies) is a disease caused by
(a) Virus (b) Nematode
(c) Helminth (d) Protozoan

4. Hepatitis B virus is a
(a) Hepadna Virus (b) Variola Virus
(c) Retrovirus (d) Picornavirus

5. *Aedes aegypti* is a vector of
   (a) Both dengue and yellow fever
   (b) Dengue fever
   (c) Yellow fever
   (d) Japanese encephalitis
6. *Pulse–Polio programme* is organised in our country
   (a) To cure polio (b) To eradicate polio
   (c) To spread polio (d) None of these
7. Which of the following is not a waterborne disease
   (a) Asthma (b) Cholera
   (c) Amoebiasis (d) None of these
8. The following flow chart shows the mode of action of AIDS virus. Identify the labelled sequences A, B, C and D



   (a) A - Viral DNA introduced into cell; B - Viral RNA; C - Viral RNA incorporated into host DNA; D - New viral DNA produced
   (b) A - Viral RNA introduced into cell; B - Viral DNA; C - Viral DNA incorporated into host DNA; D - New viral RNA produced
   (c) A - Viral RNA introduced into cell; B - Viral RNA; C - Viral DNA incorporated into host DNA; D - New viral DNA produced
   (d) A - Viral DNA introduced into cell; B - Viral DNA; C - Viral DNA incorporates into host RNA; D - New viral RNA produced

3. Diseases caused by bacteria

1. 'Diphtheria' disease is connected with
   (a) Lungs (b) Liver
   (c) Throat (d) Blood
2. 'Tuberculosis' is caused by
   (a) Bacterium (b) Virus
   (c) Protozoan (d) Malnutrition
3. Symptoms of diphtheria is
   (a) Suffocation (b) Hydrophobia
   (c) Excessive watering (d) Gum bleeding
4. Pathogenicity of bacteria causing tuberculosis and leprosy is due to
   (a) Cholesterol (b) Ergosterol
   (c) Prostaglandins (d) Glycerol
   (e) Wax-D
5. Biological name of insect (vector) carrying the plague
   (a) Xenopsylla cheopis (b) Anopheles mosquito
   (c) Bacillus pestis (d) Pediculus humanus
6. The disease *chikungunya* is transmitted by
   (a) House fly (b) Aedes mosquito
   (c) Cockroach (d) Female Anopheles
7. Many diseases can be diagnosed by observing the symptoms in the patient. Which group of symptoms are indicative of pneumonia
   (a) Difficulty in respiration, fever, chills, cough, headache
   (b) Constipation, abdominal pain, cramps, blood clots
   (c) Nasal congestion and discharge, cough, constipation, headache
   (d) High fever, weakness, stomach pain, loss of appetite and constipation
8. Identify the wrongly matched pair
   (a) Typhoid - Widal test
   (b) Plague - Viral disease
   (c) Malignant malaria - *Plasmodium falciparum*
   (d) Common Cold - Rhinovirus
   (e) Trichophyton - Ringworm

4. Diseases caused by protozoa & helminthes

1. In amoebiasis, which of the following conditions occurs
   (a) Mild diarrhoea with alternative constipation
   (b) Stool with mucus
   (c) Stool with blood
   (d) All of these
2. The secondary host of malaria parasite is

   Or

   Plasmodium is inoculated in human by
   (a) Male culex (b) Male anopheles
   (c) Female culex (d) Female anopheles
3. The fish used for control of malaria is
   (a) Gambusia (b) Rohu
   (c) Both (a) and (b) (d) None of these
4. A person suffering from malaria feel fever when
   (a) Exoerythrocytic cycle is completed
   (b) Signet ring stage is formed
   (c) When RBC generally ruptured and hemozoin granules are released
   (d) All the above
5. *Entamoeba gingivalis* lives in the
   (a) Intestine (b) Colon
   (c) Pus pockets of pyorrhoea (d) Intestines and colon
6. Diseases are broadly grouped into infectious and non-infectious disease. In the list given below, identify the infectious disease
   (i) Cancer (ii) Influenza
   (iii) Allergy (iv) Small pox
   (a) (i) and (ii) (b) (ii) and (iii)
   (c) (iii) and (iv) (d) (ii) and (iv)
7. The sporozoites that cause infection when a female *Anopheles* mosquito bites a person, are found in
   (a) Liver of the person
   (b) RBCs of mosquito
   (c) Salivary gland of mosquito
   (d) Gut of mosquito
8. Which of the following is not the causal organism for ringworm
   (a) Microsporum (b) Trichophyton
   (c) Epidermophyton (d) Macrosporum
9. Schuffner's dots are related to
   (a) R.B.C. of man
   (b) Leucocytes of frog
   (c) Epithelium of stomach of mosquito
   (d) Entamoeba histolytica
10. Which option is correct for the disease caused by protozoans
   (a) *Herpes simplex* – itching in the genital or anal area
   (b) *Treponema pallidum* – white patches on the tongue or roof of the buccal cavity
   (c) *Neisseria gonorrhoeae* – pain during passing urine
   (d) *Trichomonas vaginalis* – pain during passing urine

11. Match the causative organisms with their diseases

A.	*Haemophilus influenzae*	1.	Malignant malaria
B.	*Entamoeba histolytica*	2.	Elephantiasis
C.	*Plasmodium falciparum*	3.	Pneumonia
D.	*Wuchereria bancrofti*	4.	Typhoid
E.	*Salmonella typhi*	5.	Amoebiasis

(a) A–1, B–5, C–3, D–2, E–4
(b) A–3, B–5, C–1, D–2, E–4
(c) A–5, B–1, C–3, D–4, E–2
(d) A–1, B–3, C–2, D–5, E–4
(e) A–1, B–3, C–5, D–2, E–4

12. Rocky mountain fever is caused by
(a) Virus (b) Fungi
(c) Algae (d) Tick

5. Diabetes mellitus and Cardiovascular diseases

1. Neurons of people suffering from diabetes insipidus do not secrete
(a) Enzyme (b) Steroid
(c) Fatty acid (d) ADH

2. Which of the following diseases is not related to circulatory system
(a) Hypertension (b) Coronary thrombosis
(c) Diabetes mellitus (d) Diphtheria

3. Sickle cell anaemia is due to
(a) Deficiency of vitamin B
(b) Deficiency of iron in the blood
(c) A genetically determined defect of haemoglobin synthesis
(d) Increase in the number of leukocytes in the blood

4. Which of the following is a non-communicable disease
(a) Cholera (b) Diabetes mellitus
(c) Influenza (d) Filariasis

6. Arthritis and Cancer

1. The cancer of the epithelial cells is called
(a) Leukemia (b) Lipoma
(c) Sarcoma (d) Emphysema
(e) Carcinoma

2. The cancer arising in C cells of thyroid gland is called
(a) Papillary cancer (b) Medullary cancer
(c) Anaplastic cancer (d) Follicular cancer

3. Oncogenes were discovered by
(a) S.B. Prussiner
(b) F.P. Rous
(c) A. Fleming
(d) J.M. Bishop and H.E. Vermus

4. In malignant tumors, the cells proliferate, grow rapidly and move to other parts of the body to form new tumors. This stage of disease is called
(a) Metagenesis (b) Metastasis
(c) Teratogenesis (d) Mitosis

5. Cervical cancer can be caused by
(a) *Chlamydia* sp. (b) Human papilloma virus
(c) Herpes simplex virus (d) *Neisseria gonorrhoeae*

6. It causes cancer of vagina
(a) Cadmium oxide (b) Diethylstilbestrol
(c) Aflatoxin (d) Vinyl chloride

7. It is normally a rare cancer but became a marker for AIDS/HIV patients
(a) Squamous cell carcinoma (b) Retinoblastoma
(c) Kaposi's sarcoma (d) Leukemia

8. Which of the following is not used for the treatment of cancer
(a) I^{131} (b) Co^{60}
(c) Taxol (d) Streptokinase

7. Smoking & Alcoholism

1. Tobacco smoke contains carbon monoxide which
(a) Reduces the oxygen-carrying capacity of blood
(b) Causes gastric ulcers
(c) Raises blood pressure
(d) Is carcinogenic

2. Carcinogenic agent is
(a) X–ray radiation (b) U.V. radiation
(c) Nicotine (d) All the above

3. Which one of the following is most carcinogenic present in tobacco smoke
(a) Nicotine (b) Benzopyrene
(c) Caffeine (d) Tar

4. A person who is addict of alcohol gets his liver destroyed because
(a) Liver stores excess of glycogen
(b) Liver stores excess of starch
(c) Liver stores excess of protein
(d) Liver stores excess of fat

8. Drug Addiction

1. Benzodiazepine is an
(a) Antidepressant (b) Antipsychotic
(c) Antianxiety drug (d) Sedative

2. Opiate narcotic drugs are
(a) Anti Anxiety (b) Analgesic
(c) Hypnotic (d) Antihistamine

3. Opium, morphine, heroin, pethidine and methadone are collectively called as
(a) Tranquillisers (b) Stimulants
(c) Hallucinogens (d) Opiate narcotics

4. '*Marijuana*' is extracted from
(a) Dried leaves and flowers of hemp plant
(b) Ergot fungus
(c) Hemp plant (*Cannabis sativa*)
(d) Cocoa plant

5. Drugs that cause malformation in embryo during pregnancy are called
(a) Tranquilisers (b) Teratogens
(c) Alcoholic beverages (d) Nicotine

6. Sports persons are frequently accused of abusing the drug known as
(a) Morphine (b) Cocaine
(c) Heroin (d) Amphetamine

7. Tunnel vision is caused by
(a) Drug addiction (b) Use of tobacco
(c) Use of alcohol (d) Use of LSD

8. The synthetic drug structurally similar to adrenalin are
(a) Amphetamines (b) Barbiturates
(c) Hallucinogens (d) Nicotinic derivatives
(e) Analgesics

9. Naloxone is used as an antidote intravenously for the over dose of
(a) Heroin (b) Opium
(c) Librium (d) Morphine

10. Cyclosporine A, an immunosuppressive drug is produced by
(a) Aspergillus niger
(b) Monascus purpureus
(c) Penicillium notatum
(d) Trichoderma polysporum

11. 'Smack' is a drug obtained from the
(a) Latex of Papaver somniferum
(b) Leaves of Cannabis sativa
(c) Flowers of Datura
(d) Fruits of Erythroxylum coca

9. Mental health and Community health

1. Amnesia is
(a) Loss of memory
(b) Loss of filtration capacity of kidney
(c) Loss of appetite
(d) Loss of blood

2. The psychological disorder, which is characterized by sadness, hopelessness, low self-esteem, decline in interest, energy, concentration and changes in sleep pattern and appetite is called
(a) Anxiety disorder
(b) Obsessive-compulsive disorder
(c) Attention deficit disorder
(d) Mood disorder
(e) Borderline Personality disorder

3. Neurasthenia refers to
(a) Undue concern about health
(b) Traumatic experience like rape
(c) Disorder of sensory perception
(d) Mental inability to concentrate on or enjoy things
(e) A mood upswing

4. In epilepsy, seizure is
(a) Warming cry (b) Fit of convulsions
(c) Loss of consciousness (d) All the above

5. Belonephobia is the fear of
(a) Dust (b) Depth
(c) Needles (d) Water

6. Community health service includes
(a) School and health education
(b) Hygienic environment
(c) Control of communicable diseases
(d) All the above

10. NEET

1. Sensitivity to any allergen is related to **[1996]**
(a) Deviation from the process of immunity
(b) Age of the person
(c) Eating habit
(d) Rise in environmental temperature

2. Passive immunity was discovered by **[1996]**
(a) Robert Koch (b) L. Pasteur
(c) Edward Jenner (d) Emil Von Behring

3. The cell-mediated immunity inside the human body is carried out by **[2013]**
(a) Erythrocytes (b) T-lymphocytes
(c) B-lymphocytes (d) Thrombocytes

4. HIV causes reduction in **[1997, 2006, 2010, 2012]**
Or
HIV virus affects _____ in AIDS patient
(a) T-helper cells only (b) All T-cells
(c) B-cells only (d) Both B and T-cells

5. The antibodies are **[1996, 99; 2012]**
(a) Lipids (b) Germs
(c) Proteins (d) Carbohydrates

6. The term 'active immunity' means **[1999]**
(a) Resistance developed after disease
(b) Resistance deve'oped before disease
(c) Resistance rate of heart beat
(d) Increasing quantity of blood

7. A person likely to develop tetanus is immunized by administering **[2009]**
Or
When a quick immune response is required due to infection of a deadly microbes, the patient is injected with
(a) Dead germs
(b) Preformed antibodies
(c) Wide spectrum antibiotics
(d) Weakened germs

8. If you suspect major deficiency of antibodies in a person, to which of the following would you look for confirmatory evidence **[2007; 2015]**
(a) Serum albumins (b) Serum globulins
(c) Fibrinogen in the plasma (d) Haemocytes

9. Severe Acute Respiratory Syndrome (SARS) **[2004]**
(a) Is caused by a variant of *Pneumococcus*
(b) Is caused by a variant of the common cold virus (corona virus)
(c) Is an acute form of asthma
(d) Affects non-vegetarians much faster than the vegetarians

10. Which one of the following statement is correct **[2009]**
(a) Patients who have undergone surgery are given cannabinoids to relieve pain
(b) Benign tumours show the property of metastasis
(c) Heroin accelerates body functions
(d) Malignant tumours may exhibit metastasis

11. Which one of the following statements is correct with respect to immunity **[2012]**
(a) Preformed antibodies need to be injected to treat the bite by a viper snake
(b) The antibodies against smallpox pathogen are produced by T-lymphocytes
(c) Antibodies are protein molecules, each of which has four light chains
(d) Rejection of a kidney graft is the function of B-lymphocytes

12. Read the following four statements (*A-D*) **[2012]**
(A) Colostrum is recommended for the new born because it is rich in antigens
(B) Chikungunya is caused by a Gram negative bacterium
(C) Tissue culture has proved useful in obtaining virus-free plants
(D) Beer is manufactured by distillation of fermented grape juice
How many of the above statements are wrong
(a) Two (b) Three
(c) Four (d) One

13. A certain patient is suspected to be suffering from Acquired Immunodeficiency Syndrome. Which diagnostic technique will you recommend for its detection **[2011]**
(a) ELISA (b) Australian antigen
(c) HIV test (d) None of these

14. Consider the following four statements A to D regarding kidney transplant and select the two correct ones out of these
(A) Even if a kidney transplant is proper the recipient may need to take immuno-suppressants for a long time
(B) The cell-mediated immune response is responsible for the graft rejection
(C) The B-lymphocytes are responsible for rejection of the graft
(D) The acceptance or rejection of a kidney transplant depends on specific interferons
The two correct statements are **[2015]**
(a) (A) and (B) (b) (B) and (C)
(c) (C) and (D) (d) (A) and (D)

15. Which one of the following can not be used for preparation of vaccines against plague **[2010]**

(a) Formalin-inactivated suspensions of virulent bacteria
(b) Avirulent live bacteria
(c) Synthetic capsular polysaccharide material
(d) Heat-killed suspensions of virulent bacteria

16. At which stage of HIV infection does one usually show symptoms of AIDS **[2014]**

(a) Within 15 days of sexual contact with an infected person
(b) When the infecting retrovirus enters host cells
(c) When viral DNA is produced by reverse transcriptase
(d) When HIV replicates rapidly in helper T-lymphocytes and damages large number of these

17. Which one of the following acts as a physiological barrier to the entry of microorganisms in human body **[2011]**

(a) Skin
(b) Epithelium of Urogenital tract
(c) Tears
(d) Monocytes

18. Select the correct statement with respect to diseases and immunisation **[2011]**

(a) Certain protozoans have been used to mass produce hepatitis B vaccine
(b) Injection of snake antivenom against snake bite is an example of active immunisation
(c) If due to some reason *B* and *T*-lymphocytes are damaged, the body will not produce antibodies against a pathogen
(d) Injection of dead / inactivated pathogens causes passive immunity

19. In higher vertebrates, the immune system can distinguish self-cells and non-self. If this property is lost due to genetic abnormality and it attacks self-cells, then it leads to **[2016]**

(a) Allergic response
(b) Graft rejection
(c) Auto-immune disease
(d) Active immunity

20. In which one of the following options the two examples are correctly matched with their particular type of immunity **[2012]**

	Examples	Type of immunity
(a)	Polymorphonuclear leukocytes and monocytes	Cellular barriers
(b)	Anti-tetanus and anti-snake bite injections	Active immunity
(c)	Saliva in mouth and Tears in eyes	Physical barriers
(d)	Mucus coating of epithelium lining the urogenital tract and the *HCl* in stomach	Physiological barriers

21. Thalidomide is a non-barbiturate sedative drug which was to be given to pregnant women. Its use was withdrawn in 1961 because it resulted in phocomelia. This condition illustrates **[1988]**

(a) Early abortion of foetus
(b) Poor development of foetus
(c) Malformation of foetus
(d) Erythroblastosis fetalis

22. Match each disease with its correct type of vaccine

(A)	Tuberculosis	(I)	Harmless virus
(B)	Whooping cough	(II)	Inactivated toxin
(C)	Diphtheria	(III)	Killed bacteria
(D)	Polio	(IV)	Harmless bacteria

[2015]

	(A)	(B)	(C)	(D)
(a)	(III)	(II)	(IV)	(I)
(b)	(IV)	(III)	(II)	(I)
(c)	(I)	(II)	(IV)	(III)
(d)	(II)	(I)	(III)	(IV)

23. Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain **[2016]**

(a) Activated pathogens (b) Harvested antibodies
(c) Gamma globulin (d) Attenuated pathogens

24. Interferons are **[1996]**

(a) Antiviral proteins (b) Complex proteins
(c) Antibacterial proteins (d) Anticancer proteins

25. In which disease does mosquito transmitted pathogen cause chronic inflammation of lymphatic vessels **[2018]**

(a) Amoebiasis (b) Ringworm disease
(c) Ascariasis (d) Elephantiasis

26. Which of the following is not an autoimmune disease **[2018]**

(a) Vitiligo (b) Alzheimer's disease
(c) Rheumatoid arthritis (d) Psoriasis

27. Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively **[2018]**

(a) Decreased respiratory surface; Inflammation of bronchioles
(b) Increased respiratory surface; Inflammation of bronchioles
(c) Increased number of bronchioles; Increased respiratory surface
(d) Inflammation of bronchioles; Decreased respiratory surface

28. Which of the following is a pair of viral diseases **[1997, 2000; 2009]**

(a) Ringworm, AIDS (b) Common Cold, AIDS
(c) Dysentery, common cold (d) Typhoid, Tuberculosis

29. 'Dengue fever' is caused by **[1993]**

(a) Bacteria (b) *Plasmodium*
(c) Virus (d) *Entamoeba histolytica*

30. Common cold is not cured by antibiotics because it is **[2011]**

(a) Caused by a Gram-negative bacterium
(b) Not an infectious disease
(c) Caused by a virus
(d) Caused by a Gram-positive bacterium

31. T.O. Diener discovered a **[2009]**

(a) Free infectious RNA (b) Free infectious DNA
(c) Infectious protein (d) Bacteriophage

32. '*Chicken pox*' is caused by **[1992]**

(a) Adeno virus (b) Varicella virus
(c) *SV*–40 virus (d) Bacteriophage T-2

33. Which one of the following is a pair of viral disease **[1989; 1996]**

(a) Tetanus and typhoid
(b) Syphilis and AIDS
(c) Whooping cough and sleeping sickness
(d) Measles and rabies

34. If a person shows production of interferons in his body, the chances are that he has got an infection of **[1997]**

(a) Typhoid (b) Measles
(c) Tetanus (d) Malaria

35. Which of the following disease is now considered nearly eradicated from India **[1997]**
(a) Plague (b) Kala azar
(c) Small pox (d) Poliomyelitis

36. Which of the following viruses is not transferred through semen of an infected male **[2015]**
(a) Human immunodeficiency virus
(b) Chikungunya virus
(c) Ebola virus
(d) Hepatitis B virus

37. Which one of the following diseases is due to an allergic reaction **[1995]**
(a) Enteric fever (b) Hay fever
(c) Skin cancer (d) Goitre

38. In human beings retrovirus is considered as a cause of cancer because **[1996]**
(a) In their genome oncogene is present
(b) Their hereditary material made up of single stranded RNA
(c) They have a gene for reverse transcriptase
(d) In their genome there may be cellular proto oncogene

39. Common cold differs from pneumonia in, that **[2012]**
(a) Pneumonia is a communicable disease whereas the common cold is a nutritional deficiency disease
(b) Pneumonia can be prevented by a live attenuated bacterial vaccine whereas the common cold has no effective vaccine
(c) Pneumonia is caused by a virus while the common cold is caused by the bacterium *Haemophilus influenzae*
(d) Pneumonia pathogen infects alveoli whereas the common cold affects nose and respiratory passage but not the lungs

40. 'Leprosy' is caused by **[1991]**
(a) Mycobacterium (b) Salmonella
(c) Monocystis (d) TMV

41. Widal test is used for susceptibility of **[2010, 12]**
(a) Malaria (b) Cholera
(c) Yellow fever (d) Typhoid

42. *Vibrio cholerae* is a motile bacteria belonging to the group of **[1990]**
(a) Monotrichous (b) Lophotrichous
(c) Amphitrichous (d) Peritrichous

43. The disease due to inflammation of vermiform appendix of the digestive system is known as **[1988]**
(a) Amoebic dysentery (b) Appendicitis
(c) Intestinal cancer (d) Appendectomy

44. Which one of the following contains bacterial diseases **[1998; 2000; 2000]**
(a) Cholera, typhoid, pneumonia
(b) Malaria, AIDS, cholera, mumps
(c) Typhoid, tuberculosis, influenza, mumps
(d) Diabetes, malaria, syphilis, mumps

45. Diphtheria is caused by **[1997;1999]**
(a) Bacteria (b) Virus
(c) Nematodes (d) None of these

46. Which one of the following causes plague **[1995]**
(a) Salmonella typhimurium (b) Trichinella spiralis
(c) Yersinia pestis (d) Leishmania donovani

47. The bacterium (*Clostridium botulinum*) that causes botulism is **[2006]**
(a) A facultative aerobe (b) An obligate aerobe
(c) A facultative anaerobe (d) An obligate anaerobe

48. Which one of the following options gives the correct matching of a disease with its causative organism and mode of infection **[2011]**

	Disease	Causative Organisms	Mode of Infection
(a)	Elephantiasis	*Wuchereria bancrofti*	With infected water and food
(b)	Malaria	*Plasmodium vivax*	Bite of male *Anopheles* mosquito
(c)	Typhoid	*Salmonella typhi*	With inspired air
(d)	Pneumonia	*Streptococcus pneumoniae*	Droplet infection

49. Which of the following pairs is not correctly matched **[1995]**
(a) Dengue fever – *Arbovirus*
(b) Plague – *Yersinia pestis*
(c) Syphilis – *Trichuris trichiura*
(d) Sleeping sickness – *Trypanosoma gambiense*

50. Cholera patient is administered by 'saline drip' because **[1996]**
(a) Na^+ ions are essential for the transport of substances across the membrane
(b) Na^+ ions are helpful to conserving water in the body
(c) Cl^- ions are helpful in the formation *HCl* for digestion
(d) Cl^- ions is significant component of blood plasma

51. The main reason why antibiotics could not solve all the problems of bacteria mediated diseases is **[1994]**
(a) Insensitivity of the individual following prolonged exposure to antibiotics
(b) Inactivation of antibiotics by bacterial enzymes
(c) Decreased efficiency of the immune system
(d) The development of mutant strains resistant to antibiotics

52. Match the disease in Column I with the appropriate items (pathogen/prevention/treatment) in Column II

Column I	Column II
A. Amoebiasis	(i) Treponema pallidum
B. Diphtheria	(ii) Use only sterilized food and water
C. Cholera	(iii) DPT Vaccine
D. Syphilis	(iv) Use oral rehydration

[2008]
(a) A-(ii), B-(i), C-(iii), D-(iv)
(b) A-(ii), B-(iii), C-(iv), D-(i)
(c) A-(i), B-(ii), C-(iii), D-(iv)
(d) A-(ii), B-(iv), C-(i), D-(iii)

53. '*Glossina palpalis*' is a vector for **[1992]**
(a) Dengue (b) Filariasis
(c) Gambian fever (d) Plague

54. '*Amoebiasis*' (*amoebic dysentery*) is caused by **[1987, 91, 95; 1992; 1993, 95]**
(a) Plasmodium vivax
(b) Entamoeba gingivalis
(c) Entamoeba histolytica
(d) Trypanosoma gambiense

55. Tse-tse fly is a vector for sleeping sickness which transmits the infective stage of which of the following parasite **[1989, 1993, 2006]**
(a) Leishmania donovani (b) Plasmodium falciparum
(c) Trypanosoma gambiense (d) Wuchereria bancrofti

56. Where will you look for the sporozoites of the malarial parasite **[2011]**
(a) Salivary glands of freshly moulted female *Anopheles* mosquito
(b) Saliva of infected female *Anopheles* mosquito
(c) Red blood corpuscles of humans suffering from malaria
(d) Spleen of infected humans

57. Which of the following is the infective stage of the malarial parasite (*Plasmodium*) **[1986, 88, 89, 98;1989; 1990, 96; 1993, 2001]**
(a) Gametocyte (b) Merozoite
(c) Sporozoite (d) Trophozoite

58. Match the following

A.	*Leishmania donovani*	p. Malaria
B.	*Wuchereria bancrofti*	q. Amoebiasis
C.	*Trypanosoma gambiense*	r. Kala azar
D.	*Entamoeba histolytica*	s. Sleeping sickness
		t. Filariasis

[1991; 2000; 2002]
(a) A - s, B - r, C - q, D - p
(b) A - r, B - s, C - t, D - t
(c) A - r, B - t, C - s, D - q
(d) A - r, B - t, C - q, D - p

59. Which of the following is *not* correctly matched **[2004]**
(a) *Aedes aegypti* – Yellow fever
(b) *Anopheles culicifacies* – Leishmaniasis
(c) *Glossina palpalis* – Sleeping sickness
(d) *Culex pipiens* – Filariasis

60. 'Enterobiasis' disease is caused by **[1988]**
(a) Filarial worm (b) Hook worm
(c) Pinworm (d) Round worm

61. Filarial larva can be collected from man's **[1993]**
(a) Smears of intestinal contents
(b) Peripheral blood at midnight
(c) Smears of spleen
(d) Biopsy of liver

62. Infection of *Ascaris* usually occurs by **[1989, 93; 1996; 2013]**
(a) Imperfectly cooked pork
(b) Tsetse fly
(c) Mosquito bite
(d) Contaminated water and vegetables

63. Elephantiasis (Filariasis) in man is caused by **[1993]**
(a) Ancylostoma duodenale (b) Ascaris lumbricoides
(c) Dracunculus medinensis (d) Wuchereria bancrofti

64. The disease as a result of prolonged clotting time is due to the lack of plasma thromboplastin component (PTC) necessary to the formation of thromboplastin, is **[1988]**
(a) Christmas disease
(b) Hypoprothrombinemia
(c) Haemophilia
(d) Stuart disease

65. Haemophilia is **[1989]**
(a) A type of mosquito lacking haemocoel
(b) The royal disease
(c) Faulty blood clotting
(d) Both (b) and (c)

66. A patient brought to a hospital with myocardial infarction is normally immediately given **[2012]**
(a) Penicillin (b) Streptokinase
(c) Cyclosporin-A (d) Statins

67. Which of the following is an occupational respiratory disorder **[2018]**
(a) Emphysema (b) Botulism
(c) Silicosis (d) Anthracis

68. Blood cancer is excess production of leukocytes. It is
Or
'Blood cancer' is also known as **[1992, 1995, 1998]**
(a) Leucopenia (b) Leucoderma
(c) Leukocytosis (d) Leukemia

69. Which type of cancer is found in lymph nodes and spleen **[1999, 2003]**
(a) Carchroma (b) Sarcoma
(c) Leukaemia (d) Lymphoma

70. Which of the following will be curable in next two decades
(a) Cancer (b) Poliomyelitis
(c) Tuberculosis (d) None of these

71. A metastatic cancerous tumour is termed '*sarcoma*' if the disorder is in **[1994]**
(a) Immune system (b) Epithelial cells
(c) Fibroblasts (d) Circulatory system

72. Which one of the following is not a property of cancerous cells whereas the remaining three are **[2012]**
(a) They compete with normal cells for vital nutrients
(b) They do not remain confined in the area of formation
(c) They divide in an uncontrolled manner
(d) They show contact inhibition

73. Which of the following statements is not true for cancer cells in relation to mutations **[2016]**
(a) Mutations in proto-oncogenes accelerate the cell cycle
(b) Mutations destroy telomerase inhibitor
(c) Mutations inactive the cell control
(d) Mutations inhibit production of telomerase

74. Nicotine acts as a stimulant because it mimics the effect of **[1995]**
(a) Thyroxine (b) Acetylcholine
(c) Testosterone (d) Dopamine

75. Cirrhosis of liver is caused by the chronic intake of **[2009, 2012]**
(a) Opium (b) Alcohol
(c) Tobacco (Chewing) (d) Cocaine

76. Dilation of blood vessels, increase in fat synthesis, low blood sugar and inflammation of stomach are due to the consumption of **[1993]**
(a) Tobacco
(b) Drug addiction
(c) Alcohol
(d) Tobacco and drug addiction

77. Which of following is a hallucinogen **[2013]**
(a) Lysergic acid diethylamide (b) Psilocybin
(c) Mescaline (d) All of these

78. Use of antihistamines and steroids give a quick relief from **[2009]**
(a) Allergy (b) Nausea
(c) Cough (d) Headache

79. Which one of the following is the correct statement regarding the particular psychotropic drug specified **[2008]**
(a) Morphine leads to delusions and disturbed emotions
(b) Barbiturates cause relaxation & temporary euphoria
(c) Hashish causes after thought perceptions and hallucinations
(d) Opium stimulates nervous system and causes hallucinations

80. Which of the following is an opiate narcotic **[1997]**
(a) Barbiturates (b) Morphine
(c) Amphetamines (d) LSD

81. Select the correct statements from the ones given below **[2010]**
(a) Cocaine is given to patients after surgery as it stimulates recovery
(b) Barbiturates when given to criminals make them tell the truth
(c) Morphine is often given to persons who have undergone surgery as a painkiller
(d) Chewing tobacco lowers blood pressure and heart rate

82. Which is the particular type of drug that is obtained from the plant whose one flowering branch is shown below **[2014]**

(a) Stimulant
(b) Pain-killer
(c) Hallucinogenic
(d) Depressant

83. Which one of the following depresses brain activity and produces feelings of calmness, relaxation and drowsiness **[2005]**

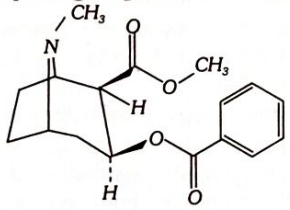
(a) Valium (b) Morphine
(c) Hashish (d) Amphetamines

94. Read the following statement having two blanks (A and B)
"A drug used for __(A)__ patients is obtained from a species of the organism __(B)__."
The one correct option for the two blanks is **[2011]**

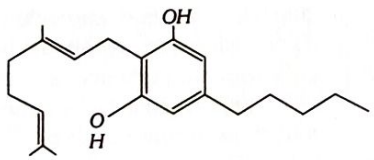
	Blank - A	Blank - B
(a)	Swine flu	*Monascus*
(b)	AIDS	*Pseudomonas*
(c)	Heart	*Penicillium*
(d)	Organ-transplant	*Trichoderma*

85. Identify the molecules (1) and (2) shown below and select the right option giving their source and use

(1)



(2)



Options **[2012]**

	Molecule	Source	Use
(a)	(1) Cocaine	Erythroxylum coca	Accelerates the transport of dopamine
(b)	(2) Heroin	Cannabis sativa	Depressant and slows down body functions
(c)	(2) Cannabinoid	Atropa belladonna	Produces hallucinations
(d)	(1) Morphine	Papaver somniferum	Sedative and painkiller

86. Which one of the following is the correct statement regarding the particular psychotropic drug specified **[2008]**

(a) Barbiturates cause relaxation and temporary euphoria
(b) Hashish causes after thought perceptions and hallucinations
(c) Opium stimulates nervous system and causes hallucinations
(d) Morphine leads to delusions and disturbed emotions

87. Select the correct statement from the ones given below **[2010]**

(a) Chewing tobacco lowers blood pressure and heart rate
(b) Cocaine is given to patients after surgery as it stimulates recovery
(c) Barbiturates when given to criminals make them tell the truth
(d) Morphine is often given to persons who have undergone surgery as a pain killer

88. Which part of poppy plant is used to obtain the drug "Smack" **[2018]**

(a) Leaves (b) Roots
(c) Latex (d) Flowers

89. A person showing unpredictable moods, outbursts of emotion, quarrelsome behaviour and conflicts with others is suffering from **[2006]**

(a) Mood disorders
(b) Addictive disorders
(c) Schizophrenia
(d) Borderline personality disorder (BPD)

11. AIIMS

1. Immune deficiency syndrome in human could develop as a consequence of **[1987]**

(a) AIDS virus infection (b) Defective liver
(c) Defective thymus (d) Weak immune system

2. Antibody formation and immunity production is done by a protein called globulin present in the **[1993]**

(a) Stroma of RBC (b) Haemoglobin of RBC
(c) Plasma (d) Blood platelets

3. Each immunoglobulin has two heavy chains and two light chains, the antigen binding site is present in **[2008]**

(a) Variable region of heavy chain
(b) Variable region of both heavy and light chain
(c) Variable region of light chain
(d) Constant region of both light and heavy chain

4. Which of the following disease is due to an allergic reaction **[2002]**

(a) Goitre (b) Enteric fever
(c) Skin cancer (d) Hay fever

5. The treatment of snake-bite by antivenin is an example of **[2004]**

(a) Artificially acquired active immunity
(b) Artificially acquired passive immunity
(c) Naturally acquired passive immunity
(d) Specific natural immunity

6. Inflammatory response in allergy is caused by the release of one of the following by mast cells **[1999]**

(a) Histamines (b) Antibodies
(c) Antigen (d) None of them

7. Passive immunity is defined as immunity **[1998]**

(a) Inherited from the parents
(b) Achieved through vaccination
(c) Acquired through first exposure to the disease
(d) Achieved through the sera of other animals enriched in antibodies

8. An insect bite may result in inflammation of that spot. This is triggered by the alarm chemicals such as **[2008]**

(a) Histamine and dopamine
(b) Histamine and kinins
(c) Interferons and opsonin
(d) Interferons and histones

9. Rishikesh is famous for the production of **[2004]**

(a) Antibiotics (b) Heavy electricals
(c) Fertilizers (d) Transistorized radios

10. Which of these is most infectious disease **[2010]**

(a) Hepatitis-B (b) AIDS
(c) Cough and cold (d) Malaria

11. The test for 'syphilis' was developed by **[1988]**

(a) Robert Koch (b) Edward Jenner
(c) Wasserman (d) Louis Pasteur

12. 'Bacillary dysentery' is caused by **[1988]**

(a) Salmonella (b) Shigella
(c) Proteus (d) Entamoeba

13. Which test confirms the scarlet fever [1988]
(a) Dick test (b) ECG
(c) UTI test (d) Widal test

14. Kala azar is caused and transmitted respectively by [2003]
(a) Leishmania and Phlebotomus
(b) Trypanosoma and sand fly
(c) Leishmania and tsetse fly
(d) Trypanosoma and Glossina palpalis

15. Which of the following organisms is known to form abscesses in human liver, lungs, brain etc. [1993]
(a) Entamoeba histolytica (b) Monocystis
(c) Plasmodium (d) Fasciola hepatica

16. A non-infectious unnatural and unusual reaction of a person to any substance or condition for which he is hypersensitive is termed as [1993]
(a) Infection (b) Immunity
(c) Allergy (d) Toxin

17. Treatment with 'Alloxan' destroys [1998]
(a) STH cells
(b) Beta–cells of islets of Langerhans
(c) Cells of Sertoli
(d) Cells of Leydig

18. In sickle cell anaemia, the death is caused when the lethal genes are present in [1992]
(a) Heterozygous condition
(b) Homozygous dominant condition
(c) Homozygous recessive condition
(d) Co–dominant condition

19. Which one of the following is a matching pair of a drug and its category [2004]
(a) Amphetamines - Stimulant
(b) Lysergic and Dimethyl amide – Narcotic
(c) Heroin – Psychotropic
(d) Benzodiazepine – Pain killer

20. Select the option having all correctly matched pairs

A. Alkaloids	(i) Carotenoid; Anthocyanin
B. Pigments	(ii) Vinblastine; Curcumin
C. Drugs	(iii) Morphine; Codeine

[2012]
(a) A-i; B-ii; C-iii (b) A-ii; B-iii; C-i
(c) A-iii; B-i; C-ii (d) A-i; B-iii; C-ii

21. Women who consumed the drug thalidomide for relief from vomiting during early months of pregnancy gave birth to children with [2004]
(a) No spleen (b) Harelip
(c) Extra fingers and toes (d) Underdeveloped limbs

22. Irrational fear of disease is [1997]
(a) Algophobia (b) Mysophobia
(c) Pathophobia (d) Haematophobia

23. Tay Sachs disease is caused by deficiency in [2009]
(a) Hexosaminidase (b) Glucocerebrosidase
(c) Galactocerebrosidase (d) Ceramidase

12. Assertion and Reason

Read the assertion and reason carefully to mark the correct option out of the options given below :
(a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion
(b) If both the assertion and reason are true but the reason is not a correct explanation of the assertion
(c) If the assertion is true but the reason is false
(d) If both the assertion and reason are false
(e) If the assertion is false but reason is true

1. Assertion : Myasthenia gravis is an autoimmune disease.
Reason : Immune system rejects the transplant muscles.

2. Assertion : Chlamydiosis is most common bacterial sexually transmitted disease.
Reason : It can be easily differentiated from gonococcal urethritis.

3. Assertion : SCID is a primary immunodeficiency.
Reason : It's a serious congenital immunodeficiency.

4. Assertion : Cancer is contagious and cells can spread from one person to other.
Reason : Cancerous cells are highly differentiated cells.

5. Assertion : Adenoma is a sarcoma.
Reason : Adenoma is located in the adipose tissue.

6. Assertion : There is no chance of transmission of malaria to a man on the bite of a male *Anopheles* mosquito.
Reason : It carries a non virulent strain of *Plasmodium*.

7. Assertion : *Escherichia coli, Shigella sp.* and *salmonella sp.* are all responsible for diarrhoeal diseases.
Reason : Dehydration is common to all types of diarrhoeal diseases and adequate supply of fluids and electrolytes should be ensured.

8. Assertion : UV – rays are carcinogenic in nature.
Reason : UV – rays rupture DNA strands and induce mutations to cause cancers.

9. Assertion : Dye workers generally suffer from bladder cancer.
Reason : These are more exposed to a carcinogenic chemical benzpyrene.

10. Assertion : Sometimes nonsmokers are prone to lung cancer.
Reason : Nonsmokers are also called passive smokers.

11. Assertion : Bacteria and other particles pass down the windpipe and enter the lungs, causing damage to the tissue.
Reason : Smoking reduces ciliary effectiveness.

12. Assertion : Brown sugar is morphine derivative.
Reason : Morphine is the principal opium alkaloid.

13. Assertion : Dope test is used to estimate the level of blood alcohol by analyzing the breath of persons drinking alcohol.
Reason : A drunken person usually feels tense and less talkative.

14. Assertion : Good athletes take Amphetamine.
Reason : Amphetamine brought increase activity and alertness.

15. Assertion : Hypnotic drugs induce sleep.
Reason : Central nervous system is sensitive to hypnotic drugs.

16. Assertion : LSD and marijuana are clinically used as analgesics.
Reason : Both these drugs suppress brain function.