

Specific Defense and Immunology

1. Define:

Adaptive or Acquired Immunity – Adaptive or acquired immunity is specific immunity that is developed as a result of previous exposure to a pathogen or foreign agent. It involves WBCs called lymphocytes (B-cells and T-cells), and the production of antibodies and cytokines. The functions of adaptive or acquired immunity are to recognize “self” VS “non-self”, eliminate specific pathogens or pathogen infected cells, and develop an immunological memory so the body can respond quickly should a subsequent infection occur.

Immunoglobulin – An immunoglobulin (Ig), also known as an antibody, is a globular and quaternary protein capable of hydrogen bonding with a specific antigenic determinant group or epitope (often associated with bacteria, protozoa, fungi, viruses, etc.). Antibodies are found on the surfaces of B-lymphocytes and are released into the bloodstream or other extracellular fluids by plasma cells or B-memory cells (derived from B-cells). The overall function of antibodies is to help neutralize or eliminate pathogens or toxins. Different categories of antibodies are called isotypes.

Epitope – An epitope, also known as an antigenic determinant, is a chemically defined site on an antigen that is recognized by a portion (binding site), of a specific antibody called a paratope. Cellular antigens (bacteria, fungi, protozoa, etc.) typically have many different epitopes on their surfaces.

Helper-T Lymphocyte – A helper-T Lymphocyte or T-helper cell, is a type of agranular leukocyte (white blood cell) involved in adaptive or acquired immunity. Mature T-helper cells carry CD4 membrane markers, and typically release cytokines that can stimulate the proliferation of T-cells and B-cells (forming clones), activate phagocytes and NK cells, and regulate T-cell activity. T-helper cells are essential to proper immune system function.

Interleukin – Interleukins are cytokines produced primarily by CD4 lymphocytes or T-helper cells (helper-T cells), though also produced by monocytes, macrophages, mast cells and other cell types. Interleukins released by T-helper cells stimulate the proliferation (reproduction) of other cells, and are major factors stimulating the formation of clones of T and B-cells during humoral immune responses. There are at least 36 different interleukins.

2. Being infected by a disease-causing agent or by receiving a vaccine or toxoid/ through the placenta or through breast milk or by receiving immune serum (antiserum). **Note** - Natural means of acquisition include direct exposure to a pathogen resulting in infection and disease, and receiving premade antibody through the placenta or in breast milk. Artificial means of acquisition include vaccination (receiving vaccine or toxoid), and receiving premade antibody in the form of immune serum (antiserum).
3. Being immunized, i.e., by receiving a vaccine (substance containing killed or attenuated microorganisms), or a toxoid (substance containing detoxified microbial toxin). During this process, the body is induced to produce its own immune cells and substances (antibodies and cytokines).

4. Immune serum (antiserum). Immune serum can be made by removing the clotting factors from blood plasma containing a high antibody titer or through monoclonal antibody techniques.
5. Ingesting breast milk or by receiving antibodies via the placenta
6. Lymphocytes/ humoral/ thymus
7. Lymphocytes/ thymus
8. Red bone marrow/ thymus
9. Humoral/ phagocytes/ T-helper cells (helper T-cells)
10. Phagocytic WBCs consume and digest foreign agents and then present the epitopes (antigenic determinants) of these agents on their cell surfaces. The T-helper cells recognize the epitopes (in combination with MHC proteins) and release cytokines that stimulate specific sub-populations of B-cells to proliferate and form clones. B-cells then give rise to plasma cells and B-memory cells, both of which can make and release antibodies.
11. Phagocytic WBCs/ Helper-T lymphocytes (T helper cells)
12. Consume antigens and present the antigenic determinant groups or epitopes on their cell surfaces/ helper-T lymphocytes (T helper cells)
13. Antibodies
14. Immunoglobulins/ anamnestic
15. Isotypes (**NOT** isotopes)/ IgG
16. Amino acid sequence
17. IgM/ IgE
18. Antigens (or immunogens)/ phagocytic WBCs
19. Antigens (or immunogens)
20. Antigens/ epitopes
21. Agglutination reactions/ neutralization
22. Anamnestic
23. Anamnestic
24. Serological/ precipitation/ immobilization
25. Human immunodeficiency Virus (HIV)/ T-helper or helper-T (CD4)

26. Eukaryotic pathogens e.g., protozoa, fungi and multicellular parasites, infected body cells and tumor cells. **Note** - Cellular immunity is also involved in the rejection of grafted/transplanted tissues and organs.
27. Cytokines/ interleukin/ Tumor necrosis factor (TNF)
28. Cytotoxic T-cells (killer T-cells)/ perforin and granzymes
29. Cytokines/ gamma-interferon or interferon-gamma (INF γ)
30. Major histocompatibility complex proteins (MHC proteins) Note - MHC proteins can also be referred to as human leukocyte antigens (HLA). Cytotoxic-T cells or killer-T cells (CD8), respond to MHC class I proteins, and phagocytes (and other antigen presenting cells), carry MHC class II proteins.
31. Matching letter sequence is – C, G, E, A, H, I, B, J, F, and D.