Major Classes of Immunoglobulin

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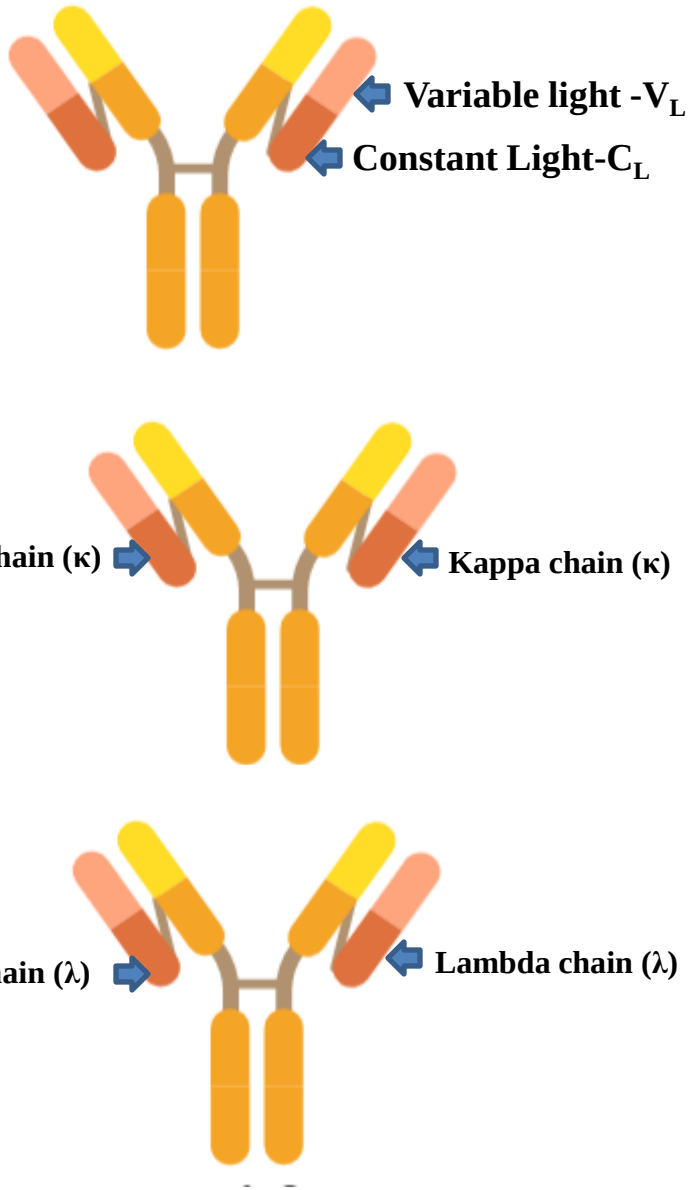
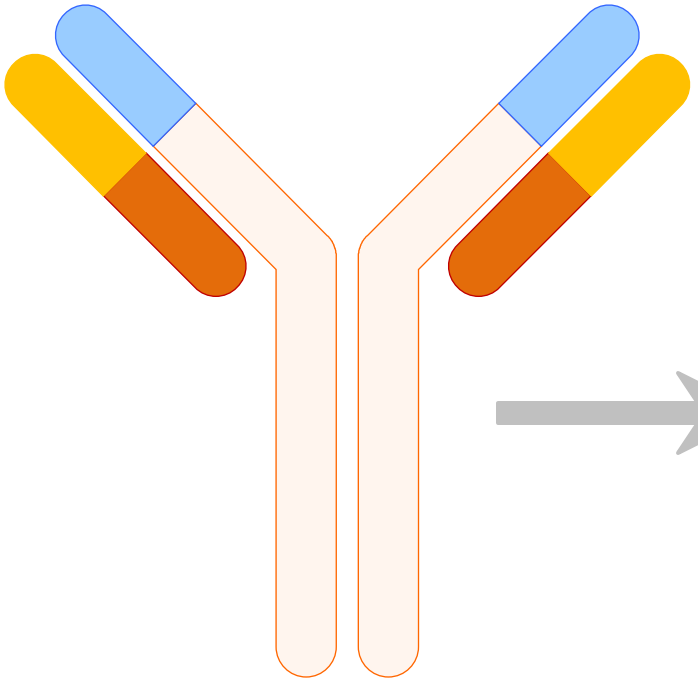
Major class of Immunoglobulin (Ig) light chain

- **Light chain** of antibody have a **amino-terminal** and a **carboxyl-terminal**.
- **Amino terminal half** – highly variable amino acid sequence (**designated Variable light -V_L**).
- **Carboxyl-terminal- less** variable amino acid sequence (**designated Constant Light-C_L**).
- On the basis of amino acid sequence present in the **C_L** chain, categorised two major class
  - **Kappa chain (κ)**
  - **Lambda chain (λ)**
- Constant region of light chain sequence further subdivided into **four subtype- λ1, λ2, λ3 and λ4**

  (subtype is due to chance in few amino acid at particular place of constant region sequence)
- **In Human, 60% Constant Light-C_L amino acid sequence is Kappa chain (κ) and 40% is Lambda chain (λ)**

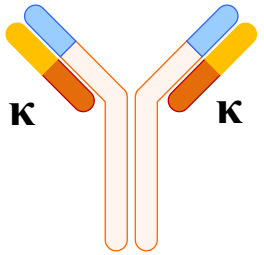


Note: In a single immunoglobulin, either **κ or λ** type of amino acids sequence found.

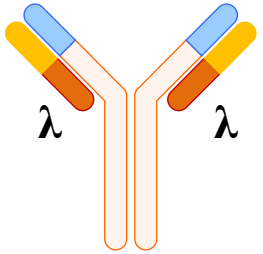


Variable light -V_L

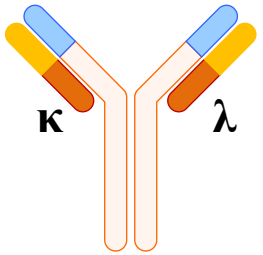
Constant Light-C_L



Correct



Correct



Incorrect

Variable light -V_L

Constant Light-C_L

Kappa chain (κ)

Light Chain

OR

Lambda chain (λ)
[C λ 1, C λ 2, C λ 3, and C λ 4]

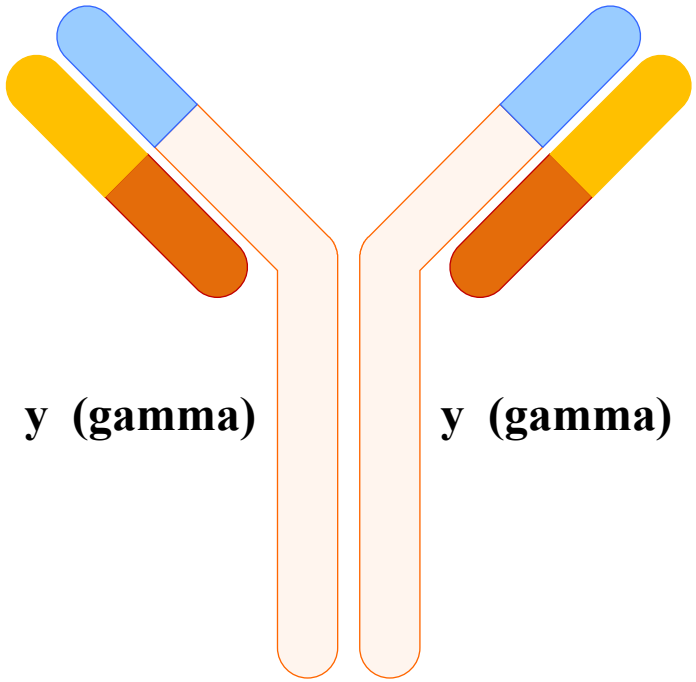
Light Chain

- **Heavy chain** of antibody also have a **amino-terminal** and a **carboxyl-terminal**.
- The sequences of the heavy chain constant region falls into **five basic pattern**.

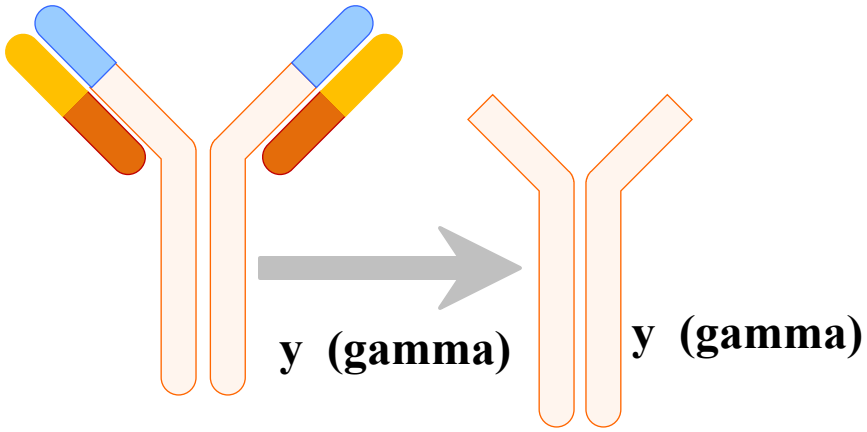
➢ **μ (mu)**
➢ **δ (delta)**
➢ **y (gamma)**
➢ **Є (epsilon) and**
➢ **α (alpha)**

- Different heavy-chain constant region is referred to as an **isotype**.
- Isotype of heavy-chain constant region determine the **class of antibody**.

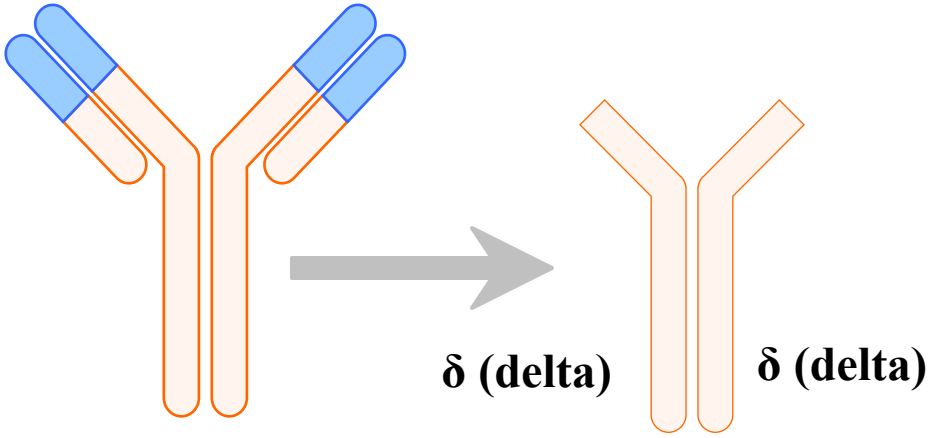
Class of Antibody	Heavy-chain Isotype
IgG	**y (gamma)**
IgD	**δ (delta)**
IgA	**α (alpha)**
IgM	**μ (mu)**
IgE	**Є (epsilon)**



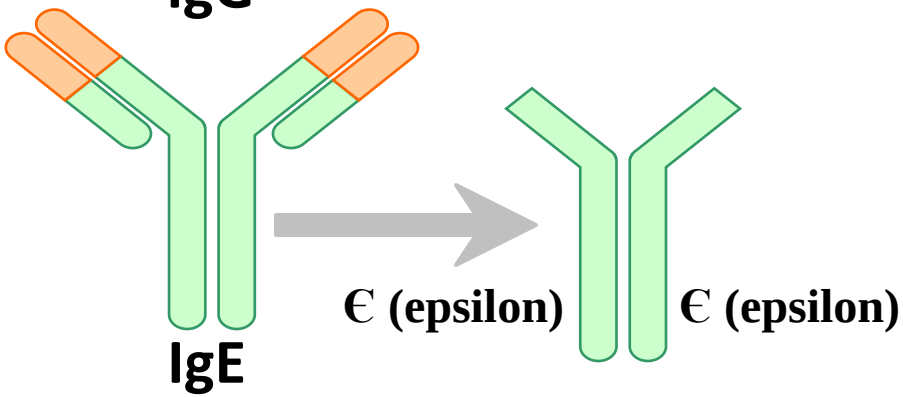
IgG



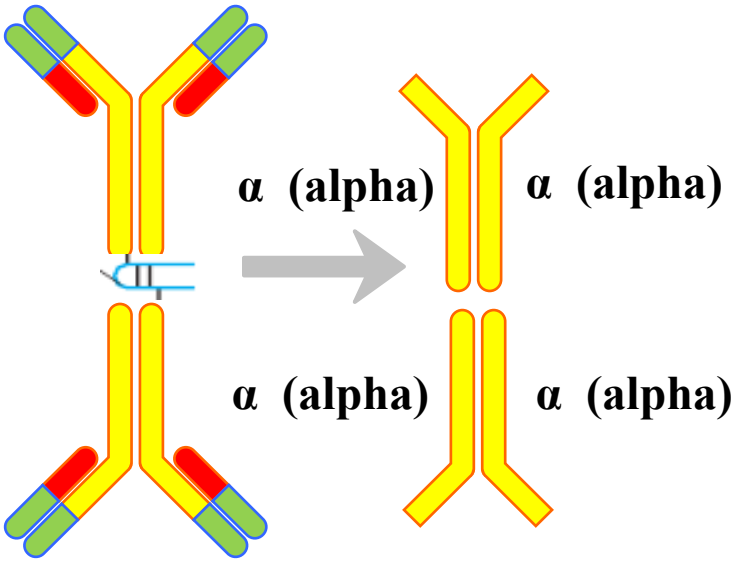
IgG



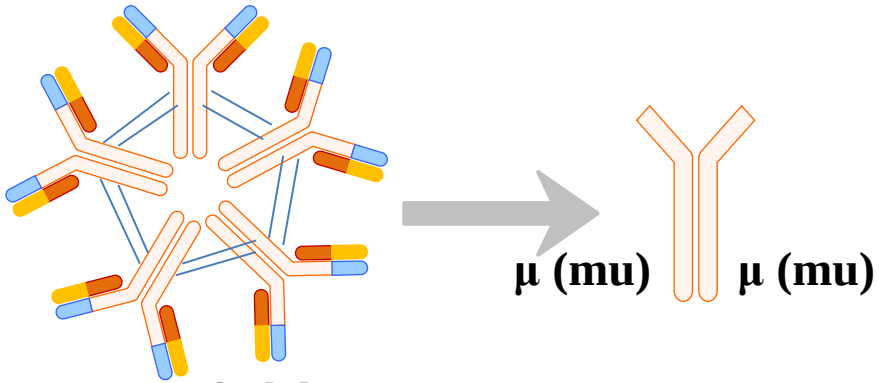
IgD



IgE



IgA



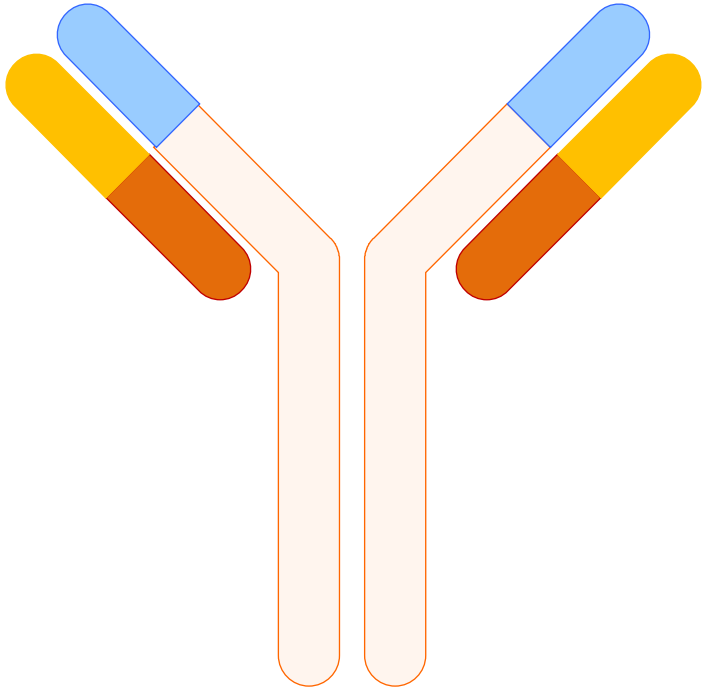
IgM

In human, there are two sub-isotypes of the **α (alpha)** heavy chain, **α1 (alpha 1)** and **α2 (alpha 2)**, and thus two IgA subclasses, IgA1 and IgA2. Similarly, there are four sub-isotypes of **y (gamma)** heavy chains, **y1 (gamma1)** , **y2 (gamma2)** , **y3 (gamma 3)** , and **y4 (gamma)** , with the corresponding formation of the four subclasses of IgG: IgG1, IgG2, IgG3, and IgG4.

Immunoglobulin Classes

Immunoglobulin G (IgG)

- Major antibody in serum- approx. 80%
- Forms-Monomer
- Present in blood plasma and tissue fluid
- Only antibody able to cross the placenta and provide natural immunity in utero and to the neonate at birth.
- Activate compliment by classical pathway.
- Help in opsonization.
- Neutralize toxins
- In human, it has four subclasses i.e., IgG1, IgG2, IgG3 and IgG4.
- IgG2 are opsonic and develop in response to antitoxin.
- IgG1 and IgG3 are anti-Rh antibody.
- Igg4 function as skin sensitizing antibody.

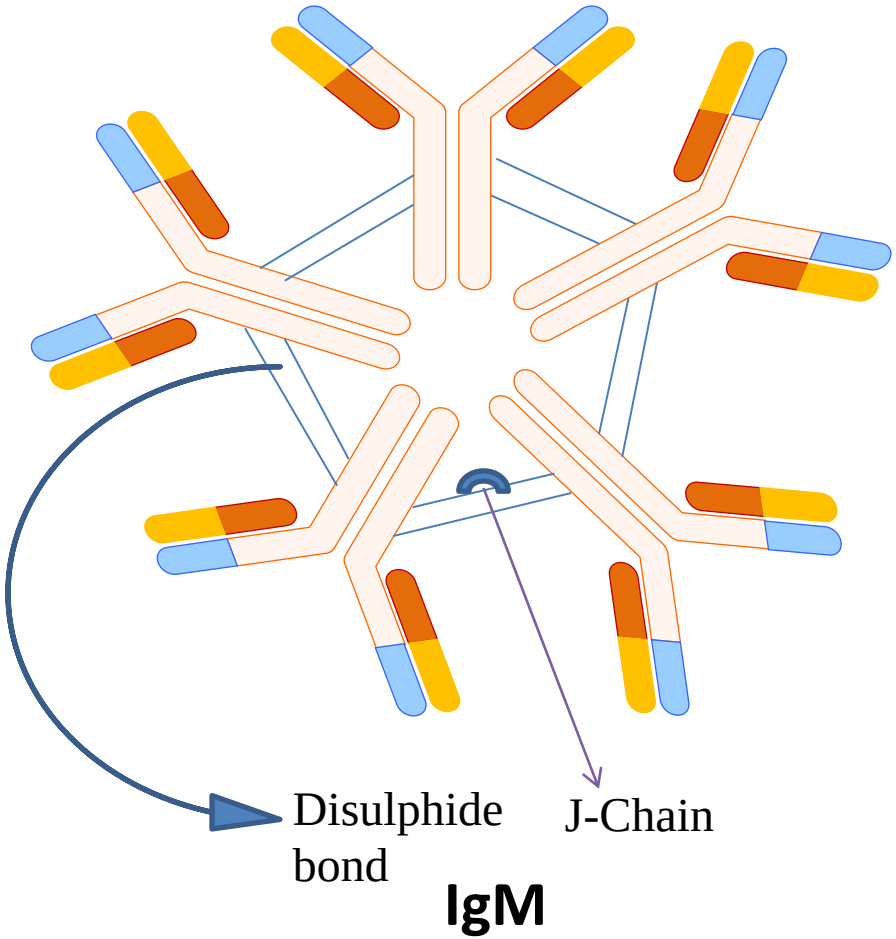


IgG

Immunoglobulin Classes cont...

Immunoglobulin G (IgM)

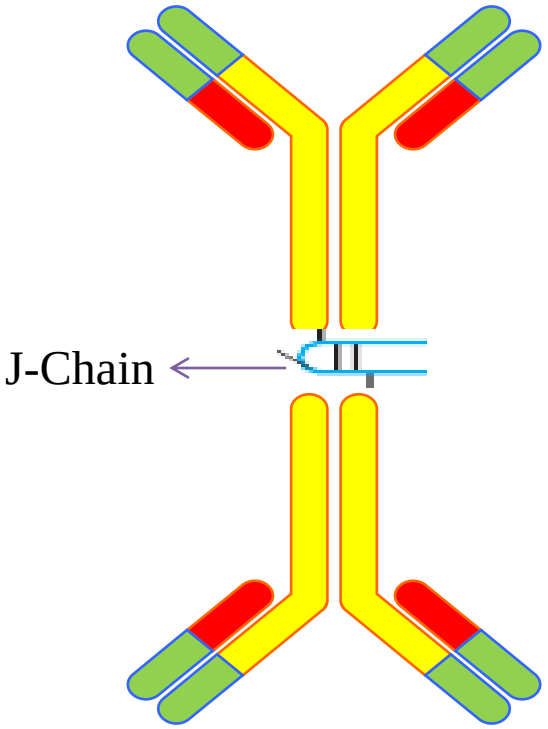
- It is about 10% of the antibody pool.
- Forms- Pentamer (a polymer of five monomeric units).
- The monomer arranged in pinwheel array. Fab region of monomer in out ward direction. All monomers are join by disulphide bond. A special J-chain (Joining chain) also helps in joining the monomers.
- It is the first antibody synthesised during B-lymphocyte maturation and expressed as membrane receptor.
- Helping in agglutinate pathogen.
- Activate compliment.
- Accelerate the phagocytosis process.



Immunoglobulin Classes cont...

Immunoglobulin G (IgA)

- It is about 15% of the antibody pool.
- Forms- Dimer (Two monomeric units).
- The monomers are joined by J-chain (Joining chain).
- Found in mucous secretions, saliva, tear and breast milk.
- Perform immune exclusion
- Provide immunity in new-borns.
- Protect surface tissue against pathogens.
- Help in complement activation.

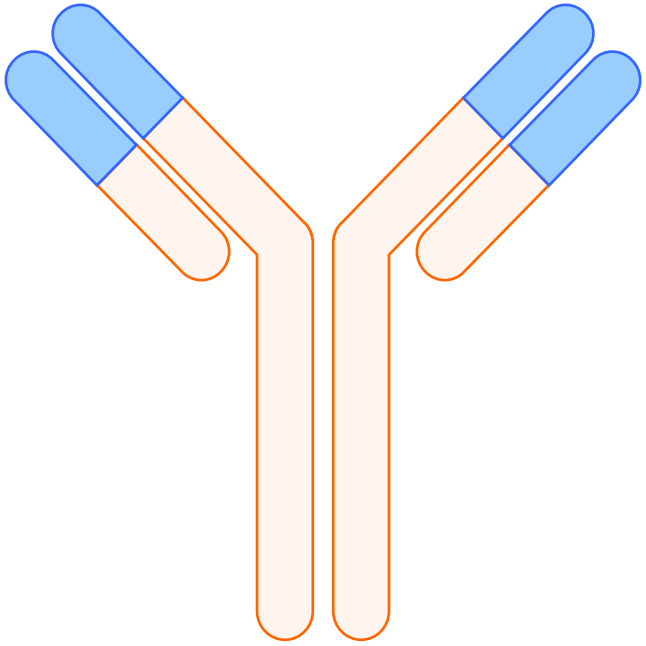


IgA

Immunoglobulin Classes cont...

Immunoglobulin G (IgD)

- Found in trace amount.
- Forms- Monomer (Like IgG).
- Unable to cross placenta.
- Like IgM, found on the surface of B-lymphocyte cells.
- Perform antigen binding on the B-lymphocyte cells
- Help in humoral immunity through signalling of B-cell.

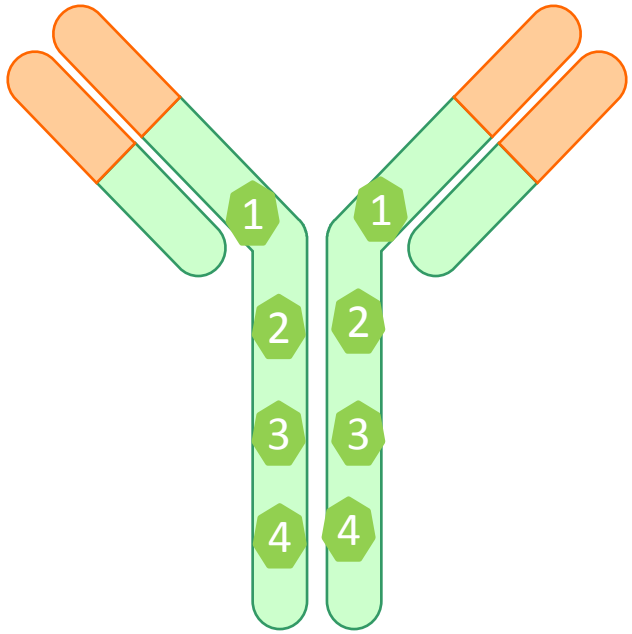


IgD

Immunoglobulin Classes cont...

Immunoglobulin G (IgE)

- Found in trace amount.
- Forms- Monomer.
- **Four constant domains** ($C_\epsilon1$, $C_\epsilon2$, $C_\epsilon3$, and $C_\epsilon4$) on heavy chain.
- $C_\epsilon4$ domain bind specialy on fc receptor on Basophil and mast cells.
- Help in realising histamine.
- Stimulate eosinophilia.



IgE

Thanks