

VCE Biology Quiz – Immunity

ASHA Lectures

Question 1

During an immune response, different types of antibodies are produced. IgM antibodies are produced as a rapid response to infection, while IgG and IgA antibodies are produced later. IgA antibodies are the main antibody isotype found in breast milk. A new mother, who is breast-feeding her newborn baby, contracts a mild form of Salmonella food poisoning. It would be expected that:

- A. The baby does not have any immunity against Salmonella and will not test positive for any antibody against Salmonella
- B. The baby has artificial passive immunity and will test positive for IgA antibodies specific for Salmonella
- C. The baby will develop natural active immunity and produce its own IgG antibodies against Salmonella
- D. The baby has natural passive immunity and will test positive for IgA antibodies specific for Salmonella

Question 2

Type 1 diabetes is an autoimmune disorder which affects the beta cells in the pancreatic islets, which produce and secrete insulin into the bloodstream. Insulin in the blood will stimulate cells in the liver and muscle to increase their uptake of glucose in the blood. The immune response mounted against the beta cells, during type 1 diabetes, results in their destruction and thus leads to a lack of insulin secretion into the bloodstream. A patient with hyperglycaemia (high blood glucose levels) was suspected of suffering from type 1 diabetes.

Confirming this diagnosis, would most likely involve testing for the presence of:

- A. Histamines in the pancreatic islets
- B. Mast cells in the blood
- C. Beta cell autoantibodies in the blood
- D. Viral proteins on the surface of mucous membranes

Question 3

- A. The inability of T cells receptors to bind to complementary antigens
- B. The inability of neutrophils to distinguish between self and non-self
- C. A failure of apoptosis of developing autoreactive T cells in the thymus
- D. The overproduction of IgM antibodies by plasma cells

Question 4

In an allergic response:

- A. An allergen causes mast cells to produce IgE antibodies and release histamine, which causes swelling and inflammation due to vasodilation of vessels.
- B. An allergen causes immature B cells to undergo clonal expansion to produce IgE antibodies which bind to mast cells. If the allergen is encountered again, it will bind to the antibodies on the surface of mast cells, resulting in the secretion of histamine from the mast cells.
- C. An allergen causes the activation of mast cells through the antigen receptors on their surface, resulting in the release of histamine which causes swelling and inflammation.
- D. An allergen causes T-helper cells to release histamines, which results in swelling and inflammation.

Question 5

In Australia, anyone who wants to protect themselves against hepatitis B needs to receive a course of two vaccinations, 6 months apart. However, the immune response following the second vaccination is faster than that following the first vaccination. Why is this the case?

- A. The IgM and IgG antibodies against the Hep B virus produced from the first vaccination still remains in the body even after 6 months
- B. There are more plasma cells that secrete antibodies specific for the Hep B virus at the time the second vaccine is administered
- C. There is a higher concentration of memory B cells with specificity for the Hep B virus at the time the second vaccine is administered
- D. Cytotoxic T cells produced from the first vaccination are able to recognize and destroy the Hep B virus faster after the second vaccination

Question 6

Mycobacterium tuberculosis is a bacterial pathogen that attacks the lungs. It is inhaled through the airways, crossing the airway mucosa and invades and reproduces inside macrophages in the lung. It can cause symptoms such as coughing, fever, chest pain and breathlessness.

- a. Identify two physical or chemical defences that the body has to prevent infection by mycobacterium tuberculosis. (2 marks)
- b. Once inside the lungs, the bacteria are recognised as foreign. How does the body distinguish between self and non- self cells? (2 marks)

- c. Once the bacterium is recognized as foreign, an immediate innate immune response is launched against the pathogen. Describe two events that occur in the innate immune response. (2 marks)

- d. A number of days after the initial infection, the patient's blood is sampled and they are found to have high levels of antibodies against this antigen. Describe the sequence of events that led to high levels of specific antibodies circulating in the blood. (3 marks)

Question 7

SARS-CoV-2 is the virus that causes COVID-19, which is a highly infectious respiratory disease, that is rapidly spreading across the world right now. Scientists around the world are racing against time to develop an effective vaccine against this novel viral pathogen.

- a. What is a vaccine? (1 mark)

- b. Vaccines are designed to give lifelong immunity against a pathogen. Name two different cell types that would be important in providing lifelong immunity and explain the role of each. (4 marks)

- c. Viruses, such as SARS-CoV-2, are obligate intracellular parasites that can only replicate inside living cells. Name the immune cells responsible for destroying infected body cells and describe its mechanism of action. (2 marks)

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