CAIE Biology A-level

Topic 11 - Immunity

Definitions and Concepts

Active immunity - Resistance in an organism that has developed through the production of specific antibodies in response to a pathogen. It provides long-lasting immunity as memory cells are produced.

Antibodies - Immunoglobulins produced by B-lymphocytes in response to a specific antigen, triggering an immune response.

Antigen - A chemical present on the surface of a cell that induces an immune response.

Antigen-presenting cell - A macrophage that displays foreign antigens.

Anti-toxins - Chemicals produced by white blood cells that neutralise toxins released by pathogens.

Artificial active immunity - The production of antibodies by the immune system following the exposure to a weakened, attenuated or dead pathogen e.g. by vaccination.

Artificial passive immunity - The immunity acquired from the administration of specific antibodies from another organism.

B-effector cells - A type of B-lymphocyte that divides to form plasma cells.

B-lymphocytes - Lymphocytes that mature in the bone marrow. There are three main types: plasma cells, B-effector cells and B-memory cells.

B-memory cells - B-lymphocytes that provide immunological memory.

Clonal expansion - Rapid mitosis of specific antibody-producing cells.

Clonal selection - The identification of an antibody-producing cell with complementary receptors to the shape of a specific antigen.

Hybridoma method - A method used to produce large numbers of monoclonal antibodies. An antigen is injected into a mammal to stimulate clonal expansion of complementary B-cells. These B-cells are harvested and fused with a myeloma, which can undergo mitosis an indefinite number of times. The hybrid cell line is called a hybridoma.

Immune response - The body's response to antigens it identifies as 'non-self' consists of a non-specific phase involving neutrophils and macrophages, and a specific phase involving T- and B-lymphocytes.

Lymphocytes - White blood cells that contribute to the specific immune response.

Memory cells - A subtype of lymphocyte which is produced after primary infection and remains in low levels in the blood. These cells undergo rapid mitosis if the same pathogen is encountered again.

Monoclonal antibodies - Identical antibodies that have been produced by an immune cell cloned from a parent cell.

Natural active immunity - The production of antibodies by the immune system following infection.

Natural passive immunity - The immunity acquired by an infant mammal when antibodies are transferred through the placenta and the colostrum from the mother.

Non-self antigens - Foreign antigens that originate from outside the body and induce an immune response.

Non-specific immune response - The first line of defence against all non-self antigens involving phagocytosis by neutrophils and macrophages.

Passive immunity - Resistance in an organism acquired via the transfer of antibodies. It provides short-term immunity as no memory cells are produced.

Phagocytes - Specialised white blood cells that engulf and destroy pathogens. There are two types: neutrophils and macrophages.

Phagocytosis - The process by which phagocytes engulf and destroy pathogens.

Phagolysosome - A vesicle within a phagocyte formed by the fusion of a phagosome and lysosome.

Phagosome - The vacuole inside a phagocyte in which a foreign particle is engulfed.

Plasma cell - A type of B lymphocyte that produces antibodies specific to a particular antigen.

Primary immune response - The response of the immune system to a pathogen when it is first encountered. A small number of antibodies are produced slowly.

Secondary immune response - The response of the immune system to a pathogen when it is encountered for a second (third, fourth…etc.) time. Immunological memory gives a rapid production of a large number of antibodies.

Self antigens - Antigens present on an organism's cells that are tolerated by their own immune system. They induce antibody formation in other organisms.

Specific immune response - The second line of defence against substances with non-self antigens begins when complementary T-helper cells bind to the antigen and secrete interleukins that trigger rapid mitosis of complementary B-cells or T-killer cells.

T-helper cells - T-lymphocytes with CD4 receptors on the cell surface membrane. These bind to antigens on antigen-presenting cells and secrete interleukins.

T-killer cells - T-lymphocytes that produce perforin, destroying pathogens with a specific antigen.

T-lymphocyte - Lymphocytes that mature in the thymus gland. There are four main types: T-helper cells, T-killer cells, T-memory cells and T-regulatory cells.

T-memory cells - T-lymphocytes that provide immunological memory.

Vaccination - The deliberate exposure of an individual to antigens from a pathogen to provide artificial active immunity.