

CHAPTER 8

HUMAN HEALTH AND DISEASE

POINTS TO REMEMBER

Carcinogens : Cancer causing agents. e.g., gamma rays. UV rays, dyes and lead.

Immunity : Resistance to infection or antigen.

Immuno Suppressant : The chemical which suppress the immunity response to antigen partially or completely.

Interferon : The glycoproteins produced by our body cells in response to a viral infection.

Incubation Period : The time period between infection and the appearance of symptoms.

Metastasis : The property in which the cancer cells spread to different sites through blood and develop secondary tumors.

Oncogenes : Viral genome which causes cancer.

Retrovirus : A virus having RNA as genetic material and forms DNA by reverse transcription and then replicate e.g., Human Immunodeficiency Virus (HIV).

Sporozoites : The infective stage of protozoa *Plasmodium* which is injected into human blood through saliva of female *Anopheles* mosquito.

Syndrome : Collection of disease symptoms responsible for a disorder or a disease.

Vaccination : Inoculation of a vaccine to stimulate production of antibodies and provide immunity for one or more disease.

ABBREVIATIONS

PMNL : Polymorpho-Nuclear Leukocytes

CMI : Cell Mediated Immunity

ELISA : Enzyme Linked Immunosorbent Assay

HLA : Human Leukocyte Antigen

MALT : Mucosal Associated Lymphoid Tissue

SCID : Severe Combined Immuno Deficiency

NACO : National AIDS Control Organisation

MRI : Magnetic Resonance Imaging

- **Health** – The state of complete physical, mental and social well beings
- Good health can be achieved by (i) awareness about disease and their effects on different body functions. (ii) vaccination (iii) control of vectors (iv) proper disposal of wastes (v) Maintenance of hygienic food and water resources.
- **Infectious Diseases** (i) Viral Diseases eg. polio, common cold, measles, rabies (ii) Bacterial diseases – eg. Typhoid, pneumonia, Diphtheria, Tetanus, (iii) Fungal diseases - eg. Ring worm & Scabies (v) Helminthic diseases - eg. Ascariasis, Filariasis, Taeniasis

Disease	Causative Agents	Symptoms
1. Common cold	Rhinoviruses	Nasal congestion and discharge, sore throat cough, headache, tiredness and hoarseness.
2. Typhoid	<i>Salmonella typhi</i>	sustained high fever, stomach pain, loss of appetite, constipation, headache.
3. Pneumonia	<i>Streptococcus pneumoniae</i> and <i>Haemophilus influenzae</i>	fever, headache, cough, chills' in severe cases finger nails may turn grey to bluish in colour.
4. Malaria	<i>Plasmodium P. malaria, P.vivax, P. falciparum</i>	yawning, tiredness, acute headache, muscular pain, feeling of chillness and shivering, nausea and high temperatures
5. Amoebic dysentery	<i>Entamoeba histolytica</i>	Abdominal pain, cramps, stool with excess mucus and blood clots, constipation

6. Ringworm	<i>Microsporium epidermophyton</i> and <i>trichophyton</i>	Dry scaly lesions on skin, nails and scalp, itching
7. Ascariasis	<i>Ascaris lumbricoides</i>	Anaemia, muscular pain, internal bleeding, insomnia, blockage of intestinal passage
8. Filariasis or Elephantiasis	<i>Wuchereria bancrofti</i> and <i>W. malayi</i>	fever, blockage of lymphatic vessels, enormous swelling of affected part viz. arm, foot, leg, mamma or scrotum

Two types of immunities –

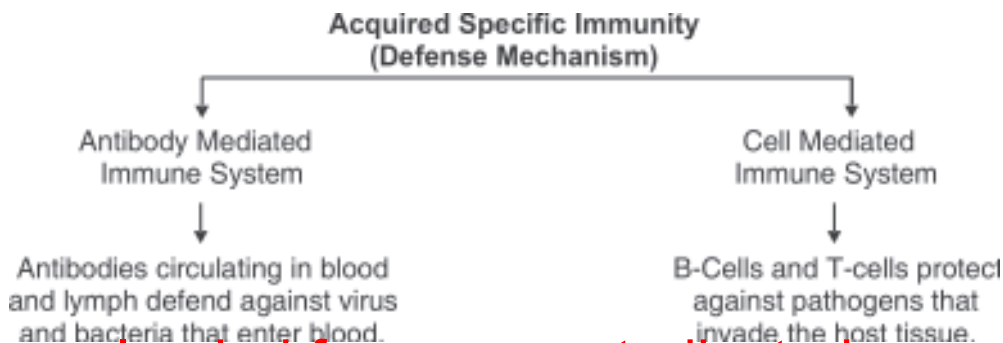
- (i) **Innate immunity** – in-herited by the organism from the parents and protects from birth through out life.

Four types of barriers

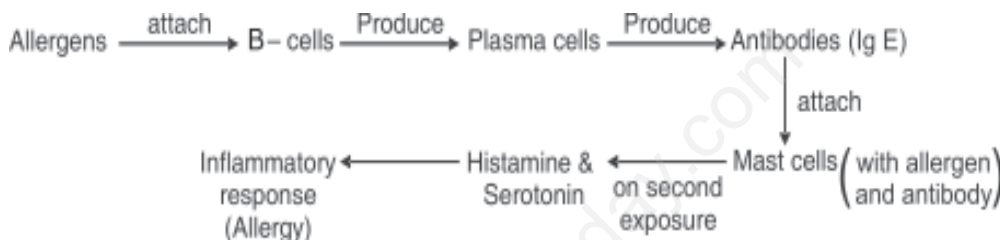
- (a) **Physical** - eg skin, mucus coating epithelium of respiratory, gastro-intestinal and urinogenital tracts.
- (b) **Physiological** - eg. acid of stomach, lysozymes of saliva and tears
- (c) **Cellular** eg. PMNL, monocytes, Neutrophils and macrophages
- (d) **Cytokine** - eg virus infected cells secrete proteins called interferons which protect non-infected cells from further infection
- (ii) **Acquired Immunity** – Acquired by a person after birth by vaccination or contacting the disease.

FACTORS AFFECTING HEALTH

- (a) **Genetic** : Child may inherit certain disorders from parents.
- (b) **Life Style** : Water/food intake, rest, exercise, personal hygiene.
- (c) Infection and Corresponding immunity.



- ❑ It is based on the principle of memory and immunity.
- ❑ The antigenic preparations of proteins of pathogens or a solution of inactivated or weakened pathogens are introduced in the body.
- ❑ The antigenic properties are recognised.
- ❑ Cascade of reactions forms antibodies
- ❑ History of reactions is stored as memory.
- ❑ Subsequent exposures result in intensified response.



Drugs

Criteria	Opioids	Cannabinoids	Coca alkaloids
Source	Papaver somniferum (Poppy Plant)	Cannabis sativa (Hemp Plant)	Erythroxylum coca (Coca plant)
Part of Plant	Fruits (Unripen Capsules)	Inflorescence, leaves, resin	Leaves and Young twigs
Product	Opium, Morphine Heroin/Smack	Charas, Ganja Hashish Marijuana	Cocaine (Coke/ Crack)
Mode of Intake	Snorting, Injection	Oral, Inhalation	Snorting
Effects (Property)	Neuro depressant, Slow down the functions of the body	Interact with cannabinoid receptors, Cardiovascular system effects	Sense of euphoria interferes with neurotransmitters, Hallucination

– Acquired Immunity

(i) May be Humoral (containing antibodies which circulate in body fluids). mediated by B-lymphocytes.

(ii) Cell-Mediated (CMI) - mediated by T-lymphocytes

– Acquired immunity may be active or passive.

– Vaccination and immunisation are based on the property called 'memory' of the immune system

- **Symptoms of Allergy** – Sneezing, watery eyes, rashes, running nose and difficulty in breathing.
- **Auto Immunity** – When the immune system of body starts destroying 'self' cells and molecules, called auto immune diseases eg Rheumatoid arthritis, multiple sclerosis and insulin-dependent diabetes.
- Immune system in the body play an important role in organ transplantation, allergic reactions and auto immune diseases
- Immune system consists of lymphoid organe, bone marrow, thymus, spleen, lymph nodes and MALT (Mucosal Associated Lymphoid Tissue)
- AIDS - (Acquired Immuno Dificiency Syndrome)
- caused by HIV (Human Immunodeficiency Virus) which belongs to retrovirus category of viruses.

Modes of transmission

- By sexual contact with infected person
- By transfusion of contaminated blood and blood products
- By sharing the infacted needles
- From infected mother to child through placenta

Persons who are at high risk of getting infection include-

- Individuals who have multiple sex partners
- Drug addicts taking drugs intravenously
- Individuals who require repeated blood transfusions
- Children born to HIV infected mother

Prevention of AIDS

- Using disposal syringes and needles, checking the blood of HIV, controlling drug abuse, free distribution of condoms and advocating safe sex.
- Main test for AIDS in ELISA (Enzyme Linked Immuno Sorbant Assay)

Cancer

- Carcinogens induce the transformation of normal cells into cancerous cells eg. UV rays, X-rays, Y-rays, anilene dyes and tumour viruses, cadmium oxide, mustard gas, Ni & Cr compounds etc

Two types of tumors – (a) **Benign** – confined to the area of formation and do not spread to other parts. (b) **Malignant** – grow metastasis i.e. cells

of these tumors can be carried by blood stream or lymph to other parts of body and form secondaries in neighbouring organs.

Treatment – through surgery, radiotherapy, chemotherapy, immunotherapy.

QUESTIONS

VSA (1 MARK)

1. Name the diagnostic test which confirms typhoid.
2. Name the two major groups of cells required to attain specific immunity.
3. You have heard of many incidences of Chickengunya in our country. Name the vector of the disease.
4. Breast fed babies are more immune to diseases than the bottle fed babies. Why?
5. Name the pathogen which causes malignant malaria.
6. Which microorganism is used to produce hepatitis B Vaccine?
7. What is the reason of shivering in malarial patient?

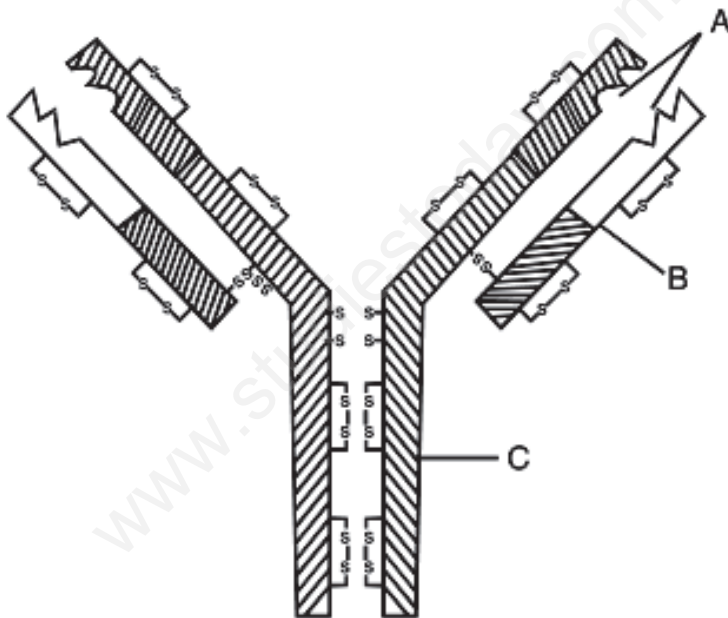
SA-II (2 MARKS)

8. Where are B-cells and T-cells formed? How do they differ from each other?
9. Given below are the pathogens and the diseases caused by them. Which out of these pairs is not correct matching pair and why?

(a) <i>Wuchereria</i>	–	Filariasis
(b) <i>Microsporium</i>	–	Ringworm
(c) <i>Salmonella</i>	–	Common Cold
(d) <i>Plasmodium</i>	–	Malaria
10. What would happen to the immune system, if thymus gland is removed from the body of a person?
11. Lymph nodes are secondary lymphoid organs. Describe the role of lymph nodes in our immune response.
12. What is the role of histamine in inflammatory response? Name few drugs which reduce the symptoms of allergy.

SA-I (3 MARKS)

13. What are Cannabinoids? From which plant Cannabinoids are obtained? Which part of the body is affected by consuming these substances?
14. In the figure, structure of an antibody molecule is shown. Observe it and Give the answer of the following questions.
- (i) Label the parts A, B and C.
 - (ii) Which cells produce these chemicals?
 - (iii) State the function of these molecules.



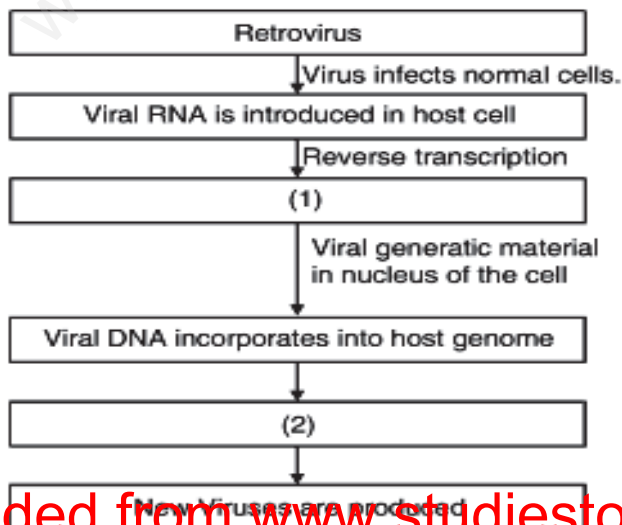
15. Mention any three causes of drug abuse. Suggest some measures for the prevention and control of drug abuse.
15. A person shows unwelcome immunogenic reactions while exposed to certain substances.
- (a) Name this condition.
 - (b) What common term is given to the substances responsible for this condition?
 - (c) Name the cells and the chemical substances released which cause such reactions.

17. Fill in the blanks in the different columns of the table given below to identify the nos 1 to 6.

	Name of disease	Causative organism	Symptoms
1.	Pneumonia	<i>Streptococcus</i>	(1)
2.	Typhoid	(2)	High fever, weakness, headache, stomach pain
3.	(3)	<i>Rhinoviruses</i>	Nasal Congestion, and discharge sorethroat cough, headache
4.	Ascariasis	<i>Ascaris</i>	(4)
5.	Ringworm	(5)	Dry, Scaly lesions on various body parts, Intense itching, redness.
6.	(6)	<i>Entamoeba histolytica</i>	Constipation, cramps, abdominal pain, Stools with excess mucous and blood clots.

18. In the given flow diagram, the replication of retrovirus in a host cell is shown. Examine it and answer the following questions

- (a) Why is virus called reterovirus? (b) Fill in (1) and (2)
 (c) Can infected cell survie while viruses are being replicated and released by host cell?



19. What is innate immunity? List the four types of barriers which protect the body from the entry of the foreign agents.

LA (5 MARKS)

20. Answer the following with respect to Cancer.
- (a) How does a cancerous cell differ from a normal cell?
 - (b) Benign tumor is less dangerous than malignant tumor. Why
 - (c) Describe causes of cancer.
 - (d) mention two methods of treatment of the disease.
21. The pathogen of a disease depends on RBCs of human for growth and reproduction. The person with this pathogen suffers with chill and high fever.
- (a) Identify the disease.
 - (b) Name the pathogen.
 - (c) What is the cause of fever?
 - (d) Represent the life cycle of the pathogen diagrammatically.
22. The immune system of a person is suppressed. He was found positive for a pathogen in the diagnostic test ELISA.
- (a) Name the disease, the patient is suffering from.
 - (b) Which pathogen is identified by ELISA test?
 - (c) Which cells of the body are attacked by the pathogen?
 - (d) Suggest preventive measure of the infection.

ANSWERS

VSA (1 MARK)

- 1. Widal test
- 2. B-lymphocytes and T-lymphocytes.
- 3. *Aedes* mosquitoes.
- 4. The mother's milk consists of antibodies (Ig A) such antibodies are not available to bottle fed babies.
- 5. *Plasmodium falciparum*.

6. Yeast.
7. After sporozoite infection, when RBC ruptures, a toxic substance haemozoin is released which causes chills and high fever.

SA-II (2 MARKS)

8. B-cells and T-cells are formed in bone marrow. B-cells produce antibodies but E-cells do not produce antibodies but help B-cells to produce them.
9. *Salmonella* : Common cold is not a matching pair.
10. T-lymphocytes are developed and matured in thymus gland, Immune system will become weak on removal of thymus gland.
11. Lymph nodes provide the sites for interaction of lymphocytes with the antigen. When the microorganisms enter the lymph nodes, lymphocytes present there are activated and cause the immune response.
12. Histamine acts as allergy-mediator which causes blood vessels to dilate. It is released by mast cells. Antihistamine steroids and adrenaline quickly reduce the symptoms of allergy.

SA-I (3 MARKS)

13. – Cannabinoids are a group of chemicals which interact with Cannabinoid receptors present
 - Principally in the brain Cannabinoids are obtained from the inflorescences of the plant *Cannabis sativa*.
 - The substances affect the cardiovascular system adversely
14. (a) A-Antigen binding site B-Light chain
 - (b) B-lymphocytes.
 - (c) Heavy Chain
 - (d) Antibodies provide acquired immune response.
15. ☐ **Reasons to attract towards drug abuse** : Curiosity, peer pressure, escape from frustration and failure, family problems, false belief of enhanced performance.

❑ **Preventive measures :**

- Avoid undue peer pressure
 - Education and Counselling
 - Seeking help from parents and peers.
 - Looking for danger signs
 - Seeking professional and medical help

16. (a) Allergy (b) Allergens

(c) Mast Cells – Histamine, Serotonin

17. (i) Alveoli filled with fluid, reduced breathing, fever, chills, cough and headache.

(ii) *Salmonella typhi*

(iii) Common Cold

(iv) Internal bleeding, muscular pain, anaemia, fever and blockage of the intestinal passage.

(v) Microsporum species/Trichophyton species/Epidermophyton Species.

(vi) Amoebiasis/amoebic dysentery

18. (a) HIV has RNA genome. It produces DNA by reverse transcription.

(b) 1 : Viral DNA is produced by reverse transcriptase.

2 : New Viral RNA is produced by the infected cell.

(c) Infected cell can survive.

19. Innate Immunity is non-specific type of defense that is present at the time of birth.

(i) **Physical Barriers** : Skin, mucous-coated epithelium or respiratory, digestive and urinogenital tract.

(ii) **Physiological Barriers** : Acidity of Stomach, lysozyme in saliva, tears, sweat.

(iii) **Cellular Barrier** : Macrophages, neutrophils, monocytes and natural killer lymphocytes..

(iv) **Cytokine Barriers** : Interferons produced by Viral infected cells, protect the non-infected cells from further Viral infection.

20. (a) In normal cells, growth and differentiation is highly controlled and regulated (contact inhibition). The cancerous cells have lost the property of contact inhibition, hence continue to divide giving rise to masses of cells (tumors).
- (b) The benign tumor remains confined in the organ affected as it is enclosed in a connective tissue sheath and does not enter the metastatic stage.
- (c) Cancer may be caused due to carcinogens which are physical (radiations), chemicals (Nicotine, Aflatoxin, Cadmium oxide, Asbestos) and biological (viral oncogens).
- (d) Surgery, radiotherapy, Chemotherapy
19. (a) Malaria
- (b) Different species of Plasmodium viz P. vivax, P. Malariae and P. falciparum.
- (c) Malaria is caused by the toxins (haemozoin) produced in the human body by the malarial parasite. This toxin is released by the rupturing of RBCs.
- (d) Life cycle of Plasmodium : Fig. 8.1 Page 148, NCERT book, Biology - XII
20. (i) AIDS (Acquired Immuno Deficiency Syndrome)
- (ii) HIV (Human Immunodeficiency Virus)
- (iii) Helper T-cells, macrophages, B-lymphocytes.
- (iv) **Preventive measures :**
- (a) People should be educated about AIDS transmission.
- (b) Disposable needles and syringes should be used
- (c) Sexual habits should be changed immediately
- (d) High-risk groups should be discouraged from donating blood.
- (e) Routine screening may be done.