**Topic 11.1 (AHL) – Antibody Production and Vaccines**

**Understandings, Applications and Skills** (This is what you will be assessed on)

|  |  |  |
| --- | --- | --- |
|  | **Statement** | **Guidance** |
| 11.1.U1 | Every organism has unique molecules on the surface of its cells. |  |
| 11.1.U2 | Pathogens can be species-specific although others can cross species barriers. |  |
| 11.1.U3 | B lymphocytes are activated by T lymphocytes in mammals. | Limit the immune response to mammals. |
| 11.1.U4 | Activated B cells multiply to form clones of plasma cells and memory cells. |  |
| 11.1.U5 | Plasma cells secrete antibodies. |  |
| 11.1.U6 | Antibodies aid the destruction of pathogens. |  |
| 11.1.U7 | White cells release histamine in response to allergens. |  |
| 11.1.U8 | Histamines cause allergic symptoms. |  |
| 11.1.U9 | Immunity depends upon the persistence of memory cells. |  |
| 11.1.U10 | Vaccines contain antigens that trigger immunity but do not cause the disease. |  |
| 11.1.U11 | Fusion of a tumour cell with an antibody-producing plasma cell creates a hybridoma cell. |  |
| 11.1.U12 | Monoclonal antibodies are produced by hybridoma cells. |  |
| 11.1.A1 | Smallpox was the first infectious disease of humans to have been eradicated by vaccination. |  |
| 11.1.A2 | Monoclonal antibodies to HCG are used in pregnancy test kits. |  |
| 11.1.A3 | Antigens on the surface of red blood cells stimulate antibody production in a person with a different blood group. |  |
| 11.1.S1 | Analysis of epidemiological data related to vaccination programmes. |  |

**Recommended resources:**

Mrs. Tyler’s Website

Bioninja

Allott, Andrew. *Biology: Course Companion.* S.l.: Oxford UP, 2014. Print.

1. All cells have a “unique” marker embedded in the cell membrane. What is the marker on cells recognized as ‘self’ and how are these treated by the immune system?
2. Describe what an antigen is and how this is related to the immune response.
3. Explain why blood transfusions are not compatible between certain blood groups.
4. Which blood type is the universal acceptor? Why?
5. Which blood type is the universal donor? Why?
6. Outline why a person with type O blood can only receive blood from others with type O.
7. Define immunity.
8. Compare active and passive immunity.
9. Pathogens are any agent that can cause disease. Qualify the statement “Diseases only infect specific species.”
10. Define the term zoonosis and give some examples.
11. List four major mechanisms of disease transmission.

Mammalian Immune Response:

1. Define non-specific immunity.
2. Outline how skin and mucus membranes play a role in non-specific immunity.
3. How is specific immunity different from non-specific immunity?
4. Outline the role of lymphocytes in the mammalian immune response.
5. Explain the steps involved in the mammalian immune response. How are antibodies are produced and respond to infection by a pathogen?

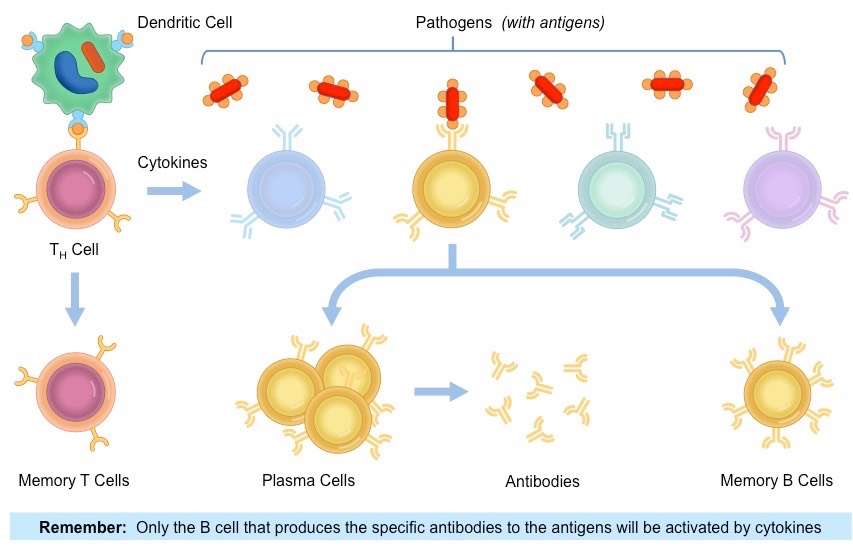
A. Outline antigen presentation and T lymphocyte activation.

B. Outline B lymphocyte activation.

C. Outline plasma cell and antibody production.

D. Outline pathogen destruction.

E. Outline how the formation of memory cells leads to immunity.



1. Antibodies are Y-shaped proteins. How are the many different kinds of antibodies produced?
2. Define opsonisation as it relates to antibodies enhancing the immune response.
3. List the five ways antibodies are able to destroy pathogens.

Allergic Reactions

1. Define allergen.
2. Outline the two stages of an allergic response: sensitization and allergic reaction.
3. Explain the role of histamines in aiding the allergic response.
4. List some of the symptoms associated with the allergic response.

Vaccination

1. Outline how the formation of memory cells leads to immunity.
2. What is the purpose of vaccination?
3. What do vaccines contain, and how can they be administered?
4. Outline how vaccination leads to immunity.
5. Explain why booster shots are needed periodically after the original vaccination.
6. Outline the purpose of vaccination programs.
7. Define herd immunity.
8. What was the first disease to be successfully eradicated by vaccinations, and why was this successful?
9. What organization is responsible from monitoring disease incidence and immunizations in different countries?
10. Nature of science: Consider **ethical implications of research** - Jenner tested his vaccine for smallpox on a child. *Outline how Jenner’s trials would be in breach modern day ethical concerns for testing drugs and vaccines.*
11. Describe epidemiology, and what this field of science investigates.
12. Make sure you know this skill: **Analysis of epidemiological data** related to vaccination programmes. *Can you analyse epidemiological data to spot trends and suggest underlying reasons?*

Monoclonal Antibodies

1. Define monoclonal antibodies and what they are used for.
2. Outline the production of monoclonal antibodies.
3. Define hybridoma.
4. List some examples of how monoclonal antibodies can be used for treatment purposes.
5. Briefly explain why pregnancy tests look for the presence of HCG.
6. Outline how monoclonal antibodies can be used in pregnancy tests to detect the presence of HCG.