

DISEASES AND IMMUNITY

“Disease” is a very wide term. Any change from the normal state that causes discomfort or disability or impairs the health may be called a disease. The Oxford English Dictionary defines disease as “a condition of the body or some part or organ of the body in which its functions are disturbed or deranged”. A person free of disease is often said to be healthy. This is not fully true. The term “Health” has a very wide scope. The World Health Organization (WHO) gave the following definition of health in 1948 –

“Health” is a state of complete physical, mental and social well-being, and not merely an absence of disease or infirmity”. The WHO definition of health recognizes three dimensions of health : physical, mental and social. The physical health can be determined by various tests, but it is difficult to assess the mental health and social well-being.

3.4.1 DISEASE AGENTS

The disease agent is a factor (substance or force) which causes a disease by its excess or deficiency or absence. These agents are of five main types :

(i) **Biological Agents** : These include viruses, rickettsias, bacteria, fungi, protozoans, helminthes and arthropods. The biological agents are called **pathogens** (Gr. *Pathos* = disease; *genes* = producing).

(ii) **Nutrient Agents** : These comprise food components such as carbohydrates, fats, proteins, minerals, vitamins and water.

(iii) **Chemical Agents** : These are further of two types

(a) **Endogenous Chemical Agents** : These are formed in the body itself and include hormones, enzymes, urea and uric acid.

(b) **Exogenous Chemical Agents** : These enter the body from outside by inhalation, ingestion or inoculation. Pollutants (fumes, gases, dusts, metals) and allergens (spores, pollen) are examples.

(iv) **Physical Agents** : These include heat, cold, humidity, pressure, radiation, electricity and sound.

(v) **Mechanical Agents** : These comprise chronic friction or other mechanical forces which result in injury, sprain, dislocation, fracture.

(vi) **Deficiency and Excess of substances** : e.g. Hormones, enzymes.

Some diseases are caused by genetic disorders and lack or underdevelopment of organs. The agents for certain diseases such as peptic ulcers, coronary heart diseases and hypertension, are not fully known.

3.4.2 TYPES OF DISEASES

The diseases may be broadly classified into two types : Congenital and acquired.

(i) **Congenital Diseases** : These are anatomical or physiological abnormalities present from birth. They may be caused by (i) a single gene mutation (alkaptonuria, phenylketonuria, albinism, sickle-cell anaemia, haemophilia, colour blindness); (ii) chromosomal aberrations (Down's syndrome, Klinefelter's syndrome, Turner's syndrome); or (iii) environmental factors (cleft palate, harelip). Unlike the gene-and chromosome-induced congenital defects, environmentally caused abnormalities are not transmitted to the children.

(ii) **Acquired Diseases** : These diseases develop after birth. They are further of two types : communicable and non-communicable.

(a) **Communicable (Infectious) Diseases** : These diseases are caused by viruses, rickettsias, bacteria, fungi, protozoans and worms.

(b) **Noncommunicable (Noninfectious) Diseases** : These diseases remain confined to the person who develops them and do not spread to others. The non-communicable diseases are of four kinds –

(1) **Organic or Degenerative Diseases** : These diseases are due to malfunctioning of some of the important organs, *e.g.*, heart diseases, epilepsy. Heart diseases result from the abnormal working of some part of this vital organ. Epilepsy may result from abnormal pressure on regions of the brain.

(2) **Deficiency Diseases** : These diseases are produced by deficiency of nutrients, minerals, vitamins, and hormones, *e.g.*, kwashiorkor, beriberi, goitre, diabetes are just a few from a long list.

(3) **Allergies** : These diseases are caused when the body, which has become hypersensitive to certain foreign substance, comes in contact with that substance. Hay fever is an allergic disease.

(4) **Cancer** : This is caused by a uncontrolled growth of certain tissues in the body.

3.4.3 COMMUNICABLE DISEASES

(i) **Meaning** : The diseases which are caused by pathogens (viruses and living organisms) and readily spread from the infected to the healthy persons are called **communicable or infectious diseases**.

A German physician, Robert Koch, listed the following four conditions to establish that a specific pathogen causes a particular disease –

(a) The suspected pathogen should be invariably present in the animals suffering from the disease and should not be found in healthy individuals.

(b) The pathogens isolated from the diseased animal should be grown in a pure culture.

(c) When this culture is inoculated into a healthy host, the latter should develop the disease and show its characteristic symptoms.

(d) The pathogen should be recoverable from the experimental host, and it should be the same as the original one.

Koch's postulates proposed for animal diseases, hold good for human diseases also. However, his conditions do not apply to viruses because they cannot be cultured on artificial media.

(ii) **A communicable or Infectious Diseases** : Caused by pathogens or biological agent. They rapidly spread from one person to another and are of great concern of the society. They are further categorised as :

- (a) Viral diseases
- (b) Bacterial diseases
- (c) Protozoan diseases
- (d) Fungal diseases
- (e) Helminthes diseases
- (f) Sexually transmitted diseases (STD)
- (g) Diseases through blood transfusion

(iii) **Control of Communicable Diseases** : The Communicable diseases, beside simpering health, have been taking a heavy toll of human life in the past. Therefore, their control has always been the major problem of public health. Now, however, effective means of fighting these diseases have been found. This has not only greatly reduced the toll taken by microbes, but has also increased man's life expectancy. Efforts to control the communicable diseases have involved three major steps –

- (a) To know the nature of the disease, *i.e.*, the causative agent and its life-history.
- (b) To find out mode of transmission of the disease, *i.e.*, how the causative agents enter the human body.
- (c) To devise protective measures against the attack of the causative agent of the disease.

(iv) **Reservoir of Infection for Pathogens** : Every pathogen has some reservoir where it normally lives when it is outside the host susceptible to the disease. The reservoir varies for different pathogens. It may be soil, water, animals or other persons called **carriers**. The animals which act as reservoirs do not contract the diseases and are known as reservoir hosts.

(v) **Transmission of Diseases (Pathogens)** : The diseases (pathogens) are transmitted from the reservoirs of infection to the healthy persons in the following ways –

(a) **Direct Transmission** : The pathogens of some diseases reach the human body directly without intermediate agents. This can occur as under –

(1) **Contact with Infected Persons** : Certain diseases produce sores or lesions on the skin. Contact with materials discharged from these sores or lesions brings about infection. Ringworm, athlete's foot, barber's itch, chickenpox, smallpox, syphilis and gonorrhoea are spread by direct contact. Kissing also spreads infection. The diseases that are transmitted by direct contact are called **contagious diseases**.

(2) **Droplet Infection** : Some diseases are caught by merely being in a confined place (room, theatre, bus) with an infected person. The latter throws out tiny droplets of mucus by coughing, sneezing, spitting or even talking. These droplets may contain pathogens (viruses, bacteria) dislodged from nasal membrane, throat, and lungs. Many of these droplets are inhaled. Diphtheria, scarlet fever, influenza, common cold, measles, mumps, tuberculosis, pneumonia, and whooping cough are spread by droplets.

(3) **Contact with Soil** : The bacteria responsible for tetanus and blood poisoning enter the human body from the soil through injuries. Hence, skin injuries should not be neglected.

(4) **Animal Bites** : Virus of rabies, or hydrophobia, is introduced through the wound caused by the bites of rabid animals, most commonly dogs.

(5) **Through Placenta** : In the later part of pregnancy, due to age or injury, the placenta becomes permeable to certain pathogens such as virus of german measles and bacteria of syphilis. The pathogens then pass from the maternal blood into the foetal blood.

(b) **Indirect Transmission** : The pathogens of certain diseases reach the human body through some intermediate agents as explained below –

(1) **Arthropod Vectors** : Insects transmit diseases in two different ways.

❑ Housefly carries the causative organisms of cholera, typhoid, dysentery and tuberculosis on the legs and mouth parts from faeces and sputum to food and drinks. The latter, if taken, cause infection. It also carries the microbes responsible for ophthalmia and conjunctivitis from eye to eye. Ants, cockroaches and house crickets also carry disease germs to articles of food.

❑ Certain blood-sucking insects carry disease-causing organisms in their body and transmit them with bites. Human body-louse spreads typhus, rat flea transmits bubonic plague, tsetse fly spreads African sleeping sickness, sandfly transmits kala-azar and oriental sore, *Aedes* mosquito spreads yellow fever, *Culex* mosquito transmits filariasis, and *Anopheles* mosquito spreads malaria, ticks spread rocky mountain spotted fever.

(2) **Vehicle-borne Method** : The causative organisms of dysentery, cholera and typhoid enter the human digestive tract with food, water and ice. Most of the helminthes which produce diseases in man also get into the body in a similar way. Some diseases are transmitted through blood, *e.g.*, AIDS.

(3) **Air-borne Method** : The pathogens may reach the humans with air and dust. The epidemic typhus spreads by inhalation of dried faeces of infected lice.

(4) **Fomite-borne Method** : Many diseases are transmitted through the use of contaminated articles such as handkerchiefs, towels, clothes, utensils, toys, door handles, taps, soaps, syringes and surgical instruments.

(5) **Unclean Hands** : The unclean hands may carry disease germs to food or mouth. Therefore, hands should be washed before taking meals.

(6) **Human Carriers** : Certain diseases, notably diphtheria and typhoid, are spread by human carriers. The latter are themselves healthy and immune, but have pathogenic organisms in their body. These pathogens are transmitted in the ways already mentioned.

(vi) **Classification of communicable Diseases** : The communicable diseases are classified into seven types according to the nature of their causative agent.

(a) **Viral Diseases** : These are caused by viruses. They include chickenpox, smallpox, influenza, common cold, measles, mumps, polio, rabies, yellow fever, and sinus infections. The viruses are named after the disease they cause.

(b) **Rickettsial Diseases** : These are caused by rickettsias, the obligate intracellular parasitic organisms. They include Rocky Mountain spotted fever, typh's fever, trench fever and Q fever.

(c) **Bacterial Diseases** : These are caused by bacteria. They include diphtheria, scarlet fever, tetanus, typhoid fever, tuberculosis, anthrax, cholera, food poisoning, and meningitis.

(d) **Spirochaetal Diseases** : These are caused by spirochaetes, the long, spiral, corkscrew-shaped bacteria. They cause syphilis.

(e) **Protozoan Diseases** : These are caused by protists. They include amoebic dysentery, malaria, kala-azar, oriental sore and sleeping sickness.

(f) **Fungal Diseases** : These are caused by fungi, the non-green heterotrophic organisms. They include ringworm and athlete's foot.

(g) **Helminthes Diseases** : These are caused by helminthes, *i.e.*, flatworms and roundworms. They include liverrot, schistosomiasis, taeniasis and cysticercosis produced by flatworms; and ascariasis, enterobiasis, filariasis (elephantiasis), trichinosis, Guinea worm disease and hookworm disease caused by roundworms.

(vii) **How Pathogens Cause Diseases** : Pathogens produce diseases in two ways : tissue damage and toxin secretion.

(a) **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 haemorrhages. The bacteria that cause meningitis attack the protective membranes covering the brain. The virus of rabies destroys brain tissue. The polio virus damages motor nerve cells in the spinal cord.

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

(1) **Exotoxins** : These are released as soon as produced. The diseases brought about by exotoxins include tetanus, scarlet fever, diphtheria, and botulism (food poisoning)

(2) **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.

3.4.4 NON COMMUNICABLE DISEASES

The main non-communicable diseases are diabetes, inflammatory diseases of joints such as arthritis, gout, cardiovascular diseases and cancer.

(i) Diabetes Mellitus

(a) Diabetes is characterised by chronic hyperglycemia which is excessive concentration of glucose in the blood.

(b) Diabetes is primarily a result of relative or complete lack of insulin secretion by the β cells of islets of Langerhans in pancreas.

(c) Diabetes is established by blood and urine sugar levels.

(ii) Arthritis

(a) Arthritis is any inflammatory condition of the joints characterised by pain and swelling.

(b) Two kinds of arthritis are : rheumatoid arthritis and osteoarthritis.

(c) There is no cure for arthritis; drugs are available which relieve pain.

(d) Rheumatoid arthritis is characterised by inflammation of the synovial membrane.

(e) A kind of rheumatoid arthritis that occurs in younger people is Still's disease.

(f) Osteoarthritis is a disease common among the elderly persons resulting from erosion of articular cartilage.

(g) Paraplegia refer to weakness or paralysis of both legs, often accompanied by loss of sensation.

(h) Paraplegia is usually caused by a motor vehicle accident, sports accident, fall or gunshot wounds.

(iii) **Gout**

(a) Gout results from accumulation of uric acid crystals in the synovial joints.

(b) Gout is a disease associated with an inborn error of uric acid metabolism that increases production or interferes with the excretion of uric acid.

(iv) **Cardiovascular Diseases**

(a) Cardiovascular diseases refer to a number of diseases associated with the blood vascular system.

(b) Some major cardiovascular diseases are rheumatic heart disease, hypertensive heart disease and coronary heart disease.

(1) **Rheumatic heart disease**

Rheumatic heart disease is an autoimmune disease, most common in children after a severe throat infection by certain strain of *Streptococcus* bacteria.

An antigen on the surface of these bacteria is very similar to an antigen on the surface of myocardium.

The antibodies against *Streptococcus* may react with myocardium and cause heart difficulties.

(2) **Hypertensive heart disease**

Hypertensive heart disease are caused by **hypertension**, *i.e.*, increased blood pressure.

Serious hypertension is a common cause of chronic heart failure particularly in older people.

(c) **Coronary heart diseases**

Coronary heart diseases are characterised by impaired heart function due to inadequate blood flow to the heart.

Angina pectoris is the chest pain caused most often by myocardial anoxia.

Attacks of angina pectoris are often related to exertion, emotional disturbance and exposure to excess cold.

Myocardial infarction is commonly called coronary or heart attack.

Arteriosclerosis is the hardening of arteries due to deposition of cholesterol on arterial wall.

Coronary heart disease may be due to raised serum cholesterol, cigarette smoking, high blood pressure, physical inactivity, obesity and diabetes.

Cyanosis refers to a bluish coloration of the skin and mucous membranes due to too much deoxygenated haemoglobin in the blood.

Cyanosis commonly can be noticed in finger nails, toe nails and lips.

Irrational fear of disease is called **pathophobia**.

3.4.5 IMPORTANT DISEASES

(i) Important viral and Bacterial diseases

(a) **Important diseases caused by Viruses** : The human diseases caused by viruses include influenza, chickenpox, smallpox, measles, rabies, mumps, polio, trachoma, hepatitis and AIDS.

(1) **Influenza** : Influenza, commonly called flu, is a highly infectious disease, which has still not been conquered. It is caused by many kinds of viruses, such as myxovirus. The latter affect the mucous membrane of nose, throat and upper respiratory tract. The common symptoms are discharge from the nose, sneezing, fever, body aches, coughing and general weakness. The infection spreads by discharges from the nose and throat. The incubation period is just from 24-72 hours. Influenza generally lasts for 4 or 5 days. Rest quickens the recovery. If neglected, complications like pneumonia, bronchitis and ear infection may develop. There is no vaccine for influenza.

Influenza tends to occur in epidemic or pandemic form with varying virulence.

(2) **Chickenpox** : It is a common, relatively mild, highly contagious disease of children, generally under 10 years of age. It is caused by a virus called **chickenpox virus** (varicella zoster). Fever, aches and general discomfort are the symptoms. Dewdrop-like sores appear in successive crops, first on the trunk. The sores open and a fluid seeps out a short time later. The disease spreads by direct contact with skin sores or with clothes and other articles soiled with discharges from sores. Incubation period is 2-5 weeks. The sores heal without leaving scars. Preventive measure is isolation of the patient till all crusts fall off. One attack of chickenpox ordinarily gives permanent immunity to the disease. There is no vaccine against chickenpox. Chickenpox is rarely fatal, but in adults attack could be severe.

(3) **Smallpox** : Smallpox is an acute, highly communicable disease. It is caused by a virus named **variola virus**. It starts as a sudden onset of high fever accompanied by headache, backache, and pains all over the body. Rash appears on the 3rd or 4th day of illness. The rash gradually changes into pustules (pimples) containing clear fluid. The pustules finally form scabs which fall off by the 3rd week. The scabs leave behind permanent pitted scars, the **pockmarks**, on the skin. The disease may lead to blindness.

Smallpox spreads by exudate from pustules on the skin of the infected persons. It also spreads by oral and nasal discharges during coughing and sneezing, and by contact with the clothes of the patient soiled with discharges. Its incubation period is about 12 days. It is very serious, disfiguring and highly fatal disease. It has now been largely controlled through vaccination. Smallpox vaccine was first prepared by Edward Jenner in 1798.

(4) **Measles** : Measles is one of the most prevalent and serious diseases of children, generally 3-5 years old. It is caused by a virus named **rubeola virus**. It is characterized by fever, inflammation of nasal mucous membrane, red watery eyes sensitive to light, flushed face, loss of appetite, followed by a typical rash, *i.e.*, eruption of small red spots (rubeola). Infection is spread by discharges from nose and throat (droplet infection). The incubation period is about 10 days. One attack of measles gives life-long immunity. Vaccine which produces active immunity is available.

Patients of measles are likely to catch secondary infection of pneumonia.

(5) **Rabies (Hydrophobia)** : Rabies is a 100% fatal disease. It is caused by a **rabies virus**. The virus enters the human body with saliva of an infected (rabid) animal, generally by the bite of a dog but also of cat. Virus induces biting behaviour in its victim. Fear of water is the main symptom, hence hydrophobia. Incubation period is commonly 1-3 months, but may vary from 10 days to one year. This long period of incubation makes it possible for a rabies vaccination after a bite to develop immunity and prevent the appearance of the disease. The virus of rabies destroys the brain and spinal cord cells. The patient feels severe headache, high fever, restlessness and inability to swallow even fluids due to choked throat. The main preventive measures are eradication of stray dogs and cats and compulsory immunization of pet dogs and cats. The pet should be watched for 10 days after it has bitten someone to make sure that it does not have rabies. Symptoms of rabies in dogs are madness, changed voice and excessive salivation. Rabid dogs should be immediately killed. Treatment of rabies was discovered by Louis Pasteur. It involves a series of 14 injections given after the bite of a dog.

(6) **Mumps (Infectious Perotitis)** : Mumps is an acute communicable disease, generally of children. It is caused by a paramyxovirus, which has preference for salivary glands but may attack other glands of the body also. It is characterized by painful enlargement of one or both the parotid glands. The latter lie below the pinnae. The patient has high fever and difficulty in opening mouth. The virus is spread by discharges from the throat of an infected person (droplet infection) and by direct contact. The incubation period varies from 12-26 days. In adults testes and ovaries may also become inflamed. Infection of testes may cause sterility. One attack of mumps gives life-long immunity.

(7) **Poliomyelitis or Polio (Infantile Paralysis)** : Polio is most prevalent in hot, dry weather. Its common name is inappropriate as it is not necessarily a disease of infants nor does it always cause paralysis. It is caused by a virus known as polio virus. This virus causes inflammation of nervous system and stiffness of the neck. It also destroys motor nerve cells in the spinal cord. Muscles fail to work and shrink due to lack of nerve impulses. This may cause paralysis of limbs in some cases. The virus enters the digestive tract with contaminated food and water and multiplies in the intestinal cells. It then passes into blood stream and lymphatic system, and finally reaches the spinal cord where it starts multiplication. Incubation period is 7-14 days. A patient who recovers from polio has a life time immunity. Now oral vaccine of polio is available.

The polio virus may attack the respiratory centres in the brain. This may stop nerve impulses to the diaphragm and breathing may stop. Then artificial breathing with 'iron lung' becomes necessary.

As polio cripples the children for life and is not curable, its prevention by oral vaccine is essential.

Oral vaccines are developed by Jonas Salk and Albert Sabin in 1940. Public pulse polio immunization programme is organized in India for eradicating polio in 1996.

(8) **Trachoma** : Trachoma is a chronic inflammatory disease of the eyes all over the world. It is caused by a pathogen formerly considered a virus, now regarded an agent occupying a position intermediate between rickettsiae and viruses and named *Chlamydia trachomatis*. The latter affects eyelids, conjunctiva and cornea. It causes granules and may lead to blindness. The common symptoms are inflammation, discomfort and discharge from the eyes. Infection spreads by direct contact, by use of towels, pillows and handkerchiefs of the patients and by flies. The incubation period is 5-12 days. Trachoma can be controlled with antibiotics in early stages. Severe infection needs operation-involving scrapping of granules. Trachoma accounts for 5 percent of the blind cases in India.

(9) **Dengue Fever (Backbone fever):**

Dengue fever is a tropical viral disease spread by the tiger mosquito *Aedes aegypti*.

Dengue fever/Dengue Haemorrhagic Fever (DF/DHF), one of the dangerous diseases, can be detected by **tourniquet test**.

The symptoms of this disease include high fever, severe frontal headache, pain behind eyes, muscles and joint pain, loss of appetite, Measles-like rashes over chest and upper limbs, nausea and vomiting.

Dengue can be prevented through elimination of mosquito breeding places.

(10) **Yellow fever**

Yellow fever, caused by an **arbovirus** is a **haemorrhagic** disease transmitted by the infected *Aedes aegypti*.

Symptoms of yellow fever are headache, fever, vomiting, rupture of veins in kidneys, spleen, liver etc.

In severe cases, the skin of sufferer becomes yellow from jaundice– hence the name yellow fever.

Max Theiler in 1951 got Nobel Prize for the development of vaccine for yellow fever.

(b) **Important Diseases Caused by Bacteria :** The human diseases caused by bacteria include cholera, pneumonia, typhoid, tetanus, diphtheria, whooping cough, tuberculosis, plague, leprosy, syphilis, gonorrhoea, diarrhoea and anthrax.

Bacterial diseases and their pathogens

Disease	Causative Bacterium
(1) Cholera	<i>Vibrio comma (Vibrio cholerae)</i>
(2) Pneumonia	<i>Diplococcus pneumoniae</i>
(3) Typhoid	<i>Salmonella typhi</i>
(4) Tetanus	<i>Clostridium tetani</i>
(5) Diphtheria	<i>Corynebacterium diphtheriae</i>
(6) Whooping cough	<i>Bordetella pertussis</i>
(7) Tuberculosis	<i>Mycobacterium tuberculosis</i>
(8) Plague	<i>Pasteurella pestis</i>
(9) Leprosy	<i>Mycobacterium leprae</i>
(10) Syphilis	<i>Treponema pallidum</i>
(11) Gonorrhoea	<i>Neisseria gonorrhoeae</i>
(12) Diarrhoeal Diseases	<i>Escherichia coli, Shigella dysenteriae, Campylobacter,</i>
(13) Anthrax	<i>Salmonella</i> <i>Bacillus anthracis</i>

(1) **Cholera :** Cholera is an acute diarrhoeal disease. It is caused by a comma-shaped, motile bacterium called *Vibrio comma or Vibrio cholerae*. The organisms live in the intestine. Infection occurs with contaminated food and water. Incubation period varies from a few hours to 2-3 days. The

symptoms of the disease are sudden onset of severe diarrhoea and vomiting. The stools are watery and give rice-water appearance. If the disease is not checked early, it leads to dehydration, loss of minerals, muscular cramps, suppression of urine and death. Rapid replacement of fluid and electrolytes is needed by **oral rehydration therapy**. Cholera epidemics are common in out country during fairs and floods and other natural calamities when water supply and sanitation go out of a gear. Preventive measures include proper community sanitation, personal cleanliness, and taking boiled water and heated food. Cholera vaccine is useful during epidemic and visit to a fair. It, however, provides immunity for a short period, about 6 months. Visits to cholera affected places and families should be avoided. *Vibrio cholerae* first Isolate by Robert Koch in 1883.

(2) **Pneumonia** : Pneumonia is a serious disease of the lungs. Lymph and mucus collect in the alveoli and bronchioles. With the result, the lungs do not get sufficient air to support life. The disease is caused by a bacterium *Diplococcus pneumoniae*. It usually follows lowered body resistance due to exposure or infection of some other disease such as influenza. Infection spreads by sputum of the patient. Incubation period is just 1-3 days. Pneumonia commonly occurs in old people.

(3) **Typhoid** : Typhoid is characterized by constant fever. It is caused by a rod-like, motile bacterium named *Salmonella typhi*. The organisms live in the intestine and cause lesions in the intestinal wall. The disease spreads by contaminated food and water. Intestinal discharges of the patient contain the parasites. Incubation period varies from 1-3 weeks, average 2 weeks. Preventive measures include proper community sanitation, screening of water supply and food from contamination by flies, and personal cleanliness. Natural calamities like floods and hurricanes may cause epidemic of the disease. Typhoid vaccine provides immunity for about three years. Georges Fernand I. Widal (1896) devised the Widal Test for Diagnosis of Typhoid.

(4) **Tetanus (Lockjaw)** : Tetanus is a major endemic recurring in a locality disease in our country. It is responsible for a high mortality of infants and their mothers. It is caused by anaerobic bacillus *Clostridium tetani*. The bacillus enters the body through wounds and burns, and also by use of improperly sterilized surgical instruments. Incubation period varies from four days to three weeks. Tetanus results in painful muscular spasms and paralysis, which usually begins with jaw and neck muscles. This has led to the name “lockjaw”. The disease is often fatal.

Tetanus organisms live in the intestine of horses and other animals without doing any harm. The spores are, therefore, abundant in the soil manured with animal dung. They are also present in the road and street dust because the animals pass out dung as they move about. Spores may survive for 60 or more years in the contaminated soil. On entering the body by way of wounds, the spores release active bacteria. The latter multiply and secrete a powerful toxin **tetanospasmin** into the tissue, and blood carries it to the central nervous system. The toxin brings about tetanus.

It is advisable to have tetanus toxoid injection in case of an injury in a road accident or a cut contaminated with street dust or animal dung. This will prevent tetanus. All of us should have toxoid immunization as a safe preventive measure against this dangerous disease. Tetanus toxoid gives active immunity. Anti tetanus serum (A.T.S.) produces passive immunity. It is now a practice to immunize the infants against diphtheria, whooping cough (pertussis) and tetanus simultaneously by DPT or triple vaccine.

(5) **Diphtheria** : Diphtheria is a serious disease of 2-5 years old children. It may attack adults also. It tends to occur in an epidemic form. It is caused by a rod-shaped bacterium named *Corynebacterium diphtheriae*. It commonly attacks the mucous membrane of nose, throat and tonsils. A semisolid material oozes from the affected region and forms a tough membrane over it. It may block the air passage. An acute case may need throat surgery. The bacteria may invade the heart, causing fatal heart blockade. The disease spreads by discharges from the affected regions (droplet infection). Incubation period is 2-5 days. Diphtheria antitoxin rids the victim of infection fully if given within 24 hours of the appearance of the symptoms. The symptoms include high fever, sore throat, difficulty in breathing due to choking. After 24 hour the antitoxin is not effective. Babies should be immunised with DPT vaccine within the first six weeks of birth.

(6) **Whooping Cough (Pertussis)** : Whooping cough is primarily a disease of children. It is usually not serious in older children, but is often fatal in infants. It affects the respiratory tract. It is caused by a bacterium *Bordetella pertussis*. It spreads by discharges from the throat of infected person (droplet infection) and direct contact. Incubation period is 10-16 days. Fever, severe coughing, vomiting and characteristic gasping “whoop” (loud, crowing inspiration) are common symptoms. Infants strangle from accumulation of mucus. Whooping cough vaccine (DPT) can immunize the infants.

(7) **Tuberculosis** : Tuberculosis, commonly called T.B., is a very serious disease. About half a million people die of this disease each year in our country. It is especially common among poor people living in dingy, ill-ventilated, congested localities of big cities. It is caused by a rod-shaped bacterium named *Mycobacterium tuberculosis*. Tuberculosis (TB) or “consumption” is a bacterial disease caused by *Mycobacterium tuberculosis*. It commonly affects the lungs, where small tubercles are formed but may attack any part of the body, including the brain. Infection spreads by sputum from the person suffering from the disease (droplet infection). Incubation period is quite variable. The bacteria damage tissues and release a toxin named **tuberculin** which produces the disease. Symptoms of pulmonary tuberculosis are fever, cough, blood-containing sputum, pain in the chest and loss of weight. Contrary to common belief, tuberculosis is curable. Treatment in early stages of the disease yields best results. It includes rest, good diet, drugs, surgery, health education and rehabilitation. BCG vaccine gives considerable protection against tuberculosis, but it should be used as a supplemental measure rather than to replace other measure of control. World T.B. Day is celebrated on 24 March.

(8) **Plague** : Plague is essentially a disease of the rats, and is one of nature’s methods of periodically reducing the rat population. Man is affected incidentally. The disease is caused by a rod-shaped, nonmotile bacillus, *Pasteurella pestis*. It is carried from rat to rat by rat fleas, chiefly, *Xenopsylla cheopis*. The rat fleas leave the rats that die of plague, and bite human beings, thus infecting them with the disease. Death of the rats in a house may indicate the onset of plague. Plague is normally not spread from man to man. The incubation period of plague is 2-6 days. The disease is characterized by high fever, prostration (extreme weakness), and painful bubo (enlargement) of lymph nodes, generally in the groin or armpit. Plague has high mortality. A plague epidemic in Europe in 1348 reduced the population to one-third. Plague reached India in 1895 with ships from Hong Kong. Bubonic plague is caused by yersinia pestis (formerly pasteurella pestis) wayson stain test is used for susceptibility of plague. Bubonic plague is basically a blood disease.

Preventive measures include killing the rats, having rat-proof ships and houses, killing the rat fleas when plague outbreak is suspected and immunization with plague vaccine.

(9) **Leprosy (Hansen's Disease)** : Leprosy is a chronic infectious disease, endemic in warmer climates. It is caused by a bacillus named *Mycobacterium leprae*, which was discovered by Hansen. It primarily affects the skin, mucous membrane and peripheral nerves, but may affect internal organs also. Its symptoms include hypopigmented skin patches, partial or total loss of sensation in the affected areas, lesions, ulcers, nodules, scales, deformity of fingers and toes, wasting of body parts, and thickened nerves. Infection occurs by prolonged and close contact with the leprosy patients. Babies isolated from leper parents early in life grow into normal healthy individuals. The bacilli leave the body in nasal discharge, from the throat during coughing, sneezing and even speaking, and through broken skin lesions. Incubation period is not exactly known. It is commonly between 2 to 5 years, but may vary from a few months to 30 or 40 years. Some 10.7 million people suffer from leprosy in Asia and Africa (WHO report). Leprosy has a special position among the communicable diseases because of the long duration of the disease, the frequency of disabilities and the social stigma it carries. It is a curable disease and the public should be educated about it and about the rehabilitation of the cured patients in society.

(10) **Sexually Transmitted Diseases (STD)** : The sexually transmitted diseases, also called **venereal diseases** (VD), spread by sexual intercourse with infected persons. The major venereal diseases are syphilis and gonorrhoea. These are international diseases. There are about 50 million cases of syphilis and 150 million cases of gonorrhoea in the world. However, the reported cases are merely a fraction of the actual prevalence of these diseases. The venereal diseases constitute a major medical problem in India.

Syphilis : Syphilis is caused by spirochaete bacterium, *Treponema pallidum*. It affects the mucous membranes in genital, rectal and oral regions, and causes lesions. Infection occurs by contact. Incubation period is about 3 weeks. The mothers may transmit the disease to their new-born babies. Syphilis is an easily curable disease. Syphilis is commonly known as “**French disease**” or “**French pox**” caused by a spirochete, *Treponema pallidum*.

Gonorrhoea : Gonorrhoea is caused by a diplococcus bacterium, *Neisseria gonorrhoeae*. The victim feels burning sensation during urination. Incubation period is 2 to 5 days. The disease affects the mucous membrane of the urogenital tract, and spreads by sexual contact. The infection may spread to other parts of the body and cause arthritis and female sterility. The children born to afflicted mothers often suffer from eye infection (gonococcal ophthalmia). Gonorrhoea is also easily curable.

(11) **Diarrhoeal Diseases** : These are a group of intestinal infections, including food poisoning. The prominent symptom of all such infections is diarrhoea. Infections spread through contaminated food, water, drinks, hands, clothes, bed sheets and utensils. The causative agents are mainly bacteria such as *Escherichia coli*, *Shigella dysenteriae*, *Campylobacter* and *Salmonella*. A protozoan *Giardia intestinalis* and some viruses also act as causative agents. Toxins released by *E. coli* cause mild diarrhoea (loose and frequent evacuation of bowels) to severe dehydration. Shigellosis caused by *Salmonella*. The protozoans *Giardia intestinalis* and *Balantidium coli* and some viruses also act as causative agents. Toxins released by *E. coli* cause mild diarrhoea (loose and frequent evacuation of bowels) to severe dehydration. Shigellosis caused by *Shigella* is characterised by frequent passage of

stools with blood and mucus and abdominal cramps. All diarrhoeal diseases caused dehydration, which can be countered with **oral rehydration therapy**, *i.e.*, intake of adequate fluid and electrolytes.

Food infection should be distinguished from food poisoning. In food infection, food merely transfers bacteria into the body. In food poisoning, bacteria grow in food and release toxins. When such a food is taken, toxins are absorbed into the blood from the digestive tract. They affect the body quickly, causing gastrointestinal trouble and other effects. *Clostridium botulinum* is a Gram positive anaerobic bacillus responsible food poisoning known as botulism. The bacilli release exotoxin to the environment, which is one of the most potent neurotoxic substance produced by microbes. Bubonic plague is caused by *Yersinia pestis* (formerly *Pasteurella pestis*), a Gram-negative rod.

(ii) **Important Diseases Caused by Protozoans** : Protozoans cause many diseases in humans. The major ones in our country are amoebiasis, diarrhoea, ciliary dysentery and malaria. Some diseases are given below:

(a) **Amoebiasis (Amoebic Dysentery, Enteritis)** : Amoebiasis is widespread in India due to poor sanitary conditions and polluted drinking water. The disease is caused by **Entamoeba histolytica** all over the world. The parasites live in the large intestine and lower part of the small intestine of humans. Infection occurs by ingesting cysts with food and drinks.

The parasites secrete a proteolytic enzyme, **cytolysin**, that erodes the mucous membrane of the intestine. This may form bleeding ulcers that produce dysentery. In this disease, the patient passes out blood and mucus with the stools. He also experiences severe gripping pain in the abdomen, fever, nausea, exhaustion and nervousness. In chronic cases, the intestinal wall is punctured. This may prove fatal. The parasites that invade the intestinal mucous membrane may be carried by the blood stream to the liver, lungs and brain. In these organs, the parasites, feed on cells and produce severe lesions and abscesses. The latter may cause death.

(b) **Diarrhoea** : Diarrhoea is caused by a flagellate protozoan named *Giardia intestinalis*. *Giardia* was discovered by Leeuwenhoek in his own stools in 1681. It is the first human parasitic protozoan known. It is found all over the world. It inhabits the upper parts (duodenum and jejunum) of human small intestine all over the world. It lives firmly attached to the intestinal mucous membrane by adhesive disc, each perched on a separate cell. Nutrition is saprozoic, *i.e.*, fluid food is absorbed through the body surface. Reproduction occurs by longitudinal binary fission. At intervals the parasites change into cysts which escape with the host's faeces. Infection occurs by taking cysts with food and drinks. By covering the mucous membrane of the intestine, the parasites check or reduce the absorption of food, particularly fats. This causes **diarrhoea or giardiasis** (very loose and frequent stools).

Preventive Measures : Properly washing hands, fruits and vegetables before eating, and protecting the food articles from dust, flies, ants and cockroaches can check human infection.

(iii) **Malaria** : Malaria has been for thousands of years a very serious disease of the tropical and temperate regions. It was almost eliminated a few years back with the efforts of World Health Organization (WHO) and our National Malaria Eradication Programme (NMEP), but unfortunately, it has appeared again.

Symptoms : The attack of malaria is preceded by yawning, tiredness, headache and muscular pain. During the fever, the patient feels chilly and shivers, and has acute headache, nausea and high

temperature. After a few hours, the body perspires freely and the temperature becomes normal. The cycle is repeated if no medicine is taken. Blood smear made during fever shows the malarial parasites. No parasites are seen at other times. In chronic cases, there is general weakness and anaemia (paleness) due to large-scale destruction of red blood corpuscles. This is also accompanied by enlargement of spleen and liver.

Cause : Malaria is caused by the toxins produced in the human body by the malarial parasites, *Plasmodium*.

Transmission : The malarial parasites are carried from the infected to the healthy persons by the female *Anopheles* mosquito. The mosquito picks up the parasites with the blood, when it bites an infected person. When this infected mosquito bites a healthy person, parasites migrate into his blood with the saliva, which the mosquito injects before sucking up blood to prevent its clotting.

Types : There are four species of *Plasmodium*, which cause different kinds of human malaria –

(1) *P. Vivax* : It causes **benign tertian malaria**, which attacks every third day, *i.e.*, after 48 hours. The fever is mild and seldom fatal. This species is wide-spread in the tropical and temperate regions.

(2) *P. ovale* : It also causes benign tertian malaria, which recurs every 48 hours. This species is found only in West Africa and South America.

(3) *P. malariae* : It causes **quartan malaria**, which recurs every fourth day, *i.e.*, after 72 hours. This species is found in both tropical and temperate regions, but it is not very common.

(4) *P. falciparum* : It alone is capable of causing three types of malaria, *viz.*, quotidian malaria, which attacks almost daily, malignant tertian malaria, which occurs every 48 hours, but is very severe and often fatal; and irregular malaria. This species is found only in the tropical region.

Incubation Period : The incubation period for malaria caused by *Plasmodium vivax* is about 10 days.

History : The name malaria was given by Mucculoch in 1872 on the belief that it was caused by the foul air of the marshy localities (Italian *mala* = bad, *aria* = air). In 1880 Laveran, a French army medical officer, discovered the malarial parasites in the blood of a malarial patient. Sir Ronald Ross of the Indian Medical Service established the “mosquito-malaria relationship” on August, 29 1897, ever since called the “Mosquito Day”.

Life-history : *Plasmodium* completes its life cycle in two phases and two hosts : asexual phase in the human host and sexual phase in the female *Anopheles* mosquito host.

❑ **Ciliary Dysentery :** Ciliary dysentery is caused by a ciliate protozoan named *Balantidium coli*. The latter inhabits the human large intestine (colon) all over the world. It feeds on tissue fragments, red blood corpuscles, bacteria and faecal matter. It reproduces asexually by transverse binary fission and sexually by conjugation. The latter is followed by cyst formation. Cysts pass out in the host's faeces. Infection occurs by ingesting cysts with food and drinks. *Balantidium coli* causes ulcers in the colon and invades mucous membrane by secreting **cytolysin**. This generally results in diarrhoea, but may lead to severe or fatal dysentery.

(iv) **Important Diseases Caused by Helminthes :** Helminthes (flatworms and roundworms) cause many diseases in man. The more common are taeniasis, ascariasis and filariasis (elephantiasis).

(a) **Taeniasis** : Taeniasis is caused by the pork tapeworm **Taenia solium**. This tapeworm lives in the human intestine, firmly anchored by hooks and suckers. It lacks mouth and absorbs host's digested food through its skin (saprozoic nutrition). It is hermaphrodite and undergoes self-fertilization. There is normally a single worm in one host. This worm has enormous power of reproduction.

(1) **Life-history** : *Taenia solium* has about 4 metres long, white, flat, ribbon like body comprising a small knob-like scolex, a short neck and a very long strobila of about 850 proglottides. Capsules of the worm pass out in host's faeces and are ingested by pigs. They release embryos which reach the pig's striated muscles, encyst and develop into infective larvae. There may be about 3,000 larvae in 500 grams of pork. The infected pork has brownish spots and is called "measly pork". Man gets infection by taking raw or undercooked measly pork. Pink or red appearance of the pork, when cut into slices, is an indication of its being undercooked. In the human intestine, the cyst wall breaks down, releasing the larva. The latter grows into an adult worm in 3 to 4 months.

(2) **Gravid proglottids** : These segments are pregnant uterus, which possess fertilized ova, and all structures disintegrate in it the dropping of gravid proglottids is called apolysis.

(3) **Effect on the Host (Pathogenicity)** : The tapeworm infection produces little effect on a person with a sound health. Weak person may develop a disease named taeniasis. This disease is characterized by abdominal pain, indigestion, vomiting, constipation, loss of appetite (anorexia) and weight, insomnia, lowered resistance to other diseases and nervous disorder.

(4) **Cysticercosis** : Tapeworm infection can also occur by taking improperly washed vegetables and water contaminated with the tapeworm capsules. Thus, the vegetarians can also get tapeworm infection. The capsules release embryos which may reach eyes or brain, develop into larvae, called **cysticerci**, that encyst. The cysts so formed may cause blindness or epilepsy-like symptoms and prove fatal.

(b) **Ascariasis** : Ascariasis is caused by the roundworm *Ascaris lumbricoides*. This roundworm lives in the human small intestine. It lies free, having no organs for attachment. It takes host's digested food by sucking through the mouth (holozoic nutrition).

(1) **Life-history** : Man gets infection by taking *Ascaris* eggs with food and water. Children become infected by ingesting soil. Eggs hatch in the host's intestine in a few hours, each liberating a tiny (0.2 to 0.3 mm. long) worm called **juvenile**. The latter grows into an adult worm in 2 to 2.5 months. The adult worm has cylindrical body tapering at each end, 20 to 40 cm. long in female and 15-30 cm. long in male. Male's hind end is curved ventrally. Mature male and female worms copulate in the host's intestine, where the female later lays eggs. The eggs pass out in the faeces, and can remain alive in the soil for several years. The eggs are carried to food and drinking water by air, flies and cockroaches.

(c) **Filariasis (Elephantiasis)** : Filariasis is caused by the **filarial worm**, *Wuchereria bancrofti*.

(1) **Life-history** : The adult male and female worms are 40 mm. and 80 mm. long respectively. They live in the lymphatics and connective tissues. The worm is viviparous. The female delivers young worms called **microfilariae**. The latter shift to deep blood vessels. At night they migrate to the superficial blood vessels of the skin and are sucked by *Culex* mosquito, the intermediate host. The mosquito injects them into the blood of a healthy human being. From the blood, they migrate to the lymph vessels and lymph glands. Here they grow into adults in about a year.

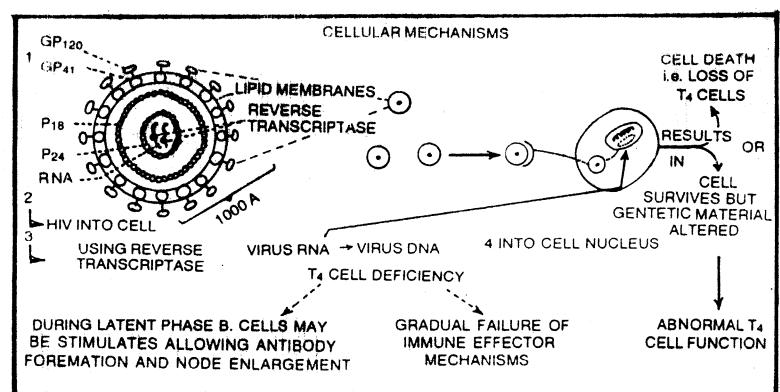
(2) **Effect on the Host (Pathogenicity)** : In acute cases the filarial infection causes fever. In chronic cases the worms block the lymph vessels. This causes enormous swelling of the affected part, which may be foot, leg, or scrotum. This is followed by thickening of skin and subcutaneous tissue. Enlargement of legs gives the disease its name, **elephantiasis**.

(d) **Ancylostomiasis (Hookworm Disease)** : Ancylostomiasis is caused by the hookworm, *Ancylostoma duodenale*. It lives in the small intestine firmly attached to its wall. It feeds on blood and bits of mucous membrane. A secretion from its pharyngeal gland prevents clotting of blood while the worm is feeding and causes considerable loss of blood after the worm has left the wound. Eggs laid by the female worm in the host's intestine escape with the faeces and hatch in the moist soil. The larvae feed on organic debris and get into the human body by boring through the skin of the feet, causing "ground itch." They enter the veins, and passing through the heart, lungs, trachea, pharynx and oesophagus, reach the intestine. Here, they mature. Adult worms live for about 5 years. Male worm is 8-11 mm. long, and female 10-13 mm.

(v) Sexually Transmitted diseases

(a) **Acquired Immune Deficiency Syndrome (AIDS)** : AIDS was first noticed in USA in 1981. It 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. It is caused by a virus named HIV (Human Immunodeficiency Virus). The virus was discovered in 1984 by American and French scientists independently. It is heartening to know that only 10% of the people who get AIDS virus infection actually develop full-blown AIDS. World AIDS day is celebrated on 1st December.

AIDS, however, is primarily a sexually transmitted disease. Semen can contain the virus, but more likely an infected lymphocyte does. About 64% of the total case in the United States are homosexual men who practice anal intercourse. Unlike the vagina, the epithelial lining of the rectum is a thin, single-celled layer that is easily torn during intercourse. Nevertheless, heterosexual transmission does occur and may become more prevalent as more females become infected. One unhappy side effect to female infection is the fact that viruses and infected lymphocytes can pass to a foetus via the placenta or to an infant via the mother's milk. Presently, infected infants account for about 2% of all AIDS cases.



Symptoms of AIDS : An HIV infection can be divided into 3 stages.

(1) **Asymptomatic Carrier** : Only 1%-2% of those newly infected have mononucleosis-like symptoms that may include fever, chills, aches, swollen lymph glands, and an itchy rash. These symptoms disappear, and there are no other symptoms for 9 months or longer. Although the individual

exhibits no symptoms during this stage. He or she is highly infectious. The standard HIV blood test for the presence of antibody becomes positive during this stage.

(2) **AIDS Related Complex (ARC)** : The most common symptom of ARC is swollen lymph glands in the neck, armpits, or groin that persist for 3 months or more. There is severe fatigue unrelated to exercise or drug use; unexplained persistent or recurrent fevers, often with night sweats; persistent cough not associated with smoking, a cold, or the flu; and persistent diarrhoea. Also possible are signs of nervous system impairment, including loss of memory, inability to think clearly, loss of judgment, and/or depression.

When the individual develops non-life threatening and recurrent infections such as thrush or herpes simplex, it is a signal that full-blown AIDS will occur shortly.

(3) **Full-Blown AIDS** : In this final stage, there is severe weight loss and weakness due to persistent diarrhoea and usually one of several opportunistic infections is present. These infections are called opportunistic because the body can usually prevent them – only an impaired immune system gives them the opportunity to get started. These infections include the following –

Pneumocystis carinii pneumonia : There is not a single documented case of this type of pneumonia in persons with normal immunity.

Toxoplasmic encephalitis : In AIDS patients, this infection leads to loss of brain cells, seizures, and weakness.

Mycobacterium avium : This is an infection of the bone marrow that leads to a decrease in red blood cells, white blood cells, and platelets.

Kaposi's Sarcoma : A cancer of the blood vessels that causes reddish purple, coin-size spots and lesions on the skin.

(4) **Treatment of AIDS** : The drug **zidovudine** (also called azidothymidine, or AZT) and dideoxyinosine (DDI) prevent HIV reproduction in cells. Proteases are enzymes HIV needs to bud from the host cell; researchers are hopeful that a protease inhibitor drug will soon be available.

A number of different types of vaccines are in, or are expected to be in, human trials. Several of these are sub unit vaccines that utilize genetically engineered proteins that resemble those found in HIV. For example, HIV-1, the cause of most AIDS cases has an outer envelop molecule called GP 120. When GP 120 combines with a CD4 molecule that projects from a helper T lymphocyte, the virus enters the cell. There are sub unit vaccines that make use of GP 120. An entirely different approach is being taken by **Jonas Salk**, who developed the polio vaccine. His vaccine utilizes whole HIV-1 killed by treatment with chemicals and radiation. So far, this vaccine has been found to be effective against experimental HIV-1 infection in chimpanzees, and clinical trials will occur soon.

AIDS Prevention : Shaking hands, hugging, social kissing, coughing or sneezing and swimming in the same pool do not transmit the AIDS virus. You cannot get AIDS from inanimate objects such as toilets, doorknobs, telephones, office machines, or household furniture.

HIV has been isolated from semen cervical secretions, lymphocytes, plasma, cerebrospinal fluid, tears, saliva, urine and breast milk. The secretions known to be especially infectious are semen, cervical secretions, blood and blood products. Infection is spread :

- By sexual intercourse, vaginal and anal

- By infected blood, blood products, donated semen and organs

- By contaminated needles used :

- (1) During the treatment of patients
- (2) When drug abusers share needles

- From an infected mother to her child :

- (1) Across the placenta before birth
- (2) While the baby is passing through the birth canal
- (3) Possibly by breast milk

The presence of antibodies to HIV indicates that the individual has been exposed to the virus but not that a naturally acquired immunity has developed. All those who have antibodies in their blood do not develop AIDS although they may spread the infection to others. A few weeks after infection there may be an acute influenza-like illness with no special features, followed by a period of two or more years without symptoms. When AIDS Develops the main complications are widespread recurrent opportunistic infections and tumours. Outstanding features include:

- Pneumonia, commonly caused by *Pneumocystis carinii*, but many other microbes may be involved.

- Persistent nausea, diarrhoea and loss of weight due to recurrent infections of the alimentary tract by a wide variety of microbes.

- Recurrent meningitis, encephalitis and brain abscesses, caused by opportunistic microbes and possible by HIV, followed by deterioration in neurological functions, characterised by forgetfulness, loss of concentration, confusion, apathy, dementia, limb weakness, ataxia, incontinence.

- Widespread skin eruptions, e.g., eczema, psoriasis, cellulitis, impetigo, warts, shingles, 'Cold sores'.

- Generalised lymphadenopathy, *i.e.*, noninfective enlargement of lymph nodes.

- Malignant tumours,

a. lymphomas, *i.e.* tumours of lymph glands.

- Kaposi's sarcoma, consisting of tumours under the skin and in internal organs.

The following behaviour will help prevent the spread of AIDS :

- Do not use alcohol or drugs in a way that prevents you from being in control of your behaviour. Especially, do not inject drugs into veins, but if you are an intravenous drug user and cannot stop your behaviour, always use a sterile needle for injection or one cleansed by bleach.

- Refrain from multiple sex partners, especially with homosexual or bisexual men or intravenous drug users of either sex. Either abstain from sexual intercourse or develop a long-term monogamous (always the same partner) sexual relationship with a partner who is free of HIV and is not an intravenous drug user.

- If you uncertain about your partner, always use a latex condom. Follow the directions, and also use a spermicide containing nonoxynol-9, which kills viruses and virus-infected lymphocytes. The risk of contracting AIDS is greater in persons who already have a sexually transmitted disease.

Diagnosis : Once the host is infected by HIV. HIV detected by the ELISA Test. (Enzyme-linked immunosorbent assay) a positive Elisa should be confirmed using another test called the western blot test.

(b) **Hepatitis :** It is a liver inflammation caused by virus, use of many drugs, chemicals and alcohol. Hepatitis may be of following types :

Hepatitis A : It is caused by *Hepatitis A* virus. It is transmitted through infected food, water, clothes and faeces. It may occur in epidemic form especially in areas where hygiene is poor. This virus does not damage liver cells.

Hepatitis B : It is caused by *Hepatitis B* virus. It is transmitted by infected food and blood products; such as plasma or by medical instruments contaminated with infected blood. It results in the swelling of liver cells.

Hepatitis is also caused by poisonous chemicals, alcohol, as a side effect of certain drugs and from severe amoebiasis.

Complete bed rest and protein free diet is the only recommended treatment. An intramuscular injection of *Gamma globulin* can protect against infectious hepatitis for about 6 months.

Infectious hepatitis, also called epidemic jaundice, is inflammation of liver due to infection by two viruses : **infectious hepatitis virus** and **serum hepatitis virus**. It is an acute communicable disease and may be fatal. An attack of viral hepatitis usually provides protection against a second attack. Incubation period is usually 20 to 35 days. Infection spreads from person to person by faecal-oral route. Contamination of water and food may cause epidemic. Liver cells are damaged, releasing bilirubin that causes jaundice.

The control measures are (i) sanitary disposal of excreta; (ii) prevention of contamination of water, food and milk; (iii) control of flies; (iv) screening of kitchens and latrines; and (v) personal cleanliness and also that of food handlers. During epidemic, boiled or chlorinated water should be taken.

(vi) **Cancer :** Cancer is an abnormal and uncontrolled division of cells, known as cancer cells, that invade and destroy the surrounding tissues. Generally **Cancer is defined as uncontrolled proliferation of cells without any differentiation**. Cancer cells are different from normal cells in some aspects. They do not remain confined to one part of the body. They penetrate and infiltrate into the adjoining tissues and dislocate their functions. Some of the cancer cells get detached from the main site of origin and travel by blood and lymph to sites distant from the original tumour and form fresh colonies, called metastasis or secondary growth.

Neoplasms or Tumours : A neoplasm (new growth) is a mass of tissue that grows in excess of normal in an uncoordinated manner and continues to grow after the initial stimulus has ceased. Tumours are classified as benign or malignant.

Oncology : (G. *onkos* – mass, tumour; *logos* – study of) is the field of biomedicine devoted to the study and treatment of tumours.

(a) **Types of Tumours :** There are two types of tumours : benign and malignant.

(1) **Benign Tumour – (=Nonmalignant Tumour) :** It remains confined to the site of its origin and does not spread to other parts of the body. It causes limited damage to the body. It is non-cancerous.

(2) **Malignant Tumour (= Cancerous Tumour) :** It first grows slowly. No symptoms are noticed. This stage is called the latent stage. The tumor later grows quickly. The cancer cells go beyond adjacent tissue and enter the blood and lymph. Once this happens, they migrate to many other sites in the body where the cancer cells continue to divide. It is **metastasis**. Only malignant tumours are properly designated as cancer.

Differences between Benign Tumour and Malignant Tumour

Benign Tumour	Malignant Tumour
(1) It remains confined to the affected organ.	(1) It also spreads to other organs of the body.
(2) Rate of growth is usually slow.	(2) Rate of growth is usually rapid.
(3) There is no latent stage.	(3) There is latent stage.
(4) It causes limited damage to the body.	(4) The cancer cells migrate to other sites of the body.
(5) There is no metastasis.	(5) There is metastasis.
(6) It is non-cancerous.	(6) It is cancerous.

(b) **Types of Cancer (Types of Malignant Tumours) :** Malignant tumours are generally classified into three main types on the basis of cell type from which they arise.

(1) **Carcinomas :** This type is mainly derived from epithelial cells. They include cervical (cervix is part of uterus) cancer, breast cancer, skin cancer, brain cancer, lung cancers, stomach cancer, etc.

(2) **Sarcomas :** These cancers are located in connective and muscular tissues derived from mesoderm. Thus, they include the cancers of bones, cartilages, tendons, adipose tissue, lymphoid tissue and muscles. Cancer of bones is called osteoma. Cancers of adipose tissue are known as lipomas and cancers of lymphatic tissue are termed as lymphomas. Hodgkin's disease is an example of human lymphoma. In Hodgkin's disease there is chronic enlargement of the lymph nodes, and enlargement of spleen and often the liver. In this disease there is excessive production of lymphocytes by lymph nodes and spleen.

(3) **Leukaemias (Blood cancers) :** They are characterized by abnormal increase of white blood corpuscles count due to their increased formation in the bone marrow.

(c) **Causes of Cancer :** The causes of cancer are not fully understood. However, many factors are known to favour cancer development. These factors are called **carcinogenic agents** or **Carcinogens**. The causes of cancer are briefly described under the following headings.

(1) **Physical irritants** : (i) Use of **Kangri** (an earthen pot containing burning coal) by Kashmiris causes abdominal skin cancer as these people keep Kangri close to their abdomen during winter. (ii) Betel and tobacco chewing causes oral cancer. (iii) Heavy smoking causes lung cancer and may also cause cancer of oral cavity, pharynx (throat) and larynx. (iv) Jagged teeth may cause tongue cancer. (v) Excessive exposure to sun light can cause skin cancer.

(2) **Chemical Agents** : Several chemicals are known to cause cancer. These are caffeine, nicotine, products of combustion of coal and oil and pesticides; constant use of artificial sweetener can cause cancer. An animal protein-rich diet is known to cause cancer of large intestine. Breast cancer has hormonal relationship. Thus, some sex hormones and steroids if secreted or given in large amounts may cause cancer. Chimney sweepers can develop cancer of scrotum. Dye workers have a high rate of bladder cancer.

Carcinogens and Organs Affected

Carcinogens	Organs Affected
(1) Soot	Skin, lungs
(2) Coaltar (3, 4-benzopirene)	Skin, lungs
(3) Cigarette smoke (N-nitrosodimethylene)	Lungs
(4) Cadmium Oxide	Prostate gland
(5) Aflatoxin (a mould metabolise)	Liver
(6) 2-naphthylamine and 4-aminobiphenyl	Urinary bladder
(7) Mustard gas	Lungs
(8) Nickel and Chromium compounds	Lungs
(9) Asbestos	Lungs, pleural membrane
(10) Diethylstilbestrol (DES)	Vagina
(11) Vinylchloride (VC)	Liver

(3) **Radiations** : The X-rays, cosmic rays, ultra-violet rays, etc. can cause cancer. Japanese people exposed to radiations from World War II nuclear bombing show five times the incidence of leukemia seen in the rest of the population.

(4) **Biological Agents** : Certain viruses can cause cancer. The viruses that cause cancers are called **oncoviruses**.

Oncogens : It has now been confirmed that all cells carry some cancer-causing genes called **oncogenes**. Certain factors stimulate oncogenes to replicate rapidly, causing malignant tumour. Experts in the study of cancer are called **oncologists**.

Other term associated with cancer cell:

Melanoma : Cancer of pigmented cells of skin.

Adenoma : Cancer of gland.

Myoma	:	Cancer of muscular tissue.
Lymphoma	:	Cancer of Lymphatic tissue.
Glioma	:	Cancer of Glial cells of CNS.

Different Sites of Cancer : Some of the important sites of cancer are skin, mouth, oesophagus, stomach, colon, rectum, liver, gall bladder, pancreas, blood, lymph, adipose tissue, lung, uterine cervix, breast, brain, penis, prostate, muscles, thyroid, kidney and bones.

Possible Symptoms of Cancer : (i) A persistent cough or hoarseness in a smoker. (ii) A persistent change in digestive and bowel habits. (iii) A change in a wart or mole. (iv) A lump or hard area in the breast. (v) Unexpected diminished or lost appetite. (vi) Unexplained low-grade fever. (vii) Unexplained loss of weight. (viii) Any ulcer that does not get well. (ix) Bleeding in vagina at times other than the menstruation. (x) Non-injury bleeding from the surface of the skin, mouth or any other opening of the body.

(d) **Treatment :** Three general methods of treatment for cancer are currently available.

(1) **Surgery :** It involves the removal of the entire cancerous tissue.

(2) **Radiation :** It involves the exposure of the cancerous parts of the body to X-rays, which destroy rapidly growing cells without harming the surrounding tissue.

(3) **Chemotherapy :** It involves the administration of certain anticancer drugs. These drugs check cell division by inhibiting DNA synthesis. These drugs may be more toxic to cancerous cells than to normal cells.

Most cancers are treated by combination of surgery, drugs and radiation therapy.

(e) **Theories related to Cancer :** The theories that seem most worth investigation are mutation and selective gene activation.

(1) **Mutation Theory :** Evidences for the **Mutation Theory** are as follow : (i) Agents that are known to cause mutations (radiations and chemicals) also appear to cause cancer. (ii) The incidence of cancer increases with age. As the number of body cell mutations also increases with age, it is possible that cumulative effects of mutations contribute to the initiation of malignancy. However, the mutation theory fails to explain occasional cases of spontaneous remission. Remission is the condition in which symptoms and evidence of the disease disappear.

(2) **Selective Gene Activation :** A second theory, that of **selective gene activation**, does account for remissions. If certain genes that are not normally expressed suddenly become active, their expression could lead to uncontrolled cell division. A remission might occur when for some reason these genes cease to be expressed. Research into the mechanism that control gene activation may provide insight into both the process of normal cell division and the aberrations in the process that lead to cancer.

❑ Characteristics of Cancer Cells

(1) Nucleus is abnormally enlarged and irregular.

(2) Chromatin material is also irregular.

(3) ER are more in cancerous cells.

(4) Ribosomes fuse together to form polyribosomes.

(5) Golgi bodies are less developed. (6) Mitochondria are swollen with few cristae.
 (7) Plasma membrane often becomes irregular. (8) Pathological cytoplasmic inclusions are also present.

❑ **Danger Signals for Cancer :** These are as follows:

- (1) Any wound that does not heal. (2) A thickening or lump in the breast or elsewhere.
 (3) Any change in the mole or wart. (4) Unusual bleeding or discharge.
 (5) Persistent indigestion or difficulty in swallowing. (6) Persistent cough or hoarseness.
 (7) Any change in normal bowel habits.

❑ **Types of Cancer :** Cancers are generally named against the tissues involved. These are –

- (1) **Carcinoma :** Cancer of epithelial cells. (2) **Sarcoma :** Cancer of connective tissue.
 (3) **Leukaemia :** Cancer of blood cells. (4) **Lymphoma :** Cancer of lymphocytes.
 (5) **Lipoma :** Cancer of adipose tissue.

Pathogenic Protozoa

S. No. and name of parasite	Host and site of parasite in its body	Diseases caused	Method of transmission
Class Rhizopoda			
(1) <i>Entamoeba histolytica</i>	In the colon of man, sometimes in dogs and cats also. It may reach liver, spleen, lungs and brain etc.	Amoebic dysentery. It also causes ulcers in the Intestine.	By contaminated food and water.
(2) <i>Entamoeba coli</i>	In the colon of man.	Gastro-intestinal disturbances.	By contaminated food and water.
(3) <i>Entamoeba gingivalis</i>	In the buccal cavity of man.	Bleeding gums.	By mouth contact.
Class Mastigophora			
(4) <i>Trypanosoma gambiense</i>	In the blood of Africans.	African sleeping sickness.	By the bite of the fly, <i>Glossina palpalis</i> .
(5) <i>Trypanosoma rhodesiense</i>	In the blood of Africans.	Rhodesian sleeping sickness.	By the bite of the fly, <i>Glossina morsitans</i> .
(6) <i>Trypanosoma cruzi</i>	In early stages, it is found in the muscles, heart, brain, spinal cord and gonads of children but in later	Chaga's disease.	By a bug.

	stages in the blood		
(10) <i>Leishmania donovani</i>	In the liver, lymph glands and leucocytes of man, dog and cat.	Kala-azar fever.	By sand fly, <i>Phlebotomus</i> supp.
(11) <i>Leishmania infantum</i>	In the spleen of children	Enlargement of spleen.	By sand fly, <i>Phlebotomus</i> supp.
(12) <i>Leishmania tropica</i>	In endothelium of blood capillaries of skin of man	Oriental sore.	By sand fly, <i>Phlebotomus</i> supp.
(13) <i>Leishmania brasiliensis</i>	In the infected man, dog and cat.	Skin disease (Espundia in man).	By sand fly, <i>Phlebotomus</i> and contact.
(14) <i>Trichomonas buccalis</i>	In the infected gums of man.	Associated with pyorrhoea.	By infected food.
(15) <i>Trichomonas hominis</i>	In colon of man and other vertebrates.	Associated with dysentery.	By contaminated eatables and water.
(16) <i>Trichomonas vaginalis</i>	In urinogenital tract of women.	Vaginitis.	During sexual intercourse.
(17) <i>Giardia intestinalis</i>	In small intestine of man	Diarrhoea.	By contaminated food.
Class Sporozoa			
(18) <i>Plasmodium vivax</i>	In erythrocytes and liver of man.	Different types of malaria fever.	By the bite of female <i>Anopheles</i> mosquito.
(19) <i>Plasmodium falciparum</i>			
(20) <i>Plasmodium malariae</i>			
(21) <i>Plasmodium ovale</i>			
(22) <i>Babesia bigemina</i>	In erythrocytes of cattle.	Texas fever and diarrhoea.	By the bite of fleas.
(23) <i>Isospora hominis</i>	In small intestine of man.	Diarrhoea and other gastric troubles.	By contaminated food.
(24) <i>Eimeria stiedae</i>	In cells of mucous membrane of hepatic ducts and liver of rabbit.	Diarrhoea and liver disorders.	By their oocysts.

<i>Class Ciliata</i>			
(25) <i>Balantidium coli</i>	In colon of human beings.	Ulcers in colon and diarrhoea.	By spores.

Viral Diseases in Humans

Disease	Pathogen	Habitat	Main Symptoms	Mode of Infection	I.P.
Influenza	Myxo viruses	Mucous membrane of respiratory tract	Nasal discharge, sneezing, coughing	By droplets from nose & throat	24 to 72 hours
Smallpox	Variola virus		Skin rash changing to pustules, then to scabs	By contact, droplets and fomite	12 days
Chicken pox	Varicella zoster		Skin sores that open & emit fluid	By contact and fomite	2 to 5 weeks
Measles	Rubeola virus		Red watery eyes, skin rash	By droplets from nose & throat	10 days
Rabies (Hydrophobia)	Rabies virus	Brain & spinal cord cells	Biting behaviour, fear of water, inability to swallow	Bite by rabid dog	1 to 3 months
Mumps (Infectious parotitis)	Paramyxo virus	Salivary glands	Painful enlargement of parotid glands, difficulty in opening mouth	By contact and droplets from throat	12 to 26 days
Poliomyelitis (polio)	Polio virus	Nerve cells	Inflammation of nervous system, muscle shrinkage, limb paralysis	By contaminated food & water	7 to 14 days
Trachoma	<i>Chlamydia trachomatis</i>	Eyelids, conjunctiva & cornea of eye	Granules on inner surface of eyelids, watery eyes	By contact and fomite	5 to 12 days
Acquired immune deficiency	<i>Human immunodeficiency virus</i>		Infections, cancer, brain damage, WBC destruction	By contact with blood	28 months average,

syndrome (AIDS)					
Hepatitis viral (Epidemic jaundice)	<i>Infectious & serum hepatitis viruses</i>	Liver	Jaundice due to damaged liver cells	By contaminated food and water	20-35 days

Bacterial Disease in Human

<i>Disease</i>	Pathogen	Habitat	<i>Main Symptoms</i>	<i>Mode of Infection</i>	I.P.
Cholera	<i>Vibrio comma (V.cholerae)</i>	Intestine	Severe diarrhoea and vomiting	By contaminated food and water	2 to 3 days
Pneumonia	<i>Diplococcus pneumoniae</i>	Lungs	Difficulty in breathing	By patient's sputum	1 to 3 days
Typhoid	<i>Salmonella typhi</i>	Intestine	Constant fever	By contaminated food and water	1 to 3 weeks
Tetanus (Lockjaw)	<i>Clostridium tetani</i>	Tissues	Painful muscular spasms and paralysis	Through wounds and burns	4 days to 3 weeks
Diphtheria	<i>Corynebacte rium diphthriae</i>	Mucous membrane of nose, throat & tonsils	Sore throat, difficulty in breathing	By oral & nasal discharges	2 to 5 days
Whooping cough (pertusis)	<i>Bordetella pertussis</i>	Respiratory tract	Severe coughing characteristic gasping 'whoop'	By throat discharges and contact	10 to 16 days
Tuberculosis	<i>Mycobacteri um tuberculosis</i>	Lungs	Cough, bloody sputum, chest pain	By patient's sputum	Variable
Plague	<i>Pasteurella pestis</i>	Blood and lymph	Painful puho of lymph nodes	By rat-flea bite	2 to 6 days
Leprosy	<i>Mycobacteri um leprae</i>	Skin mucous membranes, peripheral nerves	Hypopigmented skin patches, ulcers, deformity of digits	Long and close contact with patients	2 to 5 years

Syphilis	<i>Treponema pallidum</i>	Oral, genital, rectal mucosa	Lesions	By contact	3 weeks
Gonorrhoea	<i>Neisseria gonorrhoeae</i>	Urinogenital mucosa	Burning sensation in micturition	By sexual contact	2 to 5 days
Diarrhoeal diseases	<i>Shigella dysenteriae</i> , <i>Salmonella</i> , <i>Escherichia coli</i> , <i>Campylobacter</i>	Intestine	Diarrhoea	By contaminated food, water, hands, fomite	

Important Helminth Diseases in Humans

Disease	Pathogen	Habitat	Mode of Infection
Taeniasis & Cysticercosis	<i>Taenia solium</i> – the pork tapeworm	Intestine	By taking raw or undercooked measly pork
Ascariasis	<i>Ascaris lumbricoides</i>	Small intestine	By taking eggs with food and water
Filariasis (Elephantiasis)	<i>Wuchereria bancrofti</i> – the flarial worm	Lymphatics and connective tissue	By bites of <i>Culex</i> mosquitoes
Ancylostomiasis (Hookworm disease)	<i>Ancylostoma duodenale</i> – the hookworm	Small intestine	By boring through the skin, usually of feet.

Sexually Transmitted Diseases (STD) in Human

Disease	Causative organism	Nature of Disease	Symptoms – Treatment
(1) AIDS (Acquired Immuno deficiency Syndrome)	Retrovirus – HIV	Viral	Enlarged lymph nodes, long fever, weight loss – Nil
(2) Genital Herpes	Herpes simplex virus	Viral	Painful ulcer on genitals – Nil
(3) Genital warts	Human papilloma virus (HPVs)	Viral	Tumor of the vulva, vagina, anus and penis – Nil
(4) Gonorrhoea	<i>Neisseria</i>	Bacterial	Infection of all genital

	<i>gonorrhoeae</i>		organs or PID – Penicillin
(5) Chlamydiasis	<i>Chlamydia trachomatis</i>	Bacterial	White patches on vagina or PID – Nystatin
(6) Syphilis	<i>Treponema pallidum</i>	Bacterial	Cancer and skin eruption – Benzene and Penicillin
(7) Trichomoniasis	<i>Trichomonas vaginalis</i>	Protozoan	Greenish-yellow vaginal discharge–Metronidazole.
(8) Chancroid	<i>Haemophilus ducreyi</i>		Foul discharge and ulcer Drug : Sulphonamide
(9) Lymphogranuloma venerum	<i>Lymphogranuloma psittacosis bacteria</i>		Inguinal lymphadenopathy Drug : Tetracycline

Insect carrying diseases

Common name	Zoological name	Causative organism	Disease
Mosquitoes	Anopheles sps Culicine sps Stegomyia sps Aedes aegypti	<i>Plasmodium</i> <i>Wuchereria bancrofti</i> <i>Flavivirus fibricus</i> <i>Dengue virus</i>	Malaria
Rat flea	Xenopsilla cheopsis Xenopsilla sps	<i>Pasteurella pestis</i> <i>R. typhi</i>	Bubonic plague Endemic typhus
Flies	Musca sps	1. <i>Shigella</i> sps 2. <i>Salmonella typhi</i> 3. <i>Salmonella paratyphi</i> 4. <i>Hepatitis type – A virus</i>	Bacillary dysentery Typhoid fever Paratyphoid fever Infectious hepatitis
Sand fly	Phlebotomus papatasi Phlebotomus	<i>virus</i> <i>Leishmania donovani</i>	Sand fly fever Kala azar
Body louse	Pediculus	<i>Rickettsia prowazeki</i> <i>R. Quintana</i>	Trench fever
Mite	Trombicula akamushi	<i>R. Tsutsugamushi</i>	Scrub typhus (Tsutsugamushi fever)

Itch mite	<i>Sarcoptes scabieri</i>	—	Scabies
Tick fever,	<i>Amblyomma</i> sps	<i>R. rickettsiae</i>	Rocky mountain spotted theileriosis
House fly	<i>Musca domestica</i>	<i>Vibrio cholerae</i> <i>E.coli</i>	Cholera Infantile diarrhoea
Bed bug	<i>Cimex</i>	—	Relapsing fever
Tse-tse fly	<i>Glossina palpalis</i>	<i>Trypanosoma gambiense</i>	Sleeping sickness

3.4.6 DEFENSE MECHANISM

Immune response : Nature has provided certain ways in the body to defend ourselves from the invention of pathogens and therefore, from the disease. The ability of a host's body to prevent or overcome the effects caused due to the invention by pathogenic organisms and its toxins is known as **resistance** and **immunity**. Resistance is considered as an inherent factor and those acquired during life to overcome the disease, while the **immunity** is accepted to be due to the acquired factors that help in resistance. The host body has two lines of defence that must be overcome by a pathogen before establishing an infection.

(i) **External defence mechanism :** This defence mechanism involves mechanical and chemical factors *e.g.* skin, mucous membrane, mucous secretion, peristalsis, coughing, sneezing, shedding tears, etc. Chemicals are lysozymes present in the body.

(ii) **Internal defence mechanism :** This mechanism of defence has two lines of defence against pathogen :

(a) **A non specific mechanism** comprising physical and chemical barriers and inflammatory reactions, and

(b) **A specific defence mechanism, the immune system.**

(c) **Non-specific Defence Mechanism :** It is further of two types : external defence or first line of defence and internal defence or second line of defence.

(1) **External Defence :** It includes physical and chemical barriers.

Physical Barriers

Skin : The skin is physical barrier of body. Its outer tough layer, the stratum corneum prevents the entry of bacteria and viruses.

Mucous Membrane : Mucus secreted by mucous membrane traps the microorganisms and immobilises them. Microorganisms and dust particles can enter the respiratory tract with air during breathing which are trapped in the mucus. The cilia sweep the mucus loaded with microorganisms and dust particles into the pharynx (throat). From the pharynx it is thrown out or swallowed for elimination with the faeces.

Chemical barriers

Oil secreted by the oil glands and sweat secreted by sweat glands make the surface of the skin acidic (ph 3-5). This does not allow the microorganisms to establish on the skin. Some friendly bacteria also occur on the skin which releases acids and other metabolic wastes that check the growth of pathogens. The sweat also contains an enzyme named **lysozyme** that destroys the cell walls of many bacteria.

Lysozyme is also present in tears and checks eye infections.

Lysozyme is also present in the saliva which kills bacteria of food.

Highly acidic gastric juice also kills harmful bacteria in the stomach

Bile checks the growth of foreign bacteria in the intestine.

The mesh of fine hair in our nostrils filters out particles which may carry pathogens. Nasal secretions also destroy the harmful foreign germs with their lysozyme.

Certain bacteria normally live in vagina. These bacteria produce lactic acid. Lactic acid kills the foreign bacteria.

Thus physical and chemical barriers form the first line of defence.

(2) **Internal Defence** : The internal defence is carried on by white blood corpuscles, macrophages, inflammatory reaction, fever and interferons.

(i) **White blood corpuscles (Leucocytes)** : The leucocytes in general and lymphocytes in particular are capable of squeezing out through the wall of the blood capillaries into the extra-vascular regions. This phenomenon is called **diapedesis**. The leucocytes protect in different ways.

(a) **Lymphocytes** : Lymphocytes can produce plasma cells which secrete antibodies to provide immunity.

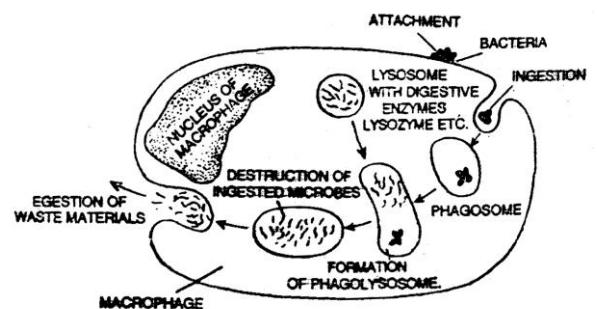
(b) **Monocytes** : They are phagocytic in action.

(c) **Eosinophils** : Eosinophils can attach themselves to parasitic forms and cause their destruction by liberating lysosomal enzymes on their surface.

(d) **Neutrophils** : They eat harmful germs and are, therefore phagocytic in nature.

(ii) **Macrophages** : The macrophages are formed by enlargement of monocytes. They are large cells which are phagocytic in nature.

(iii) **Inflammatory Response** : When the microorganisms like bacteria, viruses, etc. enter the body tissue through some injury, these produce some toxic substances which kill more cells. These broken cells also release some material which attract the mast cells. The mast cells release histamine. Histamine causes dilation of capillaries and small blood vessels surrounding the injury and increases the permeability of the capillary walls. The more blood flows to area making it red and warm. The fluid (plasma) leaks out into the tissue spaces, causing its swelling. This reaction of the body is known as



Mechanism of phagocytosis of bacterial cell performed by a phagocyte

inflammatory response. The plasma that accumulates at the injured site dilutes the toxins secreted by bacteria and decreases their effect.

(iv) **Fever** : The inflammatory response may be in the region of the wound (localized), or it may spread all over the body (systemic). In systemic inflammatory response, the number of WBC increases generally, the fever is caused by the toxins released by the pathogens or by compounds called pyrogens (fever producing substances; Gr. *Pre* = fire). These compounds are released by W.B.C. in order to regulate temperature of the body. Moderate fever stimulates the phagocytes and inhibits growth of microorganisms. However, a very high fever is dangerous. It is necessary to bring down fever by giving antipyretics (fever-reducing drug; Gr. *Anti* = against, *pyretos* = fever) and by applying cold packs.

(v) **Interferons** : These are the proteins released by the cells in response to a viral infection which they help to combat. These interferons do not inactivate the virus, but they make the unattacked cells less susceptible so they are prevented from the attack of virus. They also prevent the viruses from taking over the cellular machinery. *Interferon proteins* have proved to be effective in, treating influenza and hepatitis, but their role in cancer treatment is doubtful. Thus the leucocytes,. Macrophages, inflammatory response, fever and interferons from second line of defence.

Differences between Antibodies and Interferons

Antibodies	Interferons
These act inside the cells.	These act outside the cells.
They are slow acting.	They are quick acting.
They act against bacteria and viruses.	They act only against viruses.
Their action is long lasting	Their action is temporary.

(b) **Specific Defence Mechanism (The Immune System)** : Immune system forms third line of defence. There are two components of immune system in the body : Humoral immune system and cell-mediated immune system. One of the most important characteristics of the immune system is that it can recognize body’s own cells and macromolecules (**self**) from those which are foreign invaders (**nonself**).

(1) **Humoral Immune System or Antibody-mediated Immune system (AMIS) (Humoral** : Pertaining to body fluids): Humoral immune system results in production of antibodies. These antibodies circulate as soluble proteins in the plasma of blood and lymph which were earlier called **humors**. The humoral system protects the body against bacteria and viruses that enter the blood and lymph of the body. Antibodies are of many kinds.

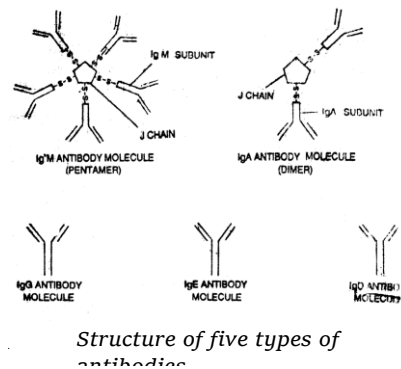
(2) **Cell-mediated Immune System (CMIS)** : In this system, highly specialized cells carry out defensive activities. These circulate in the blood and tissue. It protects the body against pathogens including the protists and fungi which have entered the host’s cells. This system also reacts against tissue transplants and perhaps also against the body’s own cells if they become cancerous. Two kinds of cells (*T* and *B* cells) are responsible for these responses.

The antigens are foreign ‘molecules’ that invade the body of an organism. The word ‘antigen’ is a shortened form of ‘antibody generating’ because they stimulate the production of antibodies in response

to infection. Antigens are generally large molecules. The majority of them are made of proteins or polysaccharides found on the cell walls of bacteria and other cells or on the coats of viruses. All antigens are not the parts of microorganisms. Other structures like pollen grains, white of an egg, shell fish, certain fruits and vegetables, chicken, feathers of birds, blood cells from other persons or animals, drugs, chemicals, etc. can also induce the immune system to produce antibodies.

Types of Antibodies

Classes	Description
IgG	Main antibody type in circulation; attacks microorganisms and their toxins.
IgA	Main antibody type in secretions, such as saliva and milk; attacks microorganisms and their toxins.
IgE	Antibody responsible for allergic reactions.
IgM	Antibody type found in circulation; largest antibody, with 5 subunits,
IgD	Antibody type found primarily as a membrane bound immunoglobulin.



(i) **Cells of the Immune System** : Lymphocytes (a type of WBCS) are the main cells of immune system of the body. Lymphocytes, meant for immune system, are of two types : T-cells and B-cells. Both types of cells develop from the stem cells found in the liver of the foetus and in the bone marrow cells of the adult. Those 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**’. The final maturation of young lymphocytes occur in lymphoid tissues like lymph nodes, spleen and tonsils. T-cells are responsible for cellular immunity, however, B-cells produce the antibodies—about 20 trillions per day that take part in the humoral immunity. Both T-cells and B-cells require antigens to trigger them into action but they respond differently.

B-lymphocytes are independent of the thymus and in man probably complete their early maturation within the bone marrow. They are called B-cells because they mature within the **Bursa of Fabricius** in birds.

(a) **Mode of Action of B-Cells to Antigens** : When antigens enter a tissue fluid, B-cells are stimulated to produce antibodies. The body has thousands of antigen-specific B-cells. The membrane of each B-cell type would have been sensitized by the previous contact with the antigen. If this does not happen, the B-cells are destroyed. However, the new B-cells will keep on producing. Once an antigen-specific B-cell is activated by the antigen it multiplies very fast to form a clone of **plasma cells**. These plasma cells produce antibodies at a rate of about 2,000 molecules per second. This ‘capacity’ of the B-cells to produce specific antibodies is acquired during its process of development and maturation even before it was exposed to an antigen. However, an antigen is necessary to stimulate the production of antibodies.

(b) **Mode of Action of T-cells to Antigens :** Like B-cells, T-cells also respond to antigens by producing a clone (a group) of T-cells. T-cells live for 4-5 years or even longer. There are separate T-cells for each type of antigen that invades the body. T-cells of a clone that are produced in response to an antigen are similar morphologically but they perform different functions. According to their functions, they are of three types.

(1) **Killer T-cells :** These cells attack directly and destroy antigens. In the process, these cells move to the site of invasion and produce chemicals that attract phagocytes and stimulate them so that they can feed more vigorously on antigens. They also produce substances that attract other T-cells.

(2) **Helper T-cells :** These cells stimulate B-cells to produce more of antibodies.

(3) **Suppressor T-cells :** These cells suppress the entire immune system keeping it away from attacking the own body cells. Some of these cells also become memory cells.

Distribution of B- and T-Cells in Man

Tissue	B-Cells %	T-Cells %
(1) Blood	15-25%	75-85%
(2) Spleen	55-75%	25-45%
(3) Bone marrow	Abundant	Few
(4) Thoracic duct	10-20%	80-90%
(5) Lymph nodes	20-30%	60-70%
(6) Thymus gland	Few	Abundant

Differences between B-Lymphocytes (B-Cells) and T-Lymphocytes (T-Cells)

Feature	B-Lymphocytes (B-cells)	T-Lymphocytes (T-cells)
(1) Origin and site of differentiation	Bone marrow Bursa of Fabricus (in fowl), gut-associated lymphoid tissue (Peyer's patches)	Bone marrow Thymus
(2) Immune System	B-cells form humoral or antibody-mediated immune system (AMIS).	T-cells form cell-mediated immune system (CMIS).
(3) Action	They defend against viruses and bacteria that enter the blood and lymph.	They defend against pathogens including protists and fungi that enter the cells.
(4) Division	They are formed by the division of plasma cells.	They are formed by the division of lymphoblasts of three types : killer, helper and suppressor cells.
(5) Movement	Plasma cells do not move to the site of infection.	Lymphoblasts move to the site of infection.
(6) Reaction against	Plasma cells do not react	Killer cells react against

Transplants and cancer cells	against transplants and cancer cells.	transplants and cancer cells.
(7) Effect on Immune System	Plasma cells have no inhibitory effect on immune system.	Suppressor cells inhibit immune system.

3.4.7 IMMUNITY

Definition : The resistance of the body to occurrence of any disease is known as immunity. Study of the ability of an organism to resist a disease is called **immunology**.

(i) **Development of Immunity :** A person may develop immunity in three ways.

(a) **Vaccination :** It is a technique to develop immunity without infection. Weakened or dead pathogens (**attenuated**) or parts of pathogens are injected into a person who is required to be made immune. The pathogens given in a vaccine are unable to cause the disease but are sufficient to stimulate the formation of antibodies by the host's immune system. Often 2 or 3 additional doses are needed to generate adequate immunity. These doses are called **booster doses**.

(b) **Antitoxins :** Antibodies that neutralize toxins produced in the body or introduced from outside are, called **antitoxins**. Bacterial toxins are produced in the body, however antitoxins produced from outside are prepared from snake venom and is used as a remedy for snake bites.

(c) **Immunity through Diseases :** Some diseases such as mumps, measles, small pox produce a life long immunity. Hence these diseases do not appear again.

(ii) **Types of Immunity :** There are two main types of immunity : Inborn or innate and acquired or adaptive.

(a) **Inborn or Innate Immunity :** This type of immunity is inherited by the organisms from their parents and protects it from birth throughout life. Examples : Human beings have inborn immunity against **distemper** (a fatal disease of dogs).

(b) **Acquired or Adaptive Immunity :** This immunity is acquired in life time. The acquired immunity is of two types : Active or natural and passive or artificial.

(1) **Active Immunity :** When an organism's own cells produce antibodies it is called active immunity. It develops when a person suffers from a disease or gets vaccination for a disease.

(2) **Passive Immunity :** In passive immunity, the antibodies are produced in some other organisms (*e.g.* vertebrates) in response to the given antigen. These antibodies are then injected into the human body at the time of need. This is known as **inoculation**. For example persons infected by rabies, tetanus, *Salmonella* (causes food poisoning) and snake venom are given the sufficient amount of antibodies so that they can survive.

Passive immunity provides immediate relief, however, active immunity requires some time for the formation of antibodies. There is another form of passive immunity. Nursing mothers transfer antibodies prepared in their body to the infants in their milk. Bottle-fed infants do not get this benefit. After a few weeks, infant's own immunity system starts working.

Difference between Active Immunity and Passive Immunity

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

3.4.8 DISORDERS OF IMMUNE SYSTEM

(i) **Allergies** : Allergy is the hypersensitiveness of a person to some foreign substance coming in contact with or entering the body.

Allergens : The substances that cause **allergic** reaction are called **allergens**. The common allergens are dust, pollen mould, spores, fabrics, lipsticks, nail paints, feathers, fur, plants, bacteria, foods, heat, cold, sunlight.

Symptoms : The symptoms that result from an allergy may be of different kinds but mostly it affects the skin and mucous membrane. Hay fever affects the mucous membranes of the nose, eyes and upper respiratory tracts. In asthma, the lower portions of the respiratory system are severely affected. In eczema the skin becomes red, followed by the appearance of minute blisters. Eczema may affect any part of the body and is one of the most severest of all allergic symptoms.

Cause : During allergic reaction there is increased release of histamine from mast cells. 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.

(a) **Hay fever** : In this allergic form, there is swollen, reddened, running eyes and nose. The drugs called **antihistamines** are of major importance in the treatment of this allergic disorder.

(b) **Asthma** : The tissue surrounding the respiratory tubes in the lungs swell up and compress the tubes. Hence there is difficulty in breathing. Antihistamine drugs are also given in this disease.

(c) **Anaphylactic shock** : It is an allergic reaction involving all the tissues of the body and occurs in a few minutes after the injection of an antigen such as **penicillin**. Such a reaction is very serious. Histamine released from ruptured mast cells causes marked dilation of all the arteries so that a large amount of fluid is passed from the blood to the tissues and there is a drastic fall in blood pressure. The affected person may become unconscious and the individual may die within a short time.

(ii) **Autoimmunity** : Sometimes it may also happen that the immune system of the body goes off the track and starts behaving against the 'own body' or 'self'. This leads to a variety of diseases known as autoimmune diseases. This type of diseases depends on which type of 'self-antigen' is involved. When the cells acting as antigens in the same body, they are called autoantigens. The nature of autoimmune diseases depends on the autoantigens involved. For example, if the autoantigens are RBC then the body destroys its own RBC, resulting in chronic anaemia; if the autoantigens are muscle cells then it results in the destruction of its own muscles resulting in severe weakness (*myasthenia gravis*); if

the autoantigens are liver cells, then it results in chronic hepatitis, etc. Other autoimmune diseases are insulin-dependent diabetes, Addison's disease, ulcerative colitis and rheumatoid arthritis.

(iii) Immuno deficiencies :

(a) **Severe Combined Immuno deficiency (SCID) :** Sometimes new born children are without T-cells and B-cells. These children are highly susceptible to various infections. The most serious disorder of this type is a congenital disease known as severe combined immuno deficiency (SCID) in which both B-cells and T-cells are not present in the body. Such children are highly susceptible even to minor infections. In developed countries like U.S.A. such children are kept alive by keeping them in germ-free environments called isolation suits.

Inflammation : When there is an injury on the skin, the capillaries and small blood vessels dilate to become more permeable to the phagocytes, which leak into the interstitial spaces, engulfing the invading microbes and cleans up the debris. Pus is a collection of dead cells and body fluids. Various chemicals are associated with this type of defence mechanism. *e.g.* Histamine released by lymphocytes causes the blood vessels to dilate. This inflammatory response may sometimes prevails all over the body *i.e.* systemic and W.B.Cs, count increases. Generation of heat results in fever which is caused by toxins released by pathogens or compounds known as pyrogens. Such pathogens are released by W.B.Cs. in order to set the body's thermostat at a high temperature. This stimulates the phagocytes and inhibits the growth of micro-organisms. These barriers are similar for most of the infections. The body backs up this mechanism by more specific immune system.

Autoimmune Disorders

Disorder	Symptoms	Antibodies Against
Glomerulonephritis	Lower back pain	Kidney cell antigens that resemble Strep bacteria antigens
Grave disease	Restlessness, Weight loss, irritability, Increased heart rate and Blood pressure	Thyroid gland antigens near thyroid stimulating hormone receptor, causing overactivity
Juvenile diabetes	Thirst, hunger, weakness, emaciation	Pancreatic beta cells
Hemolytic anemia	Fatigue and weakness	Red blood cells
Myasthenia gravis	Muscle weakness	Receptors for nerve messages on skeletal muscle
Pernicious anemia	Fatigue and weakness	Binding site for vitamin B on cells lining stomach
Rheumatic fever	Weakness, shortness of breath	Heart cell antigens that resemble Strep bacteria antigens
Rheumatoid arthritis	Joint pain and deformity	Cells lining joints
Scleroderma	Thick, hard, pigmented skin patches	Connective tissue cells
Systemic lupus	Red rash on face,	DNA, neurons, blood cells

erythamtosus	prolonged fever, weakness, kidney damage	
Ulcerative colitis	Lower abdominal pain	Colon cells

(b) **Acquired Immune Deficiency Syndrome (AIDS)** : It 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 defence against viral infection.

Discovery : AIDS was first noticed in USA homosexuals in 1981. Virus of AIDS was isolated and identified by **Prof. Luc Montagnier** in France in 1983 and almost the same time by **Prof. Robert Gallo** in USA. AIDS infections were detected in India for the first time in prostitutes of Chennai in 1986.

In India, four AIDS reference centres have been established.

(1) A.I.I.M.S., New Delhi.

(2) National Institute of communicable Diseases, New Delhi,

(3) National Institute of Virology, Pune.

(4) Centre for Advanced Research on Virology, CMC, Vellore.

AIDS – Related Complex (ARC) : It is a mild form of AIDS. Its symptoms are swollen lymph nodes, fever sweating at night and weight loss. Patients with ARC have a high possibility of early development of AIDS. ARC is also known as a **prodromal AIDS**.

Universal Immunisation Programme : A programme was launched by **WHO** in May 1974 to immunise the entire children of the world against six preventable diseases–Diphtheria, tetanus, whooping cough, polio, tuberculosis and measles. The target is to complete the immunisation by the end of year 2000. In India it was launched in 1985 and the target was to be achieved by 1992.

The schedule of vaccination for immunisation is as follows. It is followed by all government hospitals, dispensaries and even private clinics.

S. No.	Disease	Time		Name of the Vaccine
		1 st Dose	2 nd Dose	
(1)	T.B.	Birth to 19 months	After 5 years	BCG (Bacillus Calmette Guerin)
(2)	Measles, Mumps and Rubella	Birth to 12 months	—	Measles vaccine
(3)	Polio, diphtheria whooping cough	3 rd , 4 th and 5 th month	Upto 1 1/2 years and again after 5-6 years	Polio and DPT vaccine
(4)	Cholera	Within 2 years	Can be given annually	Cholera vaccine

			before summer	
(5)	Small pox	Within 3 months of birth	After 3 years	<i>Smallpox vaccine</i>
(6)	Typhoid	5-6 years, 2 doses with a gap of 1-2 months	Booster dose at the age of 10 years	<i>Typhoid vaccine</i>

Cells of Immune System

	Cell Type	Function
1.	Helper T Cell	Assists the immune process by helping other cells in the immune system to achieve an efficient immune response.
2.	Cytotoxic T Cell	Detects and kills infected body cells recruited by helper T cells.
3.	Suppressor T Cell	Guards against the overproduction of antibodies and overactivity of cytotoxic T cells.
4.	Memory cell	“Remembers” the original stimulation by the immune system and remains in the lymphoid tissue.
5.	Natural killer cell (NK)	The lymphocyte without receptor site and help to attack and neutralize virus-infected and tumor cells.
6.	B Cell	Precursor of plasma cell, specialized to recognize a specific foreign antigen.
7.	Plasma cell	Biochemical factory devoted to the production of antibodies directed against a specific antigen.
8.	Mast cell	Initiator of the inflammatory response which aids the arrival of leucocytes at a site of infection, secretes histamine and is important in allergic response.
9.	Monocyte	Precursor of macrophage.
10.	Macrophage	The body’s first cellular line of defence; also serves as antigen presenting cell to B and T cells and engulfs antibody covered cells.

Organ Transplants and Immunosuppression : These days, some organs of the body like heart and kidney can be transplanted. Sometimes the organ transplanted is rejected by the recipient body as it can recognise the ‘non-self’ organ and its immune system is stimulated. However, to avoid such rejections drugs called immunosuppressants are used. These drugs are not only expensive but they also make the patient’s body highly susceptible to infectious diseases. So to avoid the use of immunosuppressants, kidney transplants are usually taken from siblings so that they have a more or less similar genetic constitution. In case of skin grafting, the skin is taken from some other part of the patient body. Now-a-days it has also become possible to take small pieces of skin from the patient’s

body and culture it to produce more sheets of skin for transplantation. Radiations also help to suppress the immune system of the body. Efforts are now being made by the scientists to suppress only a small part of the immune system and not the entire immune system of the body.

3.4.9 VACCINES

History of Vaccines and Vaccination : *In vaccination weakened or dead pathogens, or portions of pathogens, are injected into a person who is required to be made immune.* 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. The process of vaccination was initiated by Edward Jenner in 1790. He observed that milkmaids did not contract smallpox apparently because they were exposed to a similar but milder form of disease called cowpox. Edward Jenner infected first James Phipps, a healthy boy of about 8 years with cowpox and two months later he infected the boy with smallpox. The boy did not suffer from small pox. Jenner proposed that an induced mild form of a disease would protect a person from a virulent form (which has ability to damage the host). He used the term vaccine (in Latin *Vacca* means 'cow') and the term vaccination for protective inoculation. Edward Jenner was the first to discover a safe and effective means of producing artificial immunity against small pox. Thus once vaccination is done the individual is protected from the disease. Vaccination develops acquired immunity. Pasteur confirmed Jenner's findings and produced vaccines for other diseases like anthrax, rabies and chicken cholera.

(i) **For protection need :** Antibody provoking agents are called vaccines. These are used against viral and bacterial diseases. Calmette & Guérin developed BCG vaccine for T.B. and Salk made Polio vaccine. Sabin also prepared Polio vaccine. Enders developed vaccine against measles. WHO was formed in 1948 at Geneva to take health problems at global level. In May, 1974, Global Immunisation Programme was launched by WHO for six disease (Diphtheria, Pertussis, Tetanus, Measles, TB & Polio).

(ii) **Vaccination :** It is the possible way to induce active acquired immunity against the germs of various diseases such as polio, diphtheria, whooping cough, tetanus and small pox. The immune system is thus induced to produce antibodies against these antigens. The artificial introduction of disease factors in the body is known as vaccination. Usually 2-3 injections are given to achieve full immunity against a specific pathogen and the further dose is called as booster doses.

Other Vaccines : Vaccines are also available for diphtheria, tetanus, whooping cough, tuberculosis, measles, polio, mumps, plague.

(iii) Types of Vaccines

(a) **Killed vaccine :** These vaccines are prepared by killing the pathogenic organisms by heat u.v-rays/alcohol formalin/phenol, e.g., *Typhoid Vaccine, Cholera Vaccine.*

(b) **Toxoid :** These are prepared by destroying the toxic property of the toxins produced by organisms but retaining its antigenic property, e.g., *Tetanus toxoid, Antidiphtheria toxoid.*

(c) **Attenuated living vaccines :** The pathogen is made weakened to make it nonvirulent, e.g., *Oral Polio Vaccine (OPV), BCG (Bacille Calmette Guérin).* MMR (Mumps, Measles, Rubella) Provide active life long immunity.

(d) **Antibodies as vaccines** : Serum is used after a person/animal has been exposed to infection. This serum contains antibodies against that pathogen. It provides passive artificial immunity for some period only, *e.g.*, ATS (*Anti tetanus serum*), *Antirabies serum*.

(e) Antigens like polysaccharides of *Pneumococci*, Interferon (glycoproteins) are also used as vaccines.

Some Important Vaccines

Name of Vaccine	Category of Vaccine	Used for treatment of
(1) B.C.G.	Live vaccine (actual weakened germs)	Tuberculosis
(2) Cholera Vaccine	Killed vaccines (micro-organisms are killed)	Cholera
(3) Mumps Vaccine (MMR)	Live vaccine (actual weakened germs)	Mumps Measles & Rubella
(4) Oral Polio Vaccine (OPV)	Live vaccine	Polio, 1st dose given when child is 3 months old. Booster dose is given after 1 year
(5) Rubella Vaccine	Live vaccine	German measles and small pox
(6) Rubeolla Vaccine	Live vaccine	Measles
(7) Tetanustoxoid (TT)	Toxoid (bacterial toxin loses toxicity but retains antigenicity)	Tetanus
(8) Toxoid Serum	Toxoid (bacterial toxin loses toxicity but retains antigenicity)	Diphtheria
(9) Typhoid Vaccine (TAB)	Killed vaccine (micro organisms are killed)	Typhoid (Typhoid & Paratyphoid)
(10) Triple Antigen (DPT) (Diphtheria, Pertussis Tetanus)	Toxoid	Diphtheria, tetanus and whooping cough, 1 st dose given when child is 3 months old. Booster dose at 2 years.

ASSIGNMENT

VIRAL AND BACTERIAL DISEASES

Basic Level

1. "Leprosy" is caused by
(a) Mycobacterium (b) Salmonella (c) Monocystis (d) TMV
2. Cholera is caused by
(a) Virus (b) Bacteria (c) Fungi (d) Protozoan
3. Which of the following is a communicable disease
(a) Phenylketoneuria (b) Cancer (c) Rabies (d) Alkaptonuria
4. Which of the following is a carrier of 'dengue fever'
(a) Anopheles (b) Culex (c) Aedes (d) Musca
5. The diseases caused by Entamoeba gingivalis is transmitted by
(a) Flies (b) Kissing
(c) Using the same bowl (d) Kissing and using the same bowl
6. Vibrio cholerae is a motile bacteria belonging to the group of
(a) Monotrichous (b) Lophotrichous (c) Amphitrichous (d) Peritrichous
7. 'Bacillary dysentery' is caused by
(a) Salmonella (b) Shigella (c) Proteus (d) Entamoeba
8. 'Mumps' is a viral disease caused due to inflammation of
(a) Submaxillary gland (b) Parotid gland (c) Sublingual gland (d) Infraorbital gland
9. Symptoms of diphtheria is
(a) Suffocation (b) Hydrophobia (c) Excessive watering (d) Gum bleeding
10. 'Black death' is related with
(a) Plague (b) Cancer (c) Tuberculosis (d) Measles
11. Jenner prepared the vaccine for smallpox virus by using
(a) Attenuated small-pox virus (b) Small doses of small-pox virus
(c) Attenuated cow-pox virus (d) Large dose of small-pox virus
12. Common symptoms of measles are
(a) Dew drop like rashes on skin and high fever
(b) Erupting of small red spots and inflammation of mucous membrane of Nose
(c) Lacerating ulcers
(d) None of the above
13. The region in the body where the polio virus multiplies is
(a) Nerve cells (b) Intestinal cells (c) Muscle cells (d) None of these
14. Diphtheria is caused by
(a) Bacteria (b) Virus (c) Nematodes (d) None of these

15. Which of the following disease is now considered nearly eradicated from India
(a) Plague (b) Kala azar (c) Small pox (d) Poliomyelitis
16. Which of the following is a communicable disease
(a) Diabetes (b) Hypertension (c) Kwashiorkor (d) Diphtheria
17. Which is a water borne disease
(a) Small pox (b) Malaria (c) Tuberculosis (d) Cholera
18. The causative agent of tuberculosis is
(a) Salmonella (b) Pneumococcus (c) Streptomyces (d) Mycobacterium
19. '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
20. Which one is a viral disease
(a) Syphilis (b) Measles (c) Rickets (d) Beri-beri
21. Polio immunizing vaccine was developed by
(a) E. Jenner (b) Dr. salk (c) St. Hale (d) Landsteiner
22. The jaundice is a physiological liver disease. It caused by a
(a) Bacterium (b) Virus (c) Protozoan (d) Helminthes
23. 'Tuberculosis' is caused by
(a) Bacterium (b) Virus (c) Protozoan (d) Malnutrition
24. If a person shows production of interferon in his body, the chances are that he has got an infection of
(a) Typhoid (b) Measles (c) Tetanus (d) Malaria
25. Pullorum disease of poultry is caused by
(a) Hemophilus (b) Mycobacterium (c) Salmonella (d) Clostridium
26. Which of the following is not a mental disorder
(a) Plague (b) Epilepsy (c) Neurosis (d) Psychosis
27. Against which of the following does interferon act
(a) Bacteria (b) Virus (c) Fungus (d) Snake venom
28. Jaundice is caused by
(a) Contaminated water (b) Pork
(c) Excessive sugar (d) Excessive eating of curcuma
29. Tuberculosis is caused by
(a) Mycobacterium (b) Vibrio (c) Clostridium (d) None of these
30. Pulse-polio programme is organised in our country
(a) To cure polio (b) To eradicate polio (c) To spread polio (d) None of these

31. Cholera patient is administrated by 'saline drip' because
- Na^+ ions are essential for the transport of substances across the membrane
 - Na^+ ions are helpful to conserving water in the body
 - Cl^- ions are helpful in the formation HCl for digestion
 - Cl^- ion is significant component of blood plasma
32. The main reason why antibiotics could not solve all the problems of bacteria mediated diseases is
- Insensitivity of the individual following prolonged exposure to antibiotics
 - Inactivation of antibiotics by bacterial enzymes
 - Decreased efficiency of the immune system
 - The development of mutant strains resistant to antibiotics
33. Which one of the following is a pair of viral disease
- Tetanus and typhoid
 - Syphilis and AIDS
 - Whooping cough and sleeping sickness
 - Measles and rabies
34. Which one of the following correctly matches a sexually transmitted disease with its pathogen
- Urethritis – *Bacillus anthracis*
 - Soft sore- *Bacillus brevis*
 - Syphilis – *Treponema pallidum*
 - Gonorrhoea – *Entamoeba histolytica*
35. Leprosy is communicated by
- Contact with the diseased parts
 - Prolonged contact with the diseased parts
 - Getting exposed to the diseased parts
 - None of these
36. The pathogen of bubonic plague is transmitted through the bite of
- Pediculus humanis*
 - Glossina palpalis*
 - Aedes*
 - Xenopsylla cheopis*
37. Polio causes
- Measles
 - Paralysis
 - Mumps
 - Malaria
38. The painful skin condition, known as shingles is associated with
- Chicken pox
 - Influenza
 - Rabies
 - Polio
39. Which one of the following causes plague
- Salmonella typhimurum*
 - Trichinella spiralis*
 - Yersinia pestis*
 - Leishmania donovani*
40. In polio patients, the legs get atrophied and paralysed due to
- Death of some muscles
 - Shrinkage of muscles
 - Obstruction of muscles
 - Destruction of muscles
41. 'Meningitis' is a disease of
- Respiratory system
 - Digestive system
 - Nervous system
 - Excretory system
42. Which of the following is a viral disease in silkworm
- Flacherie
 - Grasserie
 - Muscardine
 - Pebrine
43. *Salmonella* is related to
- TB
 - Polio
 - Tetanus
 - Typhoid
44. Jaundice is a disease of the
- Pancreas
 - Liver
 - Duodenum
 - Kidney

45. 'Diphtheria' disease is connected with
 (a) Lungs (b) Liver (c) Throat (d) Blood
46. The toxin produced by tetanus germs effects
 (a) Voluntary muscles (b) Involuntary muscles
 (c) Both voluntary and involuntary muscles (d) Jaw bones
47. Which of the following diseases is caused by virus in man
 (a) Tetanus (b) Dysentery (c) Typhoid (d) None of these
48. 'Paraplegia' refers to the paralysis of
 (a) Both legs (b) Both upper limbs (c) The entire body (d) Only one limb
49. Chicken pox is caused by
 (a) Adeno virus (b) Varicella virus (c) SV-40 virus (d) Bacteriophage T- 2
50. Out of the following one disease is caused by virus
 (a) Malaria (b) Influenza (c) Diphtheria (d) Typhoid
51. 'Plague' is transmitted by
 (a) House fly (b) Tse-tse fly (c) Rat flea (d) Mosquito
52. 'Dengue fever' is caused by
 (a) Bacteria (b) Plasmodium
 (c) Virus (d) Entamoeba histolytica
53. Mumps is a
 (a) Viral disease (b) Fungal disease (c) Bacterial disease (d) Protozoan disease
54. The disease caused by viruses is
 (a) Tuberculosis (b) Small pox (c) Cholera (d) Typhoid
55. Which one of the following is a common disease caused by virus
 (a) Yellow fever (b) Typhoid (c) Syphilis (d) Tetanus
56. Which virus, for the first time, was synthesised in the form of non-living crystals
 (a) Bacteriophage (b) Flu virus
 (c) Pox virus (d) Tobacco mosaic virus
57. Example of a cell without nuclear membrane and mitochondria is
 (a) Protozoan (b) Sclerocyte (c) Spermatocyte (d) Bacterium
58. BCG vaccine is anti
 (a) Emphysema (b) Pneumonia (c) Polio (d) Tuberculosis
59. Dengue is transmitted by
 (a) Culex (b) Male Anopheles (c) Female anopheles (d) Tse-tse fly
60. A boy happens to put his foot on a rusted nail and the doctor gives him an injection. Most likely he has given
 (a) OPV (b) BCG (c) ATS (d) Tetanospasmin

61. Different species of the bacterium mycobacterium cause
 (a) T. B. and tetanus (b) T.B. and leprosy (c) Leprosy and cholera (d) Tetanus and plague
62. Salmonella typhosa causes
 (a) An acute infection of intestine that causes high fever and weakness
 (b) Enlargement of spleen and pain in stomach
 (c) Rose coloured rashes on the body
 (d) All of these
63. The biological agents of disease include
 (a) Minerals, vitamins, proteins and carbohydrates
 (b) Viruses, bacteria, fungi, helminths and other organisms
 (c) Heat, cold, humidity pressure, radiations
 (d) All the above
64. The disease called vishuchika in Ayurveda is
 (a) Cholera (b) Diphtheria (c) Small pox (d) Chicken pox
65. Which of the disease is not transmitted by house flies
 (a) Typhoid (b) Yellow fever (c) Cholera (d) Dysentery
66. Biological name of insect (Vector) carrying the plague
 (a) Xenopcylla cheopis (b) Anopheles mosquito (c) Bacillus pestis (d) Pediculus humanus
67. Koch's postulates are not applicable to
 (a) T.B. (b) Leprosy (c) Diphtheria (d) Cholera
68. Maximum death among children is caused due to
 (a) T.B (b) AIDS (c) Diphtheria (d) Whooping cough
69. The protozoan found in colon of human is
 (a) *P. vivax* (b) *A. egypti* (c) *E. coli* (d) All of these
70. The smallest virus one, which causes
 (a) Measles (b) Mumps (c) Rabies (d) Poliomyelitis
71. The carrier of virus causing human yellow fever is
 (a) Mosquito (b) Bug (c) Louse (d) Beetle
72. Yersinia pestis is responsible for
 (a) Plague (b) Whooping cough (c) Leprosy (d) Syphilis
73. Encephalitis in man is a viral disease and is transmitted by
 (a) Anopheles (b) Culex (c) Aedes (d) Culex and Aedes
74. Which of the following disease is due to virus
 (a) Polio (b) Tetanus (c) Malaria (d) Cholera
75. 'Small pox' (Variola) disease is caused by
 (a) Virus (b) Bacterium (c) Protozoan (d) Mosquito

PROTOZOAN DISEASES AND MALARIA

Basic Level

76. 'Amoebiasis' (Amoebic dysentery) is caused by
(a) *Plasmodium vivax* (b) *Entamoeba gingivalis*
(c) *Entamoeba histolytica* (d) *Trypanosoma gambiense*
77. Tse-tse fly is a vector for sleeping sickness which transmits the infective stage of which of the following parasite
(a) *Leishmania donavani* (b) *Plasmodium falciparum*
(c) *Trypanosoma gambiense* (d) *Wuchereria bancrofti*
78. *Plasmodium vivax* causes
(a) Benign tertian malaria (b) Malignant fever (c) Quartan fever (d) Normal malaria
79. 'Hydrophobia' (Rabies) is a disease caused by
(a) Virus (b) Nematode (c) Helminthes (d) Protozoan
80. 'Quartan fever' is caused by
(a) *P. vivax* (b) *P. malariae* (c) *P. falciparum* (d) *P. ovale*
81. Which of the following organisms is known to form abscesses in human liver, lungs, brain etc.
(a) *Entamoeba histolytica* (b) *Monocystis* (c) *Plasmodium* (d) *Fasciola hepatica*
82. Enteritis, a widespread disease in India and its infection occurs by
(a) Viruses (b) Mosquito bite
(c) Ingesting cysts with food and drinks (d) None of these
83. African sleeping sickness or Gambiense fever is caused by
(a) *Entamoeba* (b) *Trypanosoma* (c) *Leishmania* (d) *Trichomonas*
84. Which one of the following is found in the mouth of human beings
(a) *Entamoeba histolytica* (b) *Entamoeba coli*
(c) *Amoeba proteus* (d) *Entamoeba gingivalis*
85. Chloroquin is an effective drug of
(a) Influenza (b) AIDS (c) Malaria (d) Typhoid
86. Infection of *Entamoeba histolytica* can be checked by
(a) Bathing before taking meals (b) Covering the food articles
(c) Washing hands before taking meals
(d) Washing the vegetables before their consumption
87. 'Glossina palpalis' is a vector for
(a) Dengue (b) Filariasis (c) Gambian fever (d) Plague
88. Which of the following is a parasite protozoan
(a) *Entamoeba histolytica* (b) *Paramecium caudatum*
(c) *Euglena viridis* (d) *Ascaris lumbricoides*

89. Kala azar is caused and transmitted respectively by
 (a) Leishmania and phlebotomus (b) Trypanosoma and sand fly
 (c) Leishmania and tse-tse fly (d) Trypanosoma and Glossina palpalis
90. Entamoeba gingivalis lives in the
 (a) Intestine (b) Colon
 (c) Pus pockets of pyorrhoea (d) Intestines and colon
91. Which of the following is the infective stage of the malarial parasite (Plasmodium)
 (a) Gametocyte (b) Merozoite (c) Sporozoite (d) Trophozoite
92. Intestinal ulceration is caused by which one of the following stages of Entamoeba histolytica
 (a) Metacystic (b) Binucleate stage (c) Tetranucleate stage (d) Trophozoites
93. Which of the following has only one host
 (a) Entamoeba histolytica (b) Plasmodium vivax
 (c) Taenia solium (d) Trypanosoma gambiense
94. One of the following is an intracellular parasite of man
 (a) Ancylostoma (b) Plasmodium (c) Mosquito (d) Entamoeba
95. The vector for causing sleeping sickness in man is
 (a) House fly (b) Mosquito (c) Tse-tse fly (d) Butterfly
96. Trypanosomiasis is transmitted by or Carrier of trypanosoma in man is
 (a) House fly (b) May fly (c) Tse-tse fly (d) Fruit fly
97. Coccidioasis disease in poultry is due to
 (a) Round worms (b) Tapeworms (c) Flukes (d) Protozoans
98. Entamoeba gingivalis is found in buccal cavity of man. It causes
 (a) Pyorrhoea (b) Amoebic dysentery (c) Branchitis (d) No disease
99. The infective stage of entamoeba histolytica is
 (a) Cyst (b) Egg (c) Spore (d) Trophozoite
100. The disease 'oriental sore' is caused by
 (a) Bacteria (b) Virus (c) Protozoa (d) Fungus
101. Vector for 'Kala azar' disease is
 (a) Sand fly (b) House fly (c) Louse (d) Bed bug
102. Which of the following does not cause a disease in human beings
 (a) Entamoeba coli (b) Plasmodium ovale
 (c) Entamoeba histolytica (d) Entamoeba gingivalis
103. Incubation period of plasmodium vivax is
 (a) 14 days (b) 20 days (c) 30 days (d) 45 days
104. Malaria is transmitted by 'Anopheles'. This was discovered by
 (a) A. Laveran (b) Ronald Ross (c) Pasteur (d) Huxley
105. The malignant tertian malaria is caused by
 (a) Plasmodium vivax (b) Plasmodium falciparum
 (c) Plasmodium ovale (d) Plasmodium malariae

106. Suffner's dots are related to
(a) R.B.C of man (b) Leucocytes of frog
(c) Epithelium of stomach of mosquito (d) Entamoeba histolytica
107. Incubation period in case of malarial parasite is
(a) 10-14 days (b) 20 days (c) 5 days (d) 2days
108. Mapacrine and pelludrine are used to cure which disease
(a) Plague (b) Malaria (c) T.B. (d) Pneumonia
109. Malaria parasite completes its life cycle in
(a) One host (b) Two host (c) Three host (d) Reservoir host
110. Metabolic waste responsible for malaria fever is called
(a) Haemozoin (b) Haematin (c) Melanin (d) Heparin
111. Dr. Ronald Ross worked malaria in
(a) Mumbai (b) Secunderabad (c) London (d) Madras
112. Quinine an important drug for treatment of malaria, is extracted from
(a) Calyx of cinnamon (b) Bark of cinchona (c) Red ants (d) Bark of tulsi
113. Which organ enlarges in patient of malaria
(a) Spleen (b) Kidney (c) Gall bladder (d) Liver
114. Which one of the following conditions though harmful in itself is also a potential saviour from a mosquito borne infectious disease
(a) Leukemia (b) Thalassaemia (c) Sick cell anaemia (d) Pernicious anaemia
115. Malarial parasites could be best obtained from a patient
(a) An hour before rise of temperature (b) When temperature rises with rigor
(c) When temperature comes to normal
(d) Few hours after the temperature reaches to normal
116. Malaria is caused by
(a) Ascaris (b) Foul air (c) Plasmodium (d) Mosquito
117. Which of the following causes malaria
(a) Plasmodium (b) Hook worm (c) Ascaris (d) Filaria worm
118. Who discovered malarial parasite
(a) Ronald Ross (b) Leveran (c) Grassi (d) Lanci
119. Time between successive hyperthermic condition in quatern fever in
(a) 12 hours (b) 24 hours (c) 48 hours (d) 72 hours
120. Plasmodium in man is inoculated by
(a) Anopheles male and female (b) Anopheles male
(c) Anopheles female (d) Culex female
121. 'Malaria' a common disease world wide is caused by a
(a) Bacterium (b) Virion (c) Protozoa (d) Helminthes
122. The fish used for control of malaria is
(a) Gambusia (b) Rohu (c) (a) and (b) both (d) None of these

123. 'Black water fever' is a very serious complication of
(a) *P. ovale* (b) *P. falciparum* (c) *P. malariae* (d) *P. vivax*
124. On which day, we celebrate 'Malaria Day'
(a) 5th June (b) 15th August (c) 20th August (d) 20th September
125. Match the incorrect pair
(a) *Xenopsylla* - Plague (b) *Pediculus* – Typhoid
(c) *Culex* - Malaria (d) *Stegomyia* – Yellow fever
126. Schizont is a stage in the life history of malaria parasite occurring in
(a) RBCs (b) Stomach of *Anopheles*
(c) Salivary glands of *Anopheles* (d) Blood of *Anopheles*
127. The secondary host of malaria parasite is
(a) Male *Culex* (b) Male *Anopheles* (c) Female *Culex* (d) Female *Anopheles*
128. Spraying of oil on stagnant water controls malaria because
(a) Mosquito larva cannot breathe (b) Water becomes impure for mosquito
(c) Specific gravity of water increases (d) Oil kills malarial parasite in mosquitoes
129. Which of the following malarial parasite has the longest incubation period
(a) *Plasmodium vivax* (b) *Plasmodium falciparum*
(c) *Plasmodium ovale* (d) *Plasmodium malariae*
130. Malaria repeats due to
(a) Erythrocytic cycle (b) Pre-erythrocytic cycle (c) Gametogony (d) Sporogony
131. Maurer's dots are observed in the erythrocytes of man if these are infected with
(a) *Plasmodium vivax* (b) *Plasmodium falciparum*
(c) *Plasmodium ovale* (d) *Plasmodium malariae*
132. Which one of the following is pernicious quotidian, malignant and tropical malarial parasite
(a) *Plasmodium vivax* (b) *Plasmodium falciparum* (c) *Plasmodium berghei* (d) *Plasmodium yolkii*
133. A person suffering from malaria feels fever when
(a) Exoerythrocytic cycle is completed
(b) Signet ring stage is formed
(c) When RBC generally ruptured and haemozoin granules are released
(d) All the above
134. Haemozoin is a toxic substance formed in case of malaria. It is produced by
(a) Globin protein of RBC (b) Colour pigment of RBC
(c) Dead WBC (d) Cryptozoites
135. Chloroquine is used for treatment of
(a) Malaria (b) Tetanus (c) Cancer (d) AIDS
136. Malaria is spread by
(a) Male *Culex* (b) Female *Culex* (c) Male *Anopheles* (d) Female *Anopheles*

HELMINTH DISEASES

Basic Level

137. Secondary host of schistosoma
(a) Culex (b) Man (c) Snail (d) Anopheles
138. Which one spreads filaria
(a) House fly (b) Bed bug (c) Mosquito (d) Flea
139. Which disease is caused by female culex
(a) Malaria (b) Pneumonia (c) Typhoid (d) Filaria
140. Which of the following pairs is not correctly matched
(a) Dangué fever- Arbovirus (b) Plague – Yersinia pestis
(c) Syphilis – Trichuris trichiura (d) Sleeping sickness – Trypanosoma gambiense
141. Addison's disease is characterised by
(a) Elongation of limb bones and jaw becomes broad
(b) Hypertension and enlargement of thyroid
(c) Loss of appetite, vomiting, muscular weakness, lowering of BMR blood pressure and bronze coloured patches of skin
(d) Obesity, osteoporosis and glycosuria
142. Which of the following pairs is correct
(a) House fly- Yellow fever (b) Bed bug – Kala azar
(c) Sand fly- Amoebic dysentery (d) Culex- Filariasis
143. Filariasis is caused by
(a) Wuchereria (b) Amoeba (c) P.vivax (d) E.coli
144. Wuchereria bancrofti is transmitted by
(a) Sand fly (b) Tse-tse fly (c) Anopheles mosquito (d) Culex
145. Infection of enterobius is caused to man by
(a) Inoculation (b) Contamination (c) Piercing (d) Flying
146. Microfilaria is found in the peripheral blood of man during
(a) Day time (b) Night time (c) Morning (d) Evening
147. The study of worms which cause parasitic infestations in man is called
(a) Helminthology (b) Herpetology (c) Ichthyology (d) Malacology
148. Elephantiasis (Filariasis) in man is caused by
(a) Ancylostoma duodenale (b) Ascaris lumbricoides
(c) Dracunculus medinensis (d) Wuchereria bancrofti
149. Which of the following is a matching pair of the vector and the disease
(a) Culex - Filariasis (b) Housefly – Yellow fever
(c) Body louse -Typhoid (d) Sandfly-plague
150. Which of the following is a helminthes disease
(a) Filaria (b) Filariasis (c) Polio (d) Diphtheria

151. Chenopodium oil is used in
(a) Tuberculosis (b) Typhoid (c) Ascariasis (d) Small pox
152. Cause of 'cysticercosis' is
(a) Semi-cooked meat of pig (b) Contaminated water and food
(c) Bacteria (d) Virus
153. Infection of ascaris usually occurs by
(a) Imperfectly cooked pork (b) Tse-tse fly
(c) Mosquito bite (d) Contaminated water and vegetables
154. Disease caused by the biting of culex mosquito is
(a) Filariasis (b) Dengue fever (c) Yellow fever (d) Pneumonia
155. Enterobiasis disease is caused by
(a) Filaria worm (b) Hook worm (c) Pin worm (d) Round worm
156. Filaria is transmitted by
(a) Male anopheles (b) Male culex (c) Female anopheles (d) Female culex
157. Filaria germ is a kind of
(a) Bacteria (b) Helminthes (c) Mosquito (d) Protozoa

SEXUALLY TRANSMITTED DISEASES

Basic Level

158. AIDS causing factors are associated with
(a) RNA virus (b) DNA virus (c) Bacteria (d) Protozoa
159. AIDS is caused by
(a) Blood cancer (b) HTLV-III (c) Bacterium (d) TMV
160. 'Syphilis' is a sexually transmitted disease caused by
(a) Treponema pallidum (b) Leptospira (c) Pasteurella (d) Vibrio
161. Immune deficiency syndrome in human could develop as a consequence of
(a) AIDS virus infection (b) Defective liver
(c) Defective thymus (d) Weak immune system
162. AIDS related complex (ARC) is a disease which leads to fever, swollen lymph nodes, night sweats, loss in weight etc. represents
(a) Severe form AIDS (b) Initial form of AIDS (c) No link with AIDS (d) None of the above
163. AIDS virus has
(a) Single stranded RNA (b) Double stranded RNA
(c) Single stranded DNA (d) Double stranded DNA
164. Which one of the following produces AIDS
(a) HTLV -1 (b) HTLV-2 (c) EBV (d) HIV

165. How does AIDS virus enter into man
 (a) Through food (b) Through kissing (c) Through water (d) Through blood
166. Full form of AIDS is
 (a) Anti immune deficiency syndrome (b) Auto immune deficiency syndrome
 (c) Acquired immune deficiency syndrome (d) Acquired immune disease symptom
167. Which of the glands is often referred in relation with AIDS
 (a) Thyroid (b) Thymus (c) Adrenal (d) Pancreas
168. *HIV* causes reduction in
 (a) T- helper cells only (b) All T-cells (c) B-cells only (d) Both B and T-cells
169. A disease transferred from mother to child through placenta is
 (a) German measles (b) Syphilis (c) AIDS (d) All the above
170. The AIDS test is known as
 (a) Elisa (b) Australian antigen (c) HIV test (d) None of these
171. AIDS is a
 (a) Cancer (b) Virus borne disease (c) Bacterial disease (d) Deficiency disease
172. Which of the following is an STD
 (a) Measles (b) Syphilis (c) Diphtheria (d) Cancer
173. "Zidovudine" drug is used for
 (a) Cancer (b) Hepatitis (c) AIDS (d) Malaria
174. The test for 'syphilis' was developed by
 (a) Robert koch (b) Edward jenner (c) Wasserman (d) Louis pasteur
175. AIDS day is observed on
 (a) May 1 (b) Dec 20 (c) Dec 1 (d) June 1
176. AIDS can be transmitted by
 (a) Blood circulation (b) Hand shake (c) Courtship (d) All of these

CANCER

Basic Level

177. Oral cancer may be caused by
 (a) Smoking (b) Running (c) Swimming (d) Eating betal
178. Blood cancer is excess production of leucocytes. It is
 (a) Haemorrhage (b) Haemolysis (c) Leukemia (d) Thrombosis
179. Uncontrolled and undifferentiated mass of cells is known as
 (a) Tumour (b) Overgrowth (c) Cancer (d) Hypertrophy
180. Which type of cancer is found in lymph nodes and spleen
 (a) Carchroma (b) Sarcoma (c) Leukaemia (d) Lymphoma
181. Which of the following will be curable in next two decades
 (a) Cancer (b) Poliomyelitis (c) Tuberculosis (d) None of these

- 182.** Which disease is caused by activation of oncogenes
(a) Cholera (b) Cancer (c) T.B. (d) Viral flu
- 183.** Spread of cancerous cells to distant sites is termed as
(a) Metastasis (b) Oncogenes (c) Proto-oncogenes (d) Malignant neoplasm
- 184.** Cell division or mitosis is a normal process in living cell, but sudden and abnormal mitosis an organ will frequently result in a
(a) Zygote (b) Gastrula (c) New organ (d) Cancer
- 185.** Chemicals, which can induce cancer are called
(a) Mutagenic agents and produce benign tumour
(b) Carcinogens and produce non- malignant tumour
(c) Mutagenic agents and do not produce malignant tumour
(d) Carcinogens and produce malignant tumour
- 186.** In which stage of cancer does metastitita occur
(a) III stage (b) II stage (c) I stage (d) IV stage
- 187.** A metastatic cancerous tumour is termed 'sarcoma' if the disorder is in
(a) Immune system (b) Epithelial cells (c) Fibroblasts (d) Circulatory system
- 188.** The most common cancer in men in India is
(a) Lung cancer (b) Throat cancer (c) Mouth throat cancer (d) None of these
- 189.** Cancer is related to
(a) Uncontrolled growth of tissues (b) Non malignant tumor
(c) Controlled division of tissues (d) None of these
- 190.** Which one of the following sets includes the bacterial disease
(a) Cholera, typhoid, mumps (b) Tetanus, tuberculosis, measles
(c) Malaria, mumps, poliomyelitis (d) Diphtheria, leprosy, plague
- 191.** Which one of the following cancer is prevalent in human beings
(a) Carcinoma (b) Lymphoma (c) Sarcoma (d) Melanoma
- 192.** Which of the industrial processes identified by World Health Organisation (W.H.O) can cause cancer in humans
(a) Rubber and furniture industry (b) Haematite mining
(c) Isopropyl alcohol manufacturing (d) All of these
- 193.** Carcinoma refers to
(a) Benign tumours of the connective tissue (b) Malignant tumours of the connective tissue
(c) Malignant tumours of the skin or mucous membrane
(d) Malignant tumours of the colon
- 194.** Proliferation of cancer cells is not limited because of
(a) Differing surface proteins (b) Differing cholesterol level
(c) Deficiency of steroids (d) Abberent chromosomal complement
- 195.** Which radioisotope is used in the detection of thyroid cancer
(a) U- 238 (b) Pu-240 (c) I-131 (d) C- 14

196. The spread of cancerous cells to distant sites is termed as
 (a) Mutation (b) Malignancy (c) Metastasis (d) Benign tumours
197. The process of spreading the cancerous cells distant site is known as
 (a) Hyperstasis (b) Metastasis (c) Parastasis (d) Parasitesis
198. The nucleus of cancerous cells becomes
 (a) Degenerated (b) Hypertrophied (c) Unchanged (d) Abnormally large
199. Ribosomes of cancerous cells fuse together to for
 (a) Ribosome complex (b) Polyribosomes
 (c) Agglutinated (d) Degenerative ribosomes
200. Which of the following is the cancerous state of blood
 (a) Chloremia (b) Leukemia (c) Uremia (d) Proteinemia
201. In human beings retrovirus is considered as a cause of cancer because
 (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
202. Cancer cells are more easily damaged by radiation than normal cells because they
 (a) Are undergoing rapid division (b) Are starved by nutrition
 (c) Are different in structure (d) None of these
203. Which is not cancer
 (a) Leukaemia (b) Glaucoma (c) Carcinoma (d) Sarcoma

VARIOUS DISEASES

Basic Level

204. Adenoid is the disease in which
 (a) Glandular tissue at the back of nose enlarges (b) Spleen enlarges
 (c) Thyroid enlarges (d) Tonsils enlarges
205. Thala test is done for the confirmation of
 (a) Malaria (b) Cholera (c) Colour blindness (d) Thalassaemia
206. Anaphylactic shock is due to
 (a) Allergic reaction (b) Secretion of toxins (c) Secretion of histamines (d) All the above
207. Myasthenia gravis is due to
 (a) Auto-antigens (b) Antigens (c) Toxins (d) Interferon
208. AIDS from India was reported in
 (a) 1987 (b) 1986 (c) 1990 (d) 1989
209. Antihistamine pills are to nullify
 (a) Allergic reaction (b) Malaria (c) Typhoid (d) None of these

- 210.** Hernia is a disease of
 (a) Weakening of abdominal muscles (b) Weakening in intestine
 (c) Weakening in the thigh muscles (d) Chocking of the intestine
- 211.** Sprain is caused due to excessive pulling of
 (a) Ligaments (b) Muscles (c) Nerves (d) Tendons
- 212.** Dropsy means
 (a) Accumulation of the watery fluid in any part of the body
 (b) Accumulation of toxins in the body parts
 (c) Enlargement of kidney
 (d) Defective muscles of the eye
- 213.** Rickets, kwashiorkor, osteomalacia, beri-beri anaemia etc. are diseases
 (a) Communicable (b) Deficiency (c) Degenerative (d) Genetic
- 214.** Hypersensitivity towards any foreign material or particle is known as
 (a) Hypergenital disease (b) Congenital disease (c) Cancer (d) Allergy
- 215.** The genes of genetic diseases are located over
 (a) Any body chromosome (sex or somatic) (b) Sex chromosomes only
 (c) Somatic chromosomes only (d) Mutational chromosomes
- 216.** 'Pathogens' are
 (a) Substances produced against any disease causative
 (b) Chemical substances produced by the host cells to kill the parasite animal
 (c) Disease spreading factors
 (d) Cells which kill the parasites
- 217.** 'Pathogens' were discovered by
 (a) Edward Jenner (b) William Harvey (c) Pasteur (d) Robert Koch
- 218.** Leprosy is diagnosed by which of the following set of symptoms
 (a) Fever, loss of pigmentation
 (b) Deformity of fingers, scales, ulcers, loss of pigmentation, wasting of body parts
 (c) Frequent watery stools and deformities in fingers and toes
 (d) White spots on the skin without any scales or ulcer
- 219.** Symptoms of shigellosis, a diarrhoeal disease are
 (a) Frequent passage of stools with blood and mucus (b) Severe cough and sputum
 (c) Loss of weight and appetite (d) Severe abdominal pain and vomiting
- 220.** ADH is secreted from the posterior lobe of pituitary and its deficiency leads to
 (a) Diabetes mellitus (b) Conn's syndrome (c) Addison's disease (d) Diabetes insipidus
- 221.** In sickle cell anaemia, the death is caused when the lethal genes are present in
 (a) Heterozygous condition (b) Homozygous dominant condition
 (c) Homozygous recessive condition (d) Co-dominant condition
- 222.** Which is not a gene linked disease
 (a) Haemophilia (b) Daltonism (c) Myxoedema (d) Alkaptonuria

223. Christian Barnard is known for
 (a) Discovery of polio vaccine (b) First surgical transplantation of human heart
 (c) First test tube baby birth (d) Synthesis of gene
224. 'Haemophilia' disease is caused due to lack of
 (a) ADH (b) STH (c) AHF (d) ACTH
225. Which of the following diseases is not related to circulatory system
 (a) Hypertension (b) Coronary thrombosis (c) Diabetes mellitus (d) Diphtheria
226. Which of the following diseases is known as auto immune thyroiditis/ thyroid's suicide
 (a) Addison's disease (b) Cretinism (c) Hashimoto disease (d) Goitre
227. People contract 'Hay fever' from one of the following pollutants in air
 (a) Carbon dioxide (b) House dust (c) Paint fumes (d) Pollens
228. Harmful ultraviolet radiations from sun cause
 (a) Breast cancer (b) Liver cancer (c) Mouth cancer (d) Skin cancer
229. X- rays are used in
 (a) ECG (b) EEG (c) CT-Scan (d) Endoscopy
230. 'Itaria-itaria' disease is caused by
 (a) Cadmium (b) Manganese (c) Mercury (d) Zinc
231. The bacteria living in human large intestine that feed on undigested food without harming the host in any way, are termed as
 (a) Symbionts (b) Parasites (c) Commensale (d) Predators
232. In sickle-cell anaemia, which of the following amino acids is substituted
 (a) Glutamic acid by valine in β -chain (b) Valine by glutamic acid in β -chain
 (c) Glutamic acid by valine in α -chain (d) Valine by glutamic acid in α -chain
233. If the IIIrd nerve is damaged, it will lead to
 (a) Loss of accomodation (b) Dilation of pupil
 (c) Loss of ocular movements (d) All of these
234. The disease which develops since birth is known as
 (a) Congenital disease (b) Degenerative disease
 (c) Acquired disease (d) Communicable disease
235. Arthritis is the disease of
 (a) Inflammation of abdomen (b) Inflammation of joints
 (c) Inflammation of liver (d) Inflammation of neck
236. The presence of RBC in urine is known as
 (a) Hematuria (b) Urolithiasis (c) Nephritis (d) Protonuria
237. Interferons are
 (a) Antiviral proteins (b) Antibacterial proteins (c) Anticancer proteins (d) None of these
238. The principal of sterilization is based upon experiment carried by
 (a) A.I. Oparin (b) S.L. Miller (c) L. Pasteur (d) V. Helmont

239. Cushing's syndrome which is characterised by wasting of limb muscles and accumulation of fat in the trunk region is due to hypersecretion of
(a) Corticosteroid (b) Adrenalin (c) Progesterone (d) Adrenocorticotropin
240. Gouts, a painful disorder of joints is due to
(a) Damage caused to ligaments (b) Injury to tendon
(c) Inflammation of synovial membrane (d) Deposition of uric acid at joints
241. Technique for monoclonal antibody production was discovered by
(a) Steward and Skoog (b) Arban and Haberlant (c) Kohler and Milstein (d) Lister and Koch
242. The disease characterised by extreme muscular weakness and brownish pigmentation of buccal cavity and skin is
(a) Cushing's syndrome (b) Addison's disease (c) Grave's disease (d) Myxoedema
243. Symptoms of oedema is
(a) Swelling of body part especially the legs (b) Pain in the chest
(c) Cold (d) Pain in the right leg
244. The factor responsible for cirrhosis of liver is
(a) Sugar (b) Vitamins (c) Fats and oils (d) Alcoholism
245. Which of the following insects transmits relapsing fever
(a) Drosophila (b) Apis (c) Cimex (d) Gryllus
246. Which one of the following disease is due to an allergic reaction
(a) Enteric fever (b) Hay fever (c) Skin cancer (d) Goitre
247. The substance controlling the allergic reaction are called
(a) Histamine substances (b) Anti-inflammatory substances
(c) Inflammatory substances (d) Anti-histamine substance
248. The quantity which is required to cause a disease in an organism is known as
(a) Infection dose (b) Infective dose (c) (a) and (b) both (d) Threshold dose
249. A disease caused by eating fish contaminated by industrial waste containing mercury compounds is known as
(a) Bright's disease (b) Minamata disease (c) Hashimoto disease (d) Osteosclerosis
250. The ECG method is needed to detect abnormalities in heart for
(a) Coronary thrombosis (b) Heart attack (c) Heart block (d) All the above
251. A disease which causes the black colour of the urine
(a) Leukemia (b) Haemophilia (c) Sickle-cell anaemia (d) Alkaptonuria
252. Degenerative diseases are those which develop due to
(a) Malfunction of hormones (b) Degeneration of tissues
(c) Malfunction of certain body organs (d) Degeneration of the infected organs
253. Cyclosporine is used as
(a) Allergic eczema (b) Prophylactic for viruses
(c) Immunodepressant (d) Prophylactic for marasmus

254. Which test confirms the scarlet fever
(a) Dick test (b) ECG (c) UTI test (d) Widal test
255. Which of the following is not a water born disease
(a) Asthma (b) Cholera (c) Amoebiasis (d) None of these
256. Examples of congenital disease are
(a) Alkaptonuria, albinism (b) Albinism, sickle cell anaemia
(c) Haemophilia (d) All the above
257. 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 leucocytes in human blood
258. The disease Erythroblastosis foetalis in human embryo is caused due to
(a) Disadjustment of blood groups (b) Disadjustment of *Rh* factor
(c) Both of these (d) None of these
259. Which of the following is related to heart disease
(a) Cushing's syndrome (b) Edward's syndrome (c) Turner's syndrome (d) Patau's syndrome
260. Which one of the following can help in the diagnosis of genetical basis of a disorder
(a) ELISA (b) ABO Blood group (c) PCR (d) NMR
261. Haemophilia is
(a) A type of mosquito lacking haemocoel (b) The royal disease
(c) Faulty blood clotting (d) (b) and (c) both
262. Hereditary disease condition in which the blood fails to coagulate
(a) Sickle cell anaemia (b) Leukemia (c) Haemophilia (d) Alkaptonuria
263. The accumulation of excess fluid in tissue space is called
(a) Hodgkin's disease (b) Parkinson's disease (c) Oedema (d) Cirrhosis
264. Which one of the following cases results in fatal or serious situations
(a) Rh^- male marrying Rh^- female (b) Rh^- male marrying Rh^+ female
(c) Rh^+ male marrying Rh^+ female (d) Rh^+ male marrying Rh^- female
265. The phenomenon that led to the discovery of penicillin involves
(a) Biological antagonism (b) Genotype competition
(c) Substrate competition (d) Struggle for existence
266. Life saving drug 'Desferal' is used for the treatment of
(a) Arteriosclerosis (b) Hypertension (c) Thalassaemia (d) Down's syndrome
267. 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
(a) Christmas disease (b) Hypoprothrombinemia (c) Haemophilia (d) Stuart disease

- 268.** 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
- (a) Early abortion of foetus (b) Poor development of foetus
(c) Malformation of foetus (d) Erythroblastosis foetalis
- 269.** Louse is ectoparasite of
- (a) Fish (b) Snake (c) Man (d) Whale
- 270.** Parasite which is vector host also is
- (a) House fly (b) Fasciola (c) Ascaris (d) Bug
- 271.** Which disease in children is caused by intensive use of nitrate fertilizer
- (a) Jaundice (b) Methemoglobinemia (c) Mumps (d) Septicemia
- 272.** Widal test is used for susceptibility of
- (a) Malaria (b) Cholera (c) Yellow fever (d) Typhoid
- 273.** Sickle cell anaemia is more common in South Africa. This is due to
- (a) Change in β -chain of haemoglobin (b) More population of house flies
(c) Change in α -chain of haemoglobin (d) Change in γ -chain of haemoglobin
- 274.** Swollen face, mental dullness, dry skin and loss of appetite is the characteristics of
- (a) Goitre (b) Acromegaly (c) Tetany (d) Myxoedema
- 275.** Which of the following symptoms indicate red sickness
- (a) Red and ulcerated skin (b) Nausea and anaemia
(c) Nausea and loss of hair (d) Ulcerated skin, nausea and loss of hair
- 276.** Physiotherapy is the treatment of disease by
- (a) Antibiotics (b) Vitamins
(c) Indigenous drugs (d) Massage, electricity and exercise
- 277.** All the diseases are spread by housefly except
- (a) Leprosy (b) Dysentery (c) Typhoid (d) Sleeping sickness
- 278.** Cyanosis refers to
- (a) Bluish colouration of the body (b) Reddish colouration of the body
(c) Pale colouration of the body (d) Goose flesh of the body
- 279.** Filaria, malaria, dengue fever, sleeping sickness, yellow fever are transmitted by
- (a) Mosquitoes (b) House flies (c) Insects (d) Bacteria
- 280.** Cimex present in human clothes is a type of
- (a) Autotrophic animal (b) Host (c) Parasite (d) Predator
- 281.** Which of the following set is of vector host
- (a) Sand fly, deer fly, tse-tse fly, house fly (b) Frog, lizard, snake, rabbit
(c) Leishmania, sand fly, Trypanosoma, tse-tse fly (d) Sand fly, frog, house fly
- 282.** Diabetes mellitus is due to lack of
- (a) Insulin in circulating blood (b) Starch in food
(c) Trypsin in pancreatic juice (d) ADH reaching the kidney

- 283.** Inflammatory response in allergy is caused by the release of one of the following by mast cells
 (a) Histamines (b) Antibodies (c) Antigen (d) None of them
- 284.** A condition of failure of function of kidney to form urine is
 (a) Creatinine (b) Hematuria (c) Anuria (d) Alkaptonuria
- 285.** The disease due to inflammation of vermiform appendix of the digestive system is known as
 (a) Amoebic dysentery (b) Appendicitis (c) Intestinal cancer (d) Appendectomy
- 286.** All are the disease of lungs except
 (a) Asthama (b) Bronchitis (c) Encephalitis (d) Pneumonia
- 287.** Which of the following set contains all disease transmitting arthropods
 (a) Ant, cockroach, body louse (b) Sand fly, tse-tse fly, house fly, rat flea
 (c) House fly, anopheles mosquito, body louse, termite
 (d) Rat flea, cockroach termite
- 288.** Grave's disease is caused by the hypersecretion of thyroid hormone and is associated with the
 (a) Enlargement of the thyroid gland
 (b) Increased BMR and increased nervous activity
 (c) Exophthalmia (d) All of the above
- 289.** Period from the entrance of pathogens into the body and their multiplication of show initial symptoms of disease is known as
 (a) Incubation period (b) First period (c) Climax period (d) Infection period
- 290.** After infection by pathogens dead cells, dead pathogens and liquid form the
 (a) Antibodies (b) Excretory product (c) Pus (d) Agglutinin
- 291.** Cause of 'Erythroblastosis foetalis' may be
 (a) Adjoining of RBC (b) Bleeding (c) Diapedesis (d) Haemophilia
- 292.** If a muscle fails to give stimulation action and there is much ingestion of lactic acid, the condition is termed as
 (a) Paralysis (b) Tonus (c) Fatigue (d) Tetanus
- 293.** Which one of the following is a protein deficiency disease
 (a) Eczema (b) Cirrhosis (c) Kwashiorkor (d) Nightblindness
- 294.** Servers protein deficiency in the diet leads to this disease
 (a) Kwashirokar (b) Amoebiasis (c) Diabetes (d) Cancer
- 295.** 'Asthama' is due to
 (a) Infection of trachea (b) Infection of lungs
 (c) Bleeding into pleural cavity (d) Spasm in bronchial muscles
- 296.** Epidemiology deals with the study of
 (a) Mode of transmission of disease (b) Disease causing organisms
 (c) Development of resistance against diseases (d) Skin ailments

- 297.** A non-infection unnatural and unusual reaction of a person to any substance or condition for which he is hypersensitive is termed as
 (a) Infection (b) Immunity (c) Allergy (d) Toxin
- 298.** A kind of allergy is
 (a) Asthma (b) Yellow eyes (c) Typhoid (d) Mumps
- 299.** Which of the following insect is a social animal
 (a) Locust (b) Bed bug (c) Termite (d) Mosquito
- 300.** A colour blind person cannot distinguish which of the following colours
 (a) Red (b) Green (c) All colours (d) Red and green
- 301.** 'Orchidectomy is the removal of
 (a) Ovary (b) Testis (c) Kidney (d) Spleen
- 302.** After infection of germs immunity acquired is
 (a) Active immunity (b) Passive immunity (c) Natural immunity (d) Both (a) and (b)
- 303.** Match List I with List II and select the correct answer using the code given below
 List I (Inheritable disease)
 (1) Achondroplasia, (2) Cystinuria (3) Epilepsy (4) Christmas disease
 List II (Symptoms)
 (a) Blood coagulation delayed due to absence of factor IX
 (b) Dwarfness due to short limb bones, head is norma
 (c) Periodic convulsions & unconsciousness
 (d) Renal stone formation due to excessive excretion of cystine in urine
- (a) $\begin{matrix} 1 & 2 & 3 & 4 \\ A & B & C & D \end{matrix}$ (b) $\begin{matrix} 1 & 2 & 3 & 4 \\ B & D & C & A \end{matrix}$ (c) $\begin{matrix} 1 & 2 & 3 & 4 \\ D & C & B & A \end{matrix}$ (d) $\begin{matrix} 1 & 2 & 3 & 4 \\ C & D & A & B \end{matrix}$
- 304.** The main cause of paralysis is
 (a) Some defect in muscle (b) Complete destruction of sensory nerve
 (c) Complete destruction of motor nerves (d) None of these
- 305.** Rocky mountain fever is caused by
 (a) Virus (b) Fungi (c) Algae (d) Tick
- 306.** Albino condition is found in which human race
 (a) All races (b) White race (c) Black race (d) Mongols
- 307.** Hormone produced against allergic reaction is
 (a) Epinephrine (b) Nor- epinephrine (c) Glucocorticoid (d) Mineralocorticoid
- 308.** Treatment with 'Alloxan' destroys
 (a) STH cells (b) β -cells of islets of Langerhans
 (c) Cells of Sertoli (d) Cells of Leydig

309. Which one of the following pairs correctly matches a hormone with a disease resulting from its deficiency
- (a) Insulin- Diabetes insipidus (b) Relaxin – Gigantism
(c) Prolactin- Cretinism (d) Parathyroid hormone-Tetany
310. Deficiency of adrenal cortex activity leads to
- (a) Addison's disease (b) Conn's disease (c) Cushing disease (d) Simmond's disease
311. Molecular weight of insulin is
- (a) 15,000 (b) 5000 (c) 4000 (d) 6000
312. The organism, which carries a disease from one organism to another, is called
- (a) Host (b) Vector (c) Inoculum (d) Sterilization
313. The functional organ of allergy in humans is
- (a) Lungs (b) Heart (c) Kidney (d) Spleen
314. Continued consumption of a diet rich in butter, red meat and eggs for a long period may lead to
- (a) Vitamin toxicity (b) Kidney stones
(c) Hypercholesterolemia (d) Urine laden with ketone bodies
315. Black lung disease is common among
- (a) Coal miners (b) Refinery workers
(c) Farmers (d) Petrochemical industry workers
316. Which of the following disease is due to an allergic reaction
- (a) Goitre (b) Enteric fever (c) Skin cancer (d) Hay fever
317. Where did epidemic bone softening disease Itai-Itai occurred first
- (a) USA (b) Japan (c) South Korea (d) Burma
318. Congenital diseases are those which
- (a) Occur during life time (b) Are deficiency diseases
(c) Are present from time of birth (d) Are spread from man to man
319. Which disease is caused by a nematode
- (a) Leprosy (b) Poliomyelitis (c) Amoebiasis (d) Filariasis
320. Interferons curb infection of
- (a) Bacteria (b) Fungi (c) Cancer (d) None of these
321. Christmas disease is another name for
- (a) Sleeping sickness (b) Haemophilia B (c) Hepatitis B (d) Down's syndrome
322. Kwashiorkor disease develops due to
- (a) Malnutrition (b) Over-eating (c) Catalysis (d) Mutation

IMMUNITY AND VACCINATION

Basic Level

323. The toxic substances produced by the foreign bodies are known as
(a) Antibodies (b) Allergens (c) Antigens (d) Histamine
324. Lymphocytes secrete a protein which caused the dilation of blood vessels. The protein is
(a) Pyrogens (b) Histamine (c) Interferon (d) None of these
325. Lacking of B-cells and T-cells is known as
(a) Toxigenicity (b) Autoimmunity (c) Cytotoxins (d) Immune deficiency
326. Certain compounds are released by the WBC which raise the body temperature. These compounds are known as
(a) Pyrogens (b) Histamines (c) Toxigens (d) Pathogens
327. B-cells are lymphocytes which produce the humoral immunity. These cells are produced by
(a) Liver (b) Spleen (c) Thymus (d) Bone marrow
328. T-Cells are lymphocytes which produce the cellular immunity. These are developed from
(a) Thymus (b) Liver
(c) Spleen (d) Endothelium of blood vessel
329. Which of the following displays immune tolerance
(a) B-cells (b) T-cells (c) α -cells (d) Both (a) and (b)
330. Sensitivity to any allergen is related to
(a) Deviation from the process of immunity (b) Age of the person
(c) Eating habit (d) Rise in environmental temperature
331. Passive immunity was discovered by
(a) Robert Koch (b) L. Pasteur (c) Edward Jenner (d) Eemil Von Behring
332. 'Pathogens' are also known as
(a) Immune bodies (b) Antigens (c) Agglutinins (d) Autotoxins
333. Immune activities defence mechanism for different diseases is known as
(a) Immune action (b) Immune reaction (c) First line of defence (d) Immunity
334. 'Vaccination' was invented by
(a) Pasteur (b) Edward Jenner (c) Robert Koch (d) Robert Hooke
335. Filarial larva can be collected from man's
(a) Smears of intestinal contents (b) Peripheral blood at midnight
(c) Smears of spleen (d) Biopsy of liver
336. Study of interaction of antigens and antibodies in the blood is
(a) Cryobiology (b) Serology (c) Haematology (d) Angiology
337. The cells which directly attack and destroy the antigens are known as
(a) Helper T-cells (b) Killer T-cell (c) Helper B- cells (d) Killer B-cells
338. The cells which produce the antibodies by stimulating the B-cells are known as
(a) Killer B-cells (b) Helper B- cells (c) Helper T-cells (d) Antibodies

339. The cells which suppress the entire immune system from its attack in the same body are known as
 (a) Helper T-cells (b) Killer B- cells (c) Suppressor cells (d) Suppressor T-cells
340. The binding of antibodies to the antigens to produce a large insoluble complex is known as
 (a) Antibody-antigen complex (b) Agglutination
 (c) Immunization (d) Suppressor cell reaction
341. Recognition and digestion by the phagocytes due to the coated surface of antigens by the antibodies is known as
 (a) Opsonization (b) Immunization
 (c) T-cells immunization reaction (d) B-cells immunization reaction
342. In some children similar disease does not appear due to the presence of
 (a) T- cells immune system (b) B- cells immune system
 (c) Memory cells (d) Phagocyte antigen reactions
343. The immune system which works against self is
 (a) Self immune system (b) Autoimmunity (c) Specific immunity (d) None of the above
344. When the children without T- cells and B- cells are kept in germ free isolation suits, then the disease is
 (a) Immunity less hybrids (b) Anti-antigens immune system
 (c) SCID (Severed combined immuno deficiency) (d) None of these
345. The dead bacteria and pus formation in the wounded region is known as
 (a) Inflammatory response (b) Immune response
 (c) Immune reaction (d) Phagocytic response
346. After vaccination the body builds up
 (a) Toxins (b) Lymph (c) Antibodies (d) Plasma
347. One good example of an 'antiseptic' is
 (a) Bordeaux mixture (b) DDT
 (c) Carbolic acid in dilute solution (d) Hydrocyanic acid gas
348. Humoral immunity is due to
 (a) B-lymphocytes (b) T-lymphocytes (c) L-Lymphocytes (d) P- Lymphocytes
349. Injections of antitoxin or toxoid serum is given to prevent
 (a) Diphtheria (b) Small pox (c) Chicken pox (d) Chronic headache
350. Membrane attack complex (Mac) is formed by
 (a) B- Lymphocytes (b) Compliments (c) Macrophages (d) T- Lymphocytes
351. Thymosin stimulates
 (a) Milk secretion (b) Erythrocytes (c) T-lymphocytes (d) Melanocytes
352. What is the molecular weight of IgG antibody
 (a) 146,000 (b) 160,000 (c) 190,000 (d) 200,000

353. Passive immunity is defined as immunity
- (a) Inherited from the parents
 - (b) Achieved through vaccination
 - (c) Acquired through first exposure to the disease
 - (d) Achieved through the sera of other animal enriched in antibodies
354. The function of vaccine is the production and storage of
- (a) Antigens
 - (b) Immune bodies
 - (c) Immune reactions
 - (d) Antibodies
355. Generally the number of vaccinations are to get complete immunity
- (a) 2 to 3
 - (b) 2 only
 - (c) 3 only
 - (d) 4 only
356. After vaccination, the dose given for the immunization is known as
- (a) Essential dose
 - (b) Deficient dose
 - (c) Booster dose
 - (d) Resistant dose
357. Agents which produce allergy is known as
- (a) Antigens
 - (b) Allergens
 - (c) Oncogens
 - (d) None of these
358. The poisons produced in the body by bacteria are called
- (a) Toxins
 - (b) Antitoxins
 - (c) Toxicoids
 - (d) Wastes
359. The immunity obtained after the body has recovered from a disease is
- (a) Active immunity
 - (b) Passive immunity
 - (c) Both
 - (d) None of these
360. Which of the following represent the correct sequence of events for defence by leucocytes
- (a) Inflammation, diapedesis, chemotaxis phagocytosis, digestion
 - (b) Chemotaxis, inflammation, phagocytosis, digestion, diapedesis
 - (c) Diapedesis, digestion, inflammation, phagocytosis, chemotaxis
 - (d) Inflammation, chemotaxis, diapedesis, phagocytosis, digestion
361. Edward Jenner discovered
- (a) Vaccination against polio
 - (b) Immunization against polio
 - (c) Vaccination against small pox
 - (d) Immunization against small pox
362. Which of the following is primarily concerned with protection against germs
- (a) Liver
 - (b) Lymphatic tissue
 - (c) Kidney
 - (d) Thyroid
363. Lysis of foreign cell is mediated through
- (a) IgM only
 - (b) IgA
 - (c) IgM and IgG
 - (d) IgD and IgE
364. Vaccination against small pox means the introduction into our body, of
- (a) Leucocytes obtained from animal
 - (b) Antibodies produced in other animals
 - (c) Antibodies
 - (d) Actual weakened germs or attenuated small pox virus
365. Short lived immunity acquired from mother to foetus across placenta or through mother's milk to the infant is categorised as
- (a) Innate non- specific immunity
 - (b) Active immunity
 - (c) Passive immunity
 - (d) Cellular immunity

366. Maximum application of animal cell culture technology today is in the production of
(a) Edible proteins (b) Insulin (c) Interferon (d) Vaccines
367. What is true about T-lymphocytes in mammals
(a) These are produced in thyroid
(b) These are three main types-cytotoxic T-cells helper T-cells and suppressor T- cells
(c) These originate in lymphoid tissues
(d) They scavenge damaged cells and cellular debris
368. A person is injected with immunogen against hepatitis. This is
(a) Artificially acquired passive immunity (b) Artificially acquired active immunity
(c) Naturally acquired active immunity (d) Naturally acquired passive immunity
369. Broad spectrum antibiotic is that which
(a) Acts on a variety of pathogenic microorganisms (b) Acts on both pathogen and host
(c) Is effective in very small amounts (d) Acts on all bacteria and virus
370. The term "antibiotic" was coined by
(a) Alexander Fleming (b) Edward Jenner (c) Louis Pasteur (d) Selman Waksman
371. An antibody is
(a) Molecule that specifically inactivates an antigen (b) WBC which invades bacteria
(c) Secretion of mammalian RBC (d) Component of blood
372. Booster dose of triple antigen vaccination is given to the child at the age of
(a) One year (b) Two years (c) Three years (d) Four years
373. Active immunity is obtained by
(a) Antibodies (b) Weakened germs infection (c) Natural resistance (d) None of these
374. Antibody formation and immunity production is done by a protein called globulin present in the
(a) Stroma of RBC (b) Haemoglobin of RBC (c) Plasma (d) Blood platelets
375. A scientist associated with 'antibiotic' is
(a) Brown (b) Flemming (c) Leeuwenhock (d) Koch
376. Which of the following are most abundant types of antibodies
(a) IgA (b) IgE (c) IgG (d) IgM
377. When an organ is transplanted and is rejected by the body, the lymphocytes are produced by
(a) T- cells (b) B-cells (c) Neutrophils (d) None of these
378. Which of the following is a correct statement
(a) B-cells directly engulf the pathogenic bacteria
(b) B-cells produce antibodies soon after they are formed
(c) B-cells produce a large clone of plasma cells soon after it is formed
(d) The B- cells produce the plasma cells only after they are triggered by a specific antigen
379. A cell coded protein that is formed in response to infection with most animal viruses is called
(a) Antigen (b) Interferon (c) Histone (d) Antibody

- 380.** The antibodies are
 (a) Lipids (b) Germs (c) Proteins (d) Carbohydrates
- 381.** Some people who have suffered from a disease may not be affected again during their life time such immunity is called
 (a) Natural immunity (b) Acquired immunity (c) Active immunity (d) Passive immunity
- 382.** Antibodies fight against
 (a) Infection (b) Thirst (c) Starvation (d) Stress
- 383.** Which of the following is responsible for cellular immunity
 (a) B-lymphocyte (b) T- lymphocyte (c) Erythrocytes (d) Thrombocytes
- 384.** 'First line of defence' is known as
 (a) Antibodies (b) WBC (c) Skin (d) Liver
- 385.** 'Second line of defence' is known as
 (a) Antibodies (b) WBC (c) Liver (d) Blood
- 386.** Passive immunity can be obtained by injecting
 (a) Antigens (b) Antibodies
 (c) Antibiotics (d) Vaccination having weakened germs
- 387.** An antigen is
 (a) Opposite to an antibody (b) Residue of an antibody
 (c) Stimulus for antibody formation (d) Result of antibody
- 388.** Triple antigen vaccine is not used for
 (a) Diphtheria (b) Pertussis (c) Typhoid (d) Tetanus
- 389.** Which part of the body is known as police guard'
 (a) Tonsils (b) Liver (c) Skin (d) Leucocytes
- 390.** First triple antigen vaccination is given to the child at the age of
 (a) One month (b) Three month (c) Four month (d) One year
- 391.** A molecule that elicits an immune response is called
 (a) Antibody (b) Antigen (c) Mutagen (d) Carcinogen
- 392.** The term 'active immunity' means
 (a) Resistance developed after disease (b) Resistance developed before disease
 (c) Resistance rate of heart beat (d) Increasing quantity of blood
- 393.** The antibodies are
 (a) γ -globulins (b) Albumins (c) Vitamins (d) Sugar
- 394.** Vaccines are prepared from immune
 (a) Vitamins (b) Blood (c) Serum (d) Plasma
- 395.** Suspension of killed or attenuated pathogenic micro-organisms on inoculation if stimulate the formation of antibodies, it is known as
 (a) Vaccine (b) Antibiotic (c) Sera (d) Antitoxins
- 396.** What is introduced in polio vaccination
 (a) Antibodies (b) Antigen (c) Antibiotics (d) Bacteriostatic agent

397. Vaccination is a

- (a) Active immunity (b) Passive immunity (c) Both (a) and (b) (d) None of these

ANSWER

ASSIGNMENT (BASIC & ADVANCE LEVEL)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
a	b	c	c	d	a	b	b	a	a	c	b	b	a	c	d	d	d	b	b
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
b	b	a	b	c	a	b	a	a	b	a	d	d	c	b	d	b	a	c	d
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
c	b	d	b	c	a	d	a	b	b	c	c	a	b	a	d	d	d	a	c
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
b	d	b	a	b	a	b	c	c	d	a	a	b	a	a	c	c	a	a	b
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
a	c	b	d	c	c	c	a	a	c	c	d	a	b	c	c	d	d	a	c
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
a	a	a	b	b	a	a	b	b	a	b	b	a	c	d	c	a	b	d	c
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
c	a	b	c	c	a	d	a	d	a	b	b	c	b	a	d	c	c	d	c
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
c	d	a	d	b	b	a	d	a	b	c	a	d	a	c	d	b	a	b	a
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
a	b	a	d	d	c	b	a	d	a	b	b	c	c	c	c	d	c	a	c
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
a	b	a	d	d	b	c	a	a	d	a	d	c	a	c	c	b	d	b	b
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
d	a	b	a	d	a	a	b	a	a	a	a	b	d	a	c	d	b	a	d
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
c	c	b	c	d	c	d	d	c	a	c	a	c	a	b	a	a	c	a	d
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
c	b	a	d	c	b	d	b	b	d	d	c	c	a	a	d	c	b	d	c
261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
d	c	c	d	a	c	a	c	c	d	b	d	a	d	d	d	a	a	c	c
281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
a	a	a	c	b	c	b	d	a	c	a	c	c	a	d	a	c	a	c	d
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320
b	a	b	c	d	a	a	b	d	a	d	b	d	c	a	d	b	c	d	d
321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340
b	a	c	b	d	a	d	a	d	a	d	b	d	b	b	b	b	c	d	a

341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
a	c	b	c	d	c	c	a	b	b	c	b	d	d	a	c	b	a	a	a
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380
c	b	c	d	c	d	b	b	a	d	a	a	b	c	b	c	a	b	b	c
381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397			
b	a	b	c	b	b	c	c	a	b	b	a	a	c	a	b	a			
