

5. SOLDIERS OF DEFENSE

CONTENT

- * Defense by body coverings, body secretions and body fluids.
WBCs in non-specific defense.
Defense mechanisms (Inflammatory response, Phagocytosis, Blood clotting, Healing, Fever)
- * Specific defense - Actions of B and T-lymphocytes.
- * Vaccines for induced immunity.
- * Popular systems of treatment – Allopathy, Ayurveda, Homeopathy, Unani, Sidha etc.
- * Techniques for the diagnosis of diseases – Equipments, Lab test etc.
- * Antibiotics.
- * Blood groups and blood transfusion.
- * Defense mechanisms in plants (-structural & biochemical)

QUESTIONS & ANSWERS

1. Defense ?

Defense is the ability of the body to prevent the entry of pathogens and to destroy those that have already entered the body.

2. Defense mechanisms in our body ?

- Body coverings (Skin and mucous membrane)
- Body secretions (Mucus, lysozyme in saliva, tears and urine, sweat, sebum, ear wax, HCl ...)
- Body fluids (Blood and lymph)

3. 'Our skin is referred as a fort of defense'. How?

The outer epidermis of the skin have a protein called **keratin**, prevents germs from entering it.

Sebum, produced by the sebaceous glands makes skin oily and water proof.

Sweat, produced by the sweat glands have disinfectants to destroy germs.

Skin also contain useful bacteria, which indirectly prevent germs.

4. How mucous membrane protects our body ?

Mucous membrane secretes **mucus** where germs trapped and get destroyed. The destroyed germs are expelled out by the cilia cells of the mucous membrane. It also contain useful bacteria.

5. Many useful bacteria seen in our body also prevent germs. How ?

The germs that enter the body get destroyed during the competition with the useful bacteria.

6. Table showing various secretions to defend pathogens in different body parts.

Body part	Secretion
Eye	- Lysozyme in tears
Ear	- Ear wax
Nose, Trachea	- Mucus
Mouth	- Lysozyme in saliva
Stomach	- HCl in gastric juice
Intestines	- Mucus
Urinary bladder	- Lysozyme in urine

7. The main warriors of the body ?

White blood cells (Monocytes, Basophils, Neutrophils, Eosinophils and Lymphocytes)






8. The real warriors among white blood cells ?

Lymphocytes (B-lymphocytes and T-lymphocytes)

9. Examples for certain natural defense mechanisms of our body, to prevent or destroy germs ?

Inflammatory response, Phagocytosis, Blood clotting, Healing of wounds, Fever..

10. The role of white blood cells ?

	Neutrophil	Engulfs bacteria, Synthesizes chemicals to destroy bacteria
	Basophil	Stimulates the other white blood cells, Dilates the blood vessels.
	Eosinophil	Synthesizes chemicals to destroy foreign bodies. Synthesizes chemicals for inflammatory response.
	Monocyte	Engulfs and destroys germs.
	Lymphocytes (B & T)	Identifies and destroys germs specifically

11. Inflammatory response is a kind of defense mechanism. What is inflammatory response ?

The dilation of the blood vessels by certain chemicals, when germs enter through wound, is termed as inflammatory response.

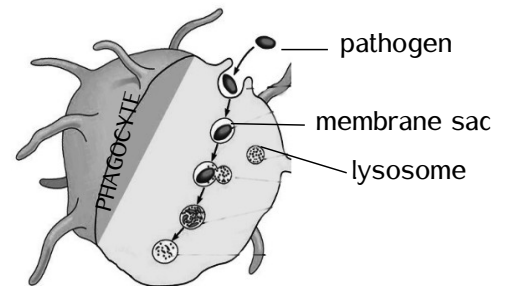
12. What is the advantage of dilation of blood vessels (inflammation) at the wound site ?

When inflammation occur, blood flow increases to the wound site and more plasma and white blood cells can reach easily there. WBC can come out from blood vessels. Germs can be engulfed and destroyed there.

13. What is phagocytosis ?

Phagocytosis is the process of engulfing and destroying germs by certain white blood cells (phagocytes).

- Phagocyte reach near the pathogen.
- Engulfs the pathogen in the membrane sac.
- Membrane sac combines with lysosome.
- The enzyme in the lysosome destroys the pathogen.
- Phagocyte expels the remnants.



14. Give examples for phagocytes.

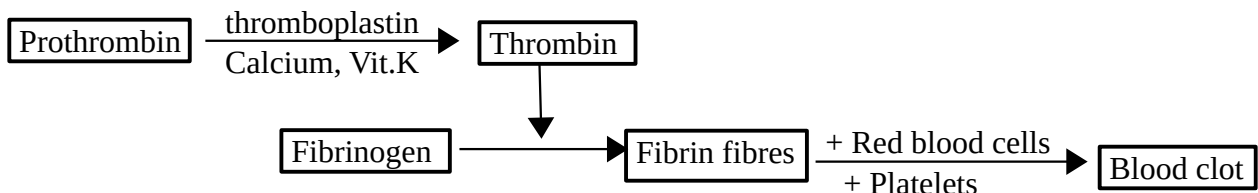
Monocytes and neutrophils.

15. The factors needed for blood clotting ?

The proteins prothrombin and fibrinogen in plasma, calcium ions, vitamin K, RBC and platelets.

16. Different stages in the process of blood clotting.

- Tissues of the wounded part degenerate to form an enzyme, **thromboplastin**.
- With calcium ions and vitamin K, thromboplastin converts prothrombin to **thrombin**.
- Thrombin converts fibrinogen to **fibrin**.
- In the fibrin net, RBCs and platelets entangled to form the blood clot.



17. In certain situations, wound scar remains there. Why ?

Instead of forming same new tissues, connective tissues form which heal the wound. In such situations the wound scar remains there.

18. Bacterial diseases are common in man. Give reason.

Our body temperature, 37° C (98.6° F), is favourable for the rapid multiplication of bacteria.

19. 'Fever is not a disease, it is mere a defense mechanism.' - Analyse the statement.

True. Our body raises temperature (fever) when chemical substances are produced by the white blood cells, which are stimulated by the toxin of pathogens.

20. What is specific defense ?

The defense mechanism that identifies the structure of each antigen and destroys it specifically is called specific defense.

21. What are antigens ?

Antigens are foreign bodies or pathogens that enter the body and stimulate the defense mechanism.

22. B-lymphocytes : Mature in the bone marrow;

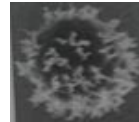
T-lymphocytes : ----- ? [Mature in the thymus gland]

23. Name the chemical substances, produced by B-lymphocytes against foreign bodies/antigens.

How these substances destroy germs ?

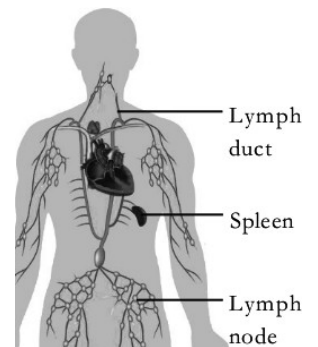
Antibodies.

They destroy germs by disintegrating bacterial cell membrane, neutralise their toxins and stimulate the other white blood cells.



24. How is T-lymphocyte destroy germs ?

T-lymphocytes stimulate the other white blood cells and destroy cancer cells as well as virus affected cells.



25. How lymph helps in defense mechanisms ?

Lymphocytes in the lymph destroy bacteria with in the **lymph nodes** and **spleen**.

26. What are vaccines ?

Vaccines are substances used for artificial immunization.

Vaccines are used to prevent certain diseases in advance. A vaccinated person gets induced immunity by the formation of antibodies in his body in advance.

27. Who started **immunization** ?

Doctor Edward Jenner.

[Smallpox vaccine , the first vaccine, was invented by him]



[The immunization programmes got the name vaccination from the Latin word 'vacca' meaning cow, in memory of the cowpox experiments of Jenner.]

Vaccine	Disease
BCG	Tuberculosis
OPV	Polio
Pentavalent	Diphtheria, Pertussis, Tetanus Hepatitis-b, Hib
MMR	Mumps, Measles, Rubella
TT	Tetanus

BCG= Bacillus Calmette-Guerin
 OPV= Oral polio vaccine
 Hib= Haemophilus influenza -type b
 TT= Tetanus toxoid

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28. How do vaccines induce immunity ?

Dead, inactive, alive but neutralized germs or toxins are used as vaccines.

By the presence of these antigens, lymphocytes become activated and produce antibodies.

These antibodies remain in the body for long time to provide immunity against such antigens.

29. Give examples for a few popular systems of treatment in the world.

Allopathy, Ayurveda, Homeopathy, Unani, Naturopathy, Siddavaidya, Panchakarma

System	Founding fathers	Special features
Ayurveda	Charaka, Susrutha, Vagbhada ... (Indian)	A life style to maintain the body fit. Medicines are herbal, but a few are animal products.
Homeopathy	Samuel Hahniman (German)	Great concern for symptoms. Homeopathy considers the causative factor can itself effect the cure and when medicine is more diluted the more is its potency.
Allopathy- Modern medicine	Hippocrates (Greek)	Gives much importance to diagnosis, treatment, medicines etc. Different areas of specialisation, Modern equipments or instruments for treatment....
Unani	Hippocrates, Galan, Razi, Ebnuseena (Greek, Arabian)	When the stability of the four body fluids (namely blood, sputum, dark and yellow bile) alters, disease occur in that body. Herbal medicines are used.

30. Give examples for equipments or means used for diagnosis.

Lab test and equipments like stethoscope, thermometer, sphygmomanometer, ECG, EEG and scanners.



A. Stethoscope



B. Thermometer



C. Sphygmomanometer (to measure BP).

31. Electrocardiogram (ECG) : to record electric waves in the heart muscles;

----- ? ----- : to record electric waves in the brain.

Electroencephalogram (EEG).

32. Different types of scanners and their uses in the diagnosis of disease.

Ultra sound scanner - to understand the structure of internal organs using ultrasonic sound waves.

CT (Computerised Tomography) scanner - to get 3D visuals of internal organs with the help of computer, using X-rays.

MRI (Magnetic Resonance Imaging) scanner - to get 3D visuals of internal organs using radio waves and magnetic field.

33. Normal value of blood cells and haemoglobin in our blood.

Haemoglobin – 12-17gm/100ml of blood.

RBCs count - 45-60 lakhs/ml of blood.

WBCs count – 5000-10000/ml of blood.

Platelets count – 2.5-3.5 lakhs/ml of blood.

CBC= Complete Blood Test

34. A doctor suggested one of his patients to test his blood for platelet count. What might be the reason ?

To know whether the patient is affected by dengue virus, which prevent the formation of platelets from the bone marrow. There will be considerable decrease in the number of platelets in dengue fever patients.

35. Examples for specialisations in modern medicines.

Cardiology – (treatment of heart)

Ophthalmology - (treatment of eye)

Neurology - (treatment of brain or nerves)

Oncology - (treatment of cancer)

E.N.T - (treatment of ear, nose and throat)

36. Define: * Antigen * Antibody * Antibiotics

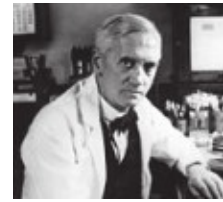
Any foreign body that stimulates the defense system is called as an antigen.

Antibodies are chemical substances, produced by the B lymphocytes against antigens.

Antibiotics are medicines that are extracted from microorganisms like bacteria, fungi, etc. and used to destroy bacteria.

37. Different kinds of medicines against microorganisms ?

- Antibiotics against bacteria.
- Antifungal medicines against fungi.
- Antiviral medicines against viruses.



38. The first antibiotics (penicillin) was synthesized by ----- ?

Alexander Fleming (in 1928 from a fungus, *penicillium notatum*.)

39. Though antibiotics are useful medicine, its use should be with great care. Why ?

- Regular use develops immunity in pathogens against antibiotics.
- Destroy useful bacteria in the body.
- Reduces the quantity of certain vitamins in the body.

40. What is **blood transfusion** ? Give example for instances that need blood transfusion.

Blood transfusion is the transfer of blood from one person to other. It can be done in the situations like heavy loss of blood in accidents, surgical operations and in the treatment of blood cancer.

41. What all things should be taken care of while transfusing blood?

Healthy people in the age 18-60 can donate blood, once in 3 months.

Pregnant and breast feeding women as well as person with communicable disease should not donate blood.

Prior to blood transfusion, blood group testing is necessary.

42. Name the major blood groups.

A, B, AB, O

[Carl Landsteiner proposed blood grouping on the basis of A, B antigens seen on the surface of RBC]

43. On what basis, blood groups are called as positive or negative ?

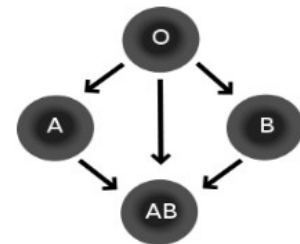
Those blood with Rh factor (antigen D) on the surface of RBC are termed as positive group blood and those with out Rh are termed as negative group blood.

44. Why is that not possible to receive blood from all persons ?

If blood is not compatible, the antigen in the received blood will react with the antibody in the recipient's blood of so as to clot RBC (agglutination).

45. Table showing different blood groups, antigen, possible antibody and group that can receive the blood.

Blood gr	Antigen present	Antibody	Whom can receive each
A	A	Anti-b	A, AB
B	B	Anti-a	B, AB
AB	A, B	--	AB
O	--	Anti-a, Anti-b	A, B, AB, O



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46. Prepare apt slogans to encourage blood donation.

Blood donation is life donation.

You can save a valuable life, through donating your blood.

Donating blood is not harmful to our health, instead it is a noble deed.

47. Defense mechanisms in plants ?

Structural :-

- Wax covering and Cuticle on leaves (prevents entry of germs through leaves).
- Bark (protects the inner cells from direct contact of pathogens)
- Cell wall (serve as a well equipped resistant coat).

Biochemical :-

- Lignin, cutin, suberin etc. strengthen the cell wall.
- **Callose**, a poly saccharide formed in cell wall prevents the germs which have crossed the cell wall.

48. Examples for a few chemical substances that strengthen the cell wall ?

Lignin, cutin or suberin.