High Yield Hints – Immunity

1. Non specific immune system — Natural defense mechanisms. Skin, Interferon, Lysozymes
2. Specific or Acquired immunity — Mechanism to recognize and destroy pathogens. Done by T cells and B cells.
3. Natural barriers
   - Anatomical barrier — Skin
   - Physiological barrier — Lysozyme, Interferon, High Temperature, Acidty.
   - Phagocytic barrier — Macrophages
   - Inflamatory barrier — Complement system
4. **First line defense system** — Destroys pathogens before activating the immune system. Natural barriers like Skin.
5. **INTERFERONS**
   Glycoproteins released by cells infected with Virus. They are alsoproduced from WBC. Interferon makes near by cell immune to viral infections.
6. **MACROPHAGES**
   Modified Monocytes that ingest microbes by phagocytosis.
7. **INFLAMATION**
   Manifestation of infection in a localized area. Symptoms include redness, pain, swelling etc. Inflamatort response is produced by Histamines and Prostaglandins produced by the injured cells and damaged Mast cells. These chemicals causes leakage of vascular fluid and influx of macrophages to the infected area.
8. **KILLER CELLS**
   These are WBC that kill the virus infected or tumour cells by making Perforin-lined pores in the plasma membrane. These pores permit water to enter the cells. The cells swells and bursts.
9. **COMPLEMENT SYSTEM**
   A group of 30 proteins in the blood. Protect the body from disease germs. The action of complement system causes formation of trans membrane pores in the microbes leading to their lysis. Some complement proteins form a coating over the microbe, so that they can be killed by phagocytes.
10. **ADAPTIVE IMMUNITY**
    Acquired immunity . It is the capacity of the body to recognize pathogens selectively and destroy them. It is an adaptive character of vertebrates.
    Important features of Adaptive immunity are
    1. Specificity 2. Diversity 3. Discrimination of self and non self molecules 4. Memory
    Cells involved in acquired immunity are Lymphocytes like T cells like T- helper cells, T- cyto toxic cells B cells and Antigen presenting cells.
11. **T cells** — Produced in the bone marrow and mature in the Thymus. Produce Cell mediated response.
12. **B cells** — Produced in the bone marrow and mature in the bone marrow. Produce Antibody mediated response.
13. **HUMORAL IMMUNITY**
    Antibody mediated response by B cells. B cells produce antibodies that circulate through blood and destroy pathogens.

14. ACTIVE IMMUNITY

Response in the body by the invasion of a foreign antigen.

15. PASSIVE IMMUNITY

Artificial immunity produced by introducing antibodies or serum into the body.

16. THYMUS

It is the site of maturation of T cells that give cell mediated immunity. When thymus is removed, T cells cannot mature.

17. T-HELPER CELLS

Activate the B cells

18. T- CYTOTOXIC CELLS

Destroy antigens.

19. ANTIBODY

Immunoglobulins produced in the blood by B lymphocytes. They are Glycoproteins specific to antigens. Each antibody has 4 polypeptide chains. 2 long Heavy chains 2 short Light chains. The heavy and light chains are connected by Di sulphide bonds to form a Y shaped structure. Both heavy and Light chains have Constant and Variable regions. Antigens bind to the variable region. ***The amino acid sequence of the variable region is different in various antibodies. This variation produces numerous types of antibodies to react with enormous number of antigens.***

20. IMMUNIGLOBULINS

Secreted by B cells. There are 5 types of immunoglobulins.

IgA	protection from Inhaled antigens
IgD	Activate B cells
IgE	Allergic response
IgG	Stimulate Phagocytes. Activate Complement system. Only Antibody crosses placenta and gives Foetal immunity.
IgM	Activate B cells. First formed

21. Antigen destruction

Free antibodies destroy antigens by 3 mechanisms.

1. Agglutination	Binding to antigens
2. Oposonisation	Coating over bacteria
3. Neutralization	Neutralize the toxins of bacteria. Eg. Tetanus toxin

22. CLONAL SELECTION

The receptors present on the T and B cells interact with antigens. The cells activate and divide to form a clone of cells. The clone also produce other cells like T- cyto toxic cells.

Significance 1. Produce large number of B and T cells.

2. Produces effector cells like antibody secreting B cells and T cytotoxic cells.

3. Some T cells become Memory cells.

23. IMMUNOLOGICAL MEMORY

When an antigen enters, large number of T cells multiply to form a clone. Some T cells remain as Memory cells. When the same antigen enters second time, the Memory cells divide rapidly and give immunity.

24. Primary Immune Response

Develop when an antigen enters the body leading to the multiplication of T cells.

25. Secondary Immune Response

Result of the multiplication of Memory cells.

26. DPT vaccine requires a Booster dose to activate the Memory cells to give longer immunity.

27. PRIMARY LYMPHOID ORGANS

Sites in which Lymphocytes proliferate and mature. Thymus (T cells) Bone marrow (B cells).

28. SECONDARY LYMPHOID ORGANS

Sites in which Lymphocytes differentiate into specific lymphocytes for an antigen

Lymphnodes, Spleen, Tonsils.

29. First Vaccine is the Rabies Vaccine produced by Jenner in 1796.

30. Antigenic Polypeptides are artificially produced Vaccines through Genetic Engineering.

31. Artificial Vaccines Antigenic polypeptide, Hepatitis B vaccine from transgenic Yeast.

32. MAJOR HISTOCOMPATIBILITY COMPLEX – MHC

A group of genes present in the 6^{th} chromosome of Mouse. Determine the compatibility of donor and recepient tissues during transplantation.

33. HUMAN LECOCYTE ANTIGENS – HLA System

Genes present in the 6^{th} chromosome of Man. They determine the tissue compatibility. The group of HLA genes is called Haplotype. An individual receives one Haplotype from father and the second from the mother.

Genes DP-DQ-DR-----C2-Bf-C4-B----------C-A

Gene products Class 2 HLA Complement components Class 1 HLA

Diseases associated with HLA system

1. Reiter's syndrome 2. Addison's disease 3. Thyrotoxicosis
4. Coeliac disease 5. Insulin dependent diabetes
6. Haemochromatosis 7. Psoriasis

34. Identical twins only have same HLA haplotypes.

35. TISSUE TYPING

Matching of **HLA proteins before tissue transplantation.**

36. ANAPHYLACTIC SHOCK

Sudden and violent allergic reaction in response to an allergen. It is a fatal condition. Egs. Bee bite, Drugs like Penicillin.

37. AUTOIMMUNE DISEASES

Body consider own cells as foreign and destroy them.

1. Insulin dependent Diabetes
2. Multiple Sclerosis - degeneration of Myelin sheath in nerves.
3. Rheumatoid Arthritis- degeneration of joints.

Organ specific autoimmune diseases

1. Primary Myxedema 2. Thyrotoxicosis 3. Pernicious anemia
4. Addison's disease 5. Good Pasteu's syndrome
6. Myasistheniagravis 7. Chronic active hepatitis

Non organ specific autoimmune diseases

1. Rheumatoid arthritis 2. Dermatomysitis 3. Systemic sclerosis.

38. IMMUNODEFICIENCY DISEASES

Caused by Mutations, Infections, Malnutrition Egs. AIDS

39. SEVERE COMBINED IMMUNODEFICIENCY SCID

Genetic defects. Low circulating Thymocytes. Fatal condition.
Egs. Adenosine deaminase deficiency (ADA), AIDS

Humoral immuno deficiencies

1. X linked Hypogammaglobinaemia 2. DiGeoge syndrome

Combined immunodeficiencies

1. Nezelof's syndrome 2. Wiskott-Aldrich syndrome

Phagocyte deficiencies

1. Chediak- Higashi syndrome 2. **Job's syndrome**

40. HIV INFECTION

HIV infects T lymphocytes. DNA produced by the virus from its RNA is inserted to the human chromosome. The inserted DNA replicate along with host DNA. The viral DNA then transcribes m RNA for viral protein and its own RNA. Genetic RNA thus formed will be packaged into the protein to form new virus.

41. Since HIV infects Lymphocytes, the disease cannot be cured because any drug that destroy Lymphocytes will permanently destroy the immune system.
42. AIDS is not contagious because the virus multiply only in Lymphocytes and are introduced only through blood , saliva and semen.

Immune benefits of Human Milk

It contains

1. B cell macrophages Produce antibodies
2. Neurtophil T cells Act as phagocytes
3. IgA antibodies destroy antigens in the baby's digestive tract.
4. Bifidus factor promote the growth of Lactobacillus bifidus . It is a harmless bacteria prevents the growth of other bacteria
5. Fibronectin increases anti microbial activity of macrophages.
6. Interferon – IFN gamma enhances anti microbial activity of immune cells.
7. Lactoferrin Reduces the availability of Iron for bacteria
8. Lysozyme kill bacteria by disrupting cell wall