What is the Structure of an Antibody?

Worksheet

An antibody consists of two identical heavy chains and two identical light chains joined by disulfide bonds, each chain having a variable region (which forms the antigen-binding site) and a constant region (which determines the antibody's class and effector function).

Questions

1. How many heavy and light chains make up a basic antibody unit?

A) 1 heavy, 1 light
B) 2 heavy, 2 light
C) 4 heavy, 2 light
D) 2 heavy, 4 light

2. Which region of an antibody determines its antigen specificity?

A) Constant region
B) Variable region
C) Fc stem only
D) Hinge region

3. What does the constant region of the heavy chain determine?

A) The antigen being recognized
B) The antibody's class (isotype) and effector functions
C) The color of the antibody
D) Whether the antibody is a protein

4. Papain digestion of an antibody classically produces:

A) Two Fc fragments and one Fab fragment
B) Two Fab fragments and one Fc fragment
C) Only light chains
D) Only heavy chains

5. A vaccine triggers B cells to produce antibodies against a specific viral spike protein. Which part of the antibody physically recognizes the viral protein?

6. IgM is the first antibody produced early in an infection, while IgG appears later with higher affinity for the same antigen. What structural feature changes between these two classes?

7. Enzymatic digestion of an antibody with papain classically produces three fragments: two identical antigen-binding fragments and one crystallizable fragment. Name and describe these fragments.

8. Define: Basic structure of an antibody

9. Define: Variable region

10. Define: Constant region

Answer Key

1. B) 2 heavy, 2 light - The basic antibody unit has two identical heavy chains and two identical light chains held by disulfide bonds.

2. B) Variable region - The variable regions of the heavy and light chains form the paratope, which determines what specific antigen is recognized.

3. B) The antibody's class (isotype) and effector functions - The heavy chain constant region defines the antibody class (IgG, IgM, etc.) and how it signals other immune components.

4. B) Two Fab fragments and one Fc fragment - Papain cleaves the antibody into two identical Fab fragments (antigen-binding) and one Fc fragment (effector).

5. The antigen-binding site is formed by the variable regions Specifically, the VH (heavy chain) and VL (light chain) domains combine at the tips of the Y This site, called the paratope, has a unique shape matching the viral protein's epitope The constant region does not participate in recognition - only in signaling after binding

6. The variable region (antigen specificity) can stay the same after class switching The heavy chain constant region changes - from the mu () chain of IgM to the gamma () chain of IgG This is called class switching, and it changes effector function without changing what antigen is recognized IgG's constant region enables better tissue penetration and longer-lasting protection

7. The two identical fragments are Fab fragments (Fragment antigen-binding) Each Fab contains one full light chain and part of one heavy chain, including the variable regions The third fragment is the Fc fragment (Fragment crystallizable), made of the paired heavy-chain constant regions Fab binds the antigen; Fc mediates effector functions like binding immune cell receptors

8. A Y-shaped protein made of two heavy chains and two light chains joined by disulfide bonds.

9. The tip of each chain; unique sequence that forms the antigen-binding site (paratope).

10. The base of each chain; determines the antibody class and its effector functions.