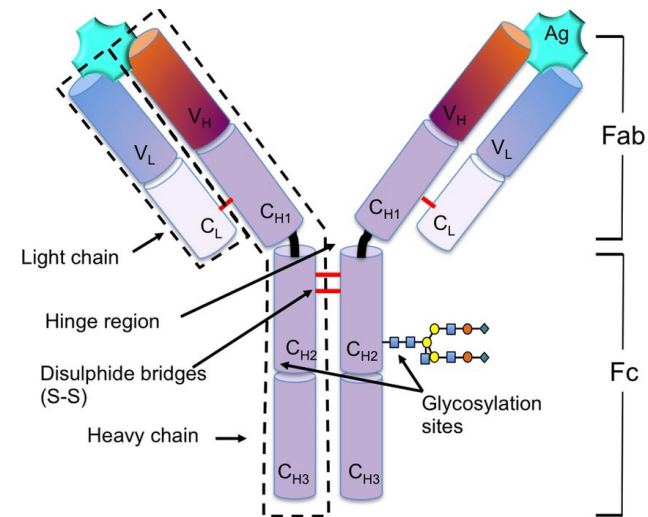


IgG1 structure:



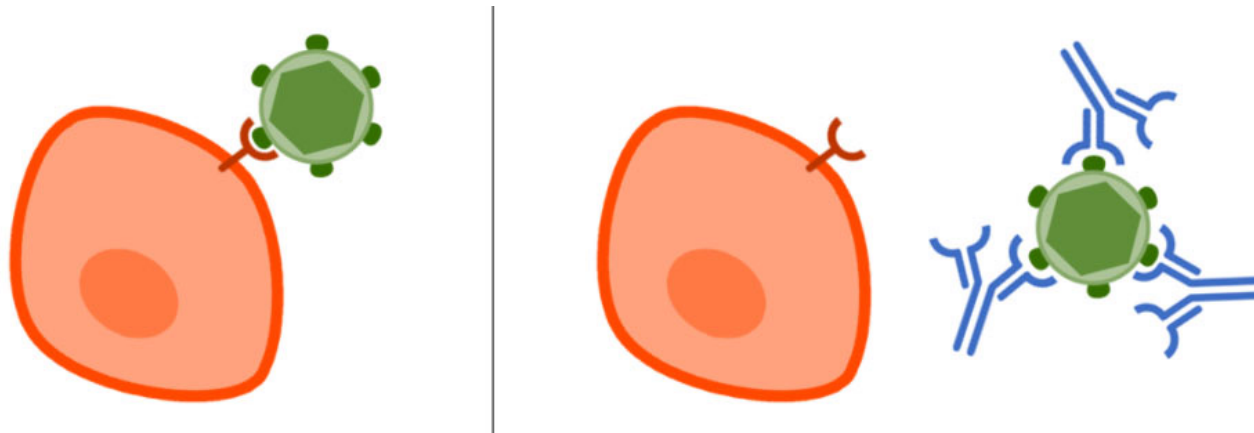
- **Structure:**
- **Y-shaped molecule** composed of two identical heavy chains (50kDa each) and two identical light chains (25 kDa each).
- Each heavy chain has **one variable domain (V_H)** and **three constant domains (C_H1, C_H2, C_H3)**.
- The light chain has **one variable (V_L)** and **one constant domain (C_L)**.
- **Fab region** (antigen-binding fragment) binds specific antigens.
- **Fc region** (constant fragment) interacts with immune effector cells via Fc receptors (FcγRs) and with complement proteins (like C1q).
- The **Asn297 Fc glycan in the C_H2 region is indispensable** for IgG1's effector functions, structural integrity, and therapeutic potential. Without it, IgG1 can still bind antigens via Fab, but it loses most of its ability to recruit immune cells or activate complement.

IgG1: Key characteristics

- Most abundant IgG subclass in human serum (~60–70% of total IgG).
- Half-life in circulation: ~21 days.
- Highly flexible hinge region, giving it versatility in binding antigens and immune complexes.
- Often preferred in therapeutic monoclonal antibodies due to strong effector functions.

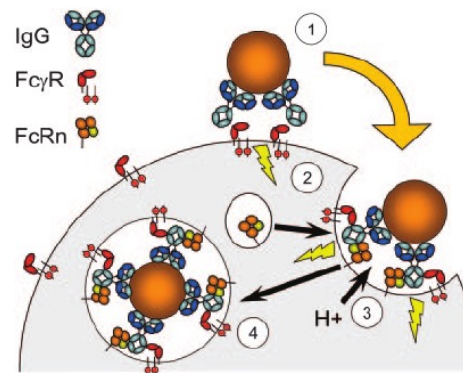
Neutralization

- **Mechanism:** The antibody binds to a pathogen or toxin and **blocks its ability to interact with host cells.**



Opsonization

- **Definition:** Antibodies coat a pathogen to **enhance its recognition and ingestion by phagocytes.**
- **Fc Interaction with Phagocytes**
- **Phagocytes (macrophages, neutrophils, dendritic cells) express Fc gamma receptors (FcγR).**
- **Mechanism:**
 - Pathogen is coated with antibodies (opsonization).
 - Fc region of bound antibodies binds FcγR on phagocytes.
 - Cross-linking of Fc receptors triggers **phagocytosis.**
 - The phagocyte engulfs the pathogen into a phagosome, then digests it.

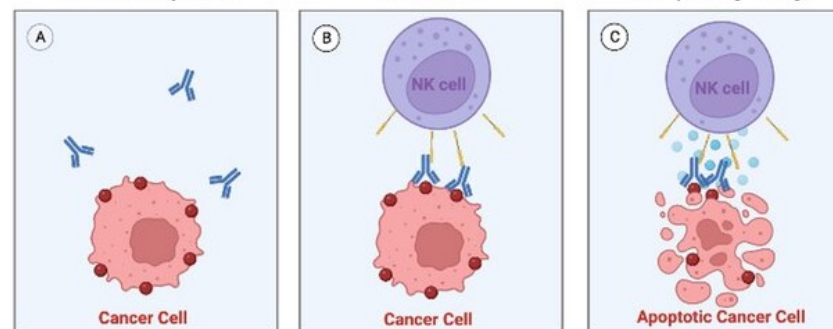


ADCC (Antibody-Dependent Cellular Cytotoxicity)

- **Mechanism:**

- (A) Antibody binds to antigens on the surface of a target cell (infected or cancerous).
- (B) Fc region of the antibody is recognized by **Fc receptors on natural killer (NK) cells**.
- (C) NK cells release cytotoxic granules (perforin, granzymes) to **kill the target cell**.

- **Effect:** Immune system directly eliminates antibody-coated cells.



CDC (Complement-Dependent Cytotoxicity)

- **Mechanism:**

- Antibody binds to antigen on a target cell.
- The **Fc portion activates the complement cascade**, a series of proteins in blood.
- Activation leads to formation of **MAC (Membrane Attack Complex)**, which punches holes in the target cell membrane.
- Target cell undergoes **lysis**.

- **Effect:** Direct killing of pathogen or infected/cancerous cells via complement-mediated lysis.

