

What is an Antibody and How Does it Work?

Worksheet

An antibody is a Y-shaped protein with two heavy chains and two light chains. The tips of the Y bind specific antigens; the stem recruits immune cells and complement to destroy pathogens.

Questions

1. What determines the specificity of an antibody?

- A) The constant region
- B) The variable region at the tips
- C) The heavy chain alone
- D) The disulfide bonds

2. What does opsonization mean?

- A) Antibody destruction of pathogens
- B) Marking a pathogen for immune attack
- C) Direct toxin neutralization
- D) Complement cascade activation

3. How does an antibody activate the complement system?

- A) It binds to complement receptors
- B) Its Fc region recruits complement C1q
- C) It directly kills pathogens
- D) It produces cytokines

4. Why can one antibody not fight all pathogens?

- A) Antibodies are weak
- B) Each antibody has ONE variable region - specific antigen
- C) Immune system is weak
- D) Pathogens are too strong

5. A virus enters your body. How does an antibody prevent it from infecting cells?

6. A pathogenic bacterium is in the bloodstream. How does an antibody help destroy it?

7. A toxin from Clostridium botulinum is released. How does an antitoxin antibody work?

8. Define: What is an antibody?

9. Define: What are the four chains in an antibody?

10. Define: What is the variable region?

Answer Key

1. B) The variable region at the tips - The variable region (Fab) at the Y tips is unique for each antibody - it determines which antigen it binds.
2. B) Marking a pathogen for immune attack - Opsonization = antibodies tag pathogens, signaling phagocytes to engulf them.
3. B) Its Fc region recruits complement C1q - The Fc region of bound antibody recruits complement protein C1, starting a cascade that destroys pathogens.
4. B) Each antibody has ONE variable region - specific antigen - Antibody specificity is a feature - each recognizes one antigen. Diversity of B cells creates millions of different antibodies.
5. B cell recognizes viral antigen produces specific antibodies Antibodies bind to viral spike proteins Virus cannot attach to host cell receptors Virus is neutralized, phagocytes engulf it
6. Antibody binds to bacterial surface antigens Fc region recruits complement proteins Complement cascade creates membrane-attack complex Bacterium cell membrane ruptures, cell dies
7. Antibody variable region binds toxin's active site Toxin cannot bind nerve endings Toxin is neutralized and cleared by liver No paralysis occurs
8. A Y-shaped protein (immunoglobulin) produced by B cells that binds specific antigens on pathogens.
9. Two heavy chains and two light chains linked by disulfide bonds.
10. The tips of the Y (Fab) - unique antigen-binding sites that differ between antibodies.

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