

What is the Antibody-Antigen Interaction?

Worksheet

An antibody binds an antigen through complementary shapes at its variable region (paratope) locking onto the antigen's epitope, held together by weak non-covalent forces like hydrogen bonds and van der Waals interactions.

Questions

1. What part of an antibody binds the antigen?

- A) The constant region
- B) The paratope (variable region)
- C) The Fc receptor
- D) The complement protein

2. What is the antigen's binding site called?

- A) Paratope
- B) Epitope
- C) Isotope
- D) Haptone

3. Antibody-antigen binding is primarily held together by

- A) Covalent bonds
- B) Ionic crystals
- C) Weak non-covalent forces
- D) Metallic bonds

4. Why is the interaction described as highly specific?

- A) Any antibody can bind any antigen
- B) Each antibody's shape complements only one particular epitope
- C) Antigens change shape to fit antibodies
- D) Antibodies bind randomly

5. A flu virus enters the body for the first time. Describe how an antibody would recognize it.

6. Why can't an antibody made against the flu virus also bind and neutralize a completely different virus, like measles?

7. In a pregnancy test, how does an antibody-antigen interaction detect the hCG hormone?

8. Define: What is a paratope?

9. Define: What is an epitope?

10. Define: What kind of bonds hold an antibody to an antigen?

Answer Key

1. B) The paratope (variable region) - The paratope, located in the antibody's variable region, is the antigen-binding site.
2. B) Epitope - The epitope is the specific region on the antigen recognized by the antibody.
3. C) Weak non-covalent forces - Hydrogen bonds, van der Waals forces and electrostatic attraction hold the complex together without covalent bonding.
4. B) Each antibody's shape complements only one particular epitope - The complementary 3D shapes mean one antibody typically recognizes only one epitope.
5. Step 1: The flu virus surface displays a hemagglutinin protein - this acts as the antigen. Step 2: B cells with matching receptor shapes recognize a specific epitope on hemagglutinin. Step 3: The B cell's antibody paratope binds the epitope through non-covalent interactions. Step 4: This binding neutralizes the virus by blocking it from entering host cells.
6. Step 1: Each antibody's paratope has a unique 3D shape, evolved to fit one specific epitope. Step 2: The measles virus has different surface antigens with different epitope shapes. Step 3: Since the flu antibody's shape doesn't complement the measles epitope, no stable binding occurs. Step 4: This specificity is why immunity to one pathogen usually does not protect against another.
7. Step 1: The test strip contains antibodies engineered to bind specifically to hCG (the antigen). Step 2: Urine containing hCG flows across the strip. Step 3: hCG binds to the antibody at a specific epitope, forming an antibody-antigen complex. Step 4: A second labeled antibody binds the complex, producing a visible colored line confirming pregnancy.
8. The specific region on an antibody's variable domain that binds to an antigen.
9. The specific part of an antigen that an antibody recognizes and binds to.
10. Weak non-covalent forces - hydrogen bonds, van der Waals forces, and electrostatic attraction.

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