

ANTIBODY

An antibody is a protein produced by the immune system that is capable of binding with high specificity to an antigen.

Antibodies

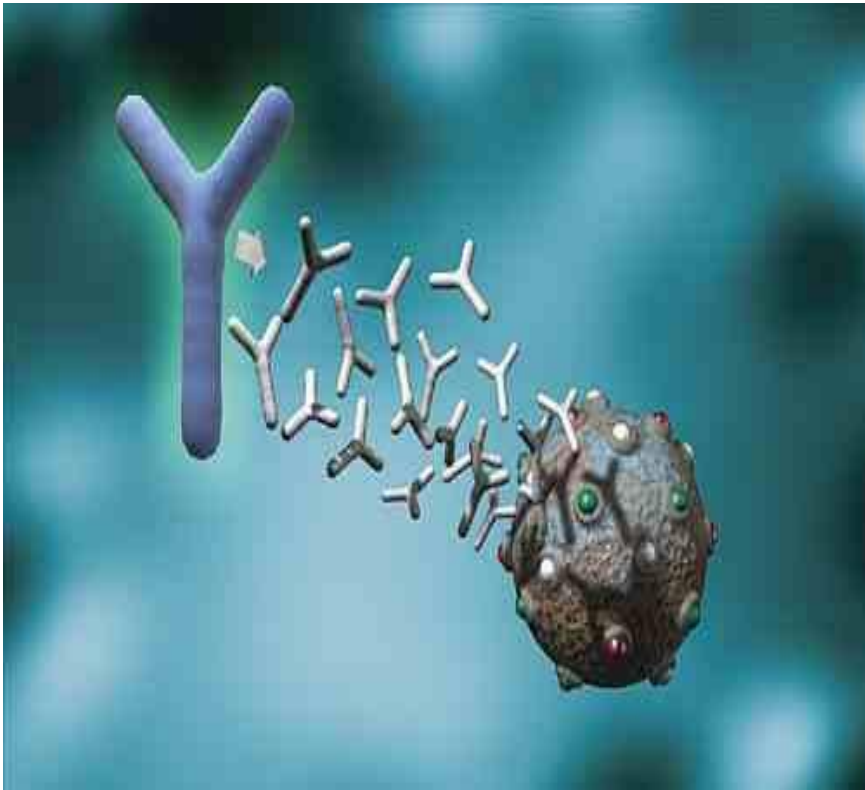
- Are one of two basic elements.(humoral immunity)
- It is found freely in blood and body fluids. B cell surface is found as " B cell antigen receptor-BCR "
- Each antibody molecule merges with one antigen molecule (key-lock)
"specificity"



Antibodies/Proteins...

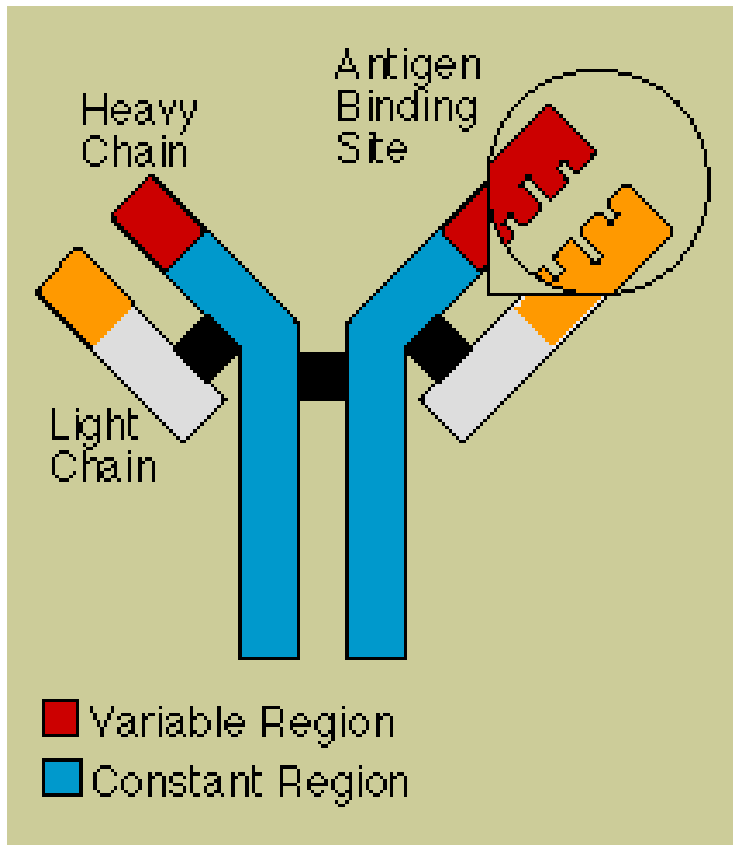


Antibody-Immunoglobulin



- Serum proteins:
electrophoresis
albumin, alpha globulin,
beta globulin and
gammaglobulin
- **Most immunoglobulins are
found in gamma globulins**
- Gammaglobulin
immunoglobulin-
antibodies

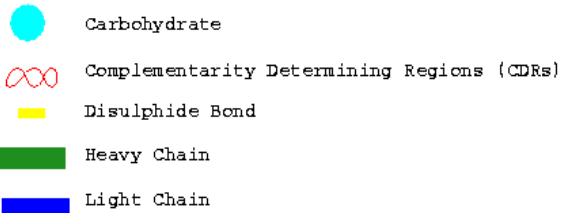
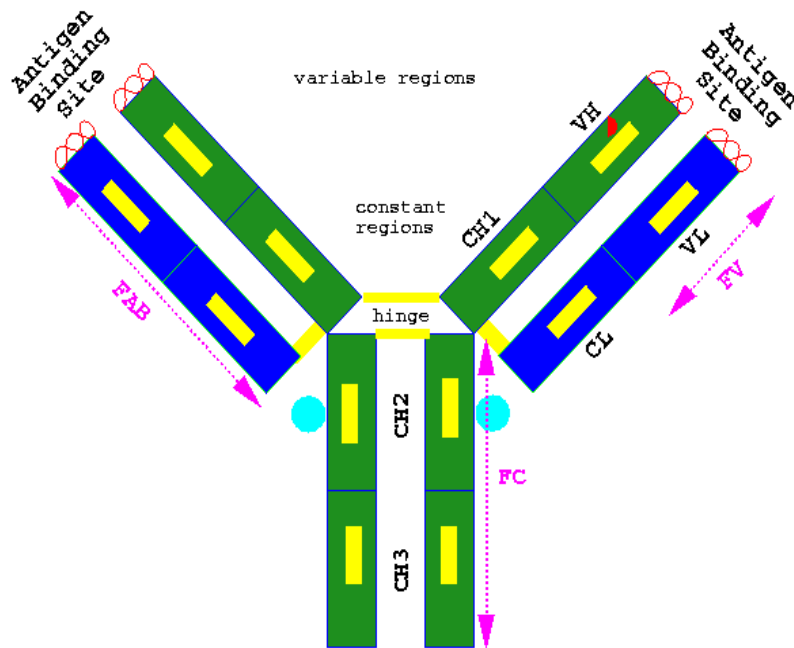
Antibody Basic Structure



- Monomeric Structure
- Heavy Chain: 450-500 amino acid (50-60 kDa)
- Light Chain: 220 aminoacid (25 kDa)
- Constant Regions
- Variable Regions
- Hypervariable Regions
- S-S (disulfide) bonds

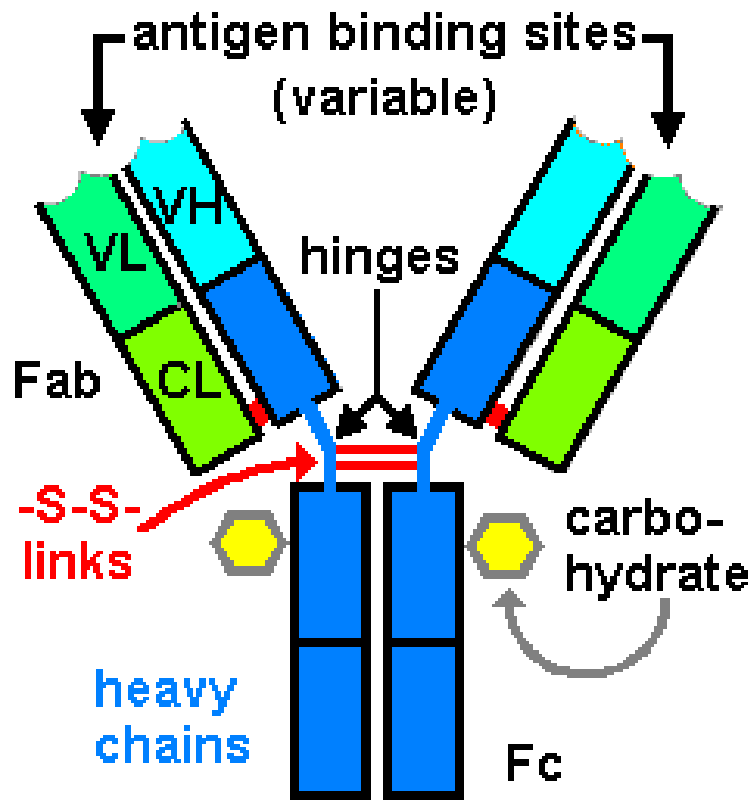
Antibody-Hinges Region

Schematic Diagram of an Immunoglobulin (IgG)



- Containing about 110 amino acids.
- It identifies the constant and variable parts on the heavy and light chains
- S-S (disulfide) bonds
- VH(variable-heavy): Variable part of heavy chain
- CH(constant-heavy): Constant part of heavy chain (CH1-CH2-CH3)
- VL(variable-light): Variable part of the light chain
- CL(constant-light): Constant part of the light chain
- Constant Regions
- Variable Regions
- Hypervariable Regions

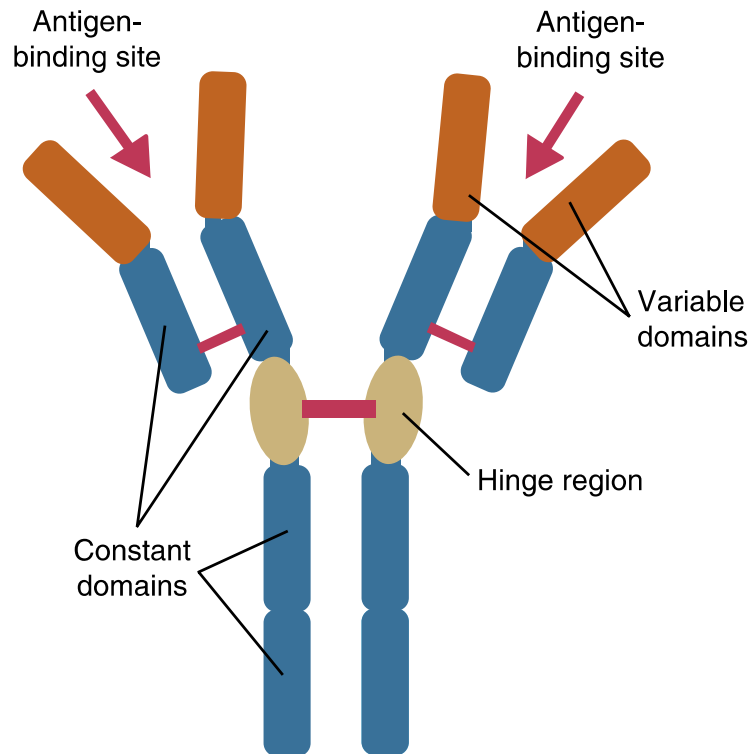
Antibody



Immunoglobulin G (IgG)

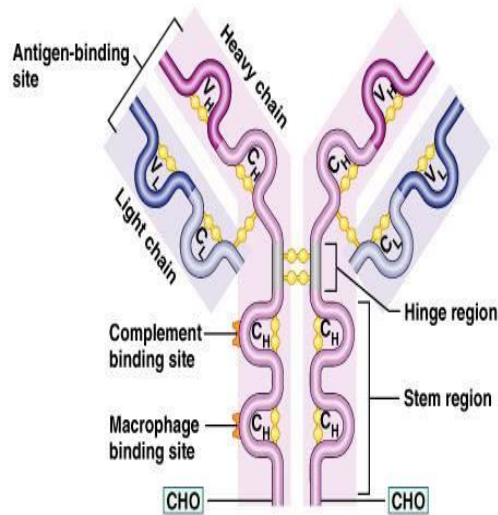
- The Hinge located with CH1-CH2
- Hinges region is rich in cysteine and proline
- S-S (disulfide) bonds
- Fab: antigen binding sites
- Fc: cell binding region

Antibody

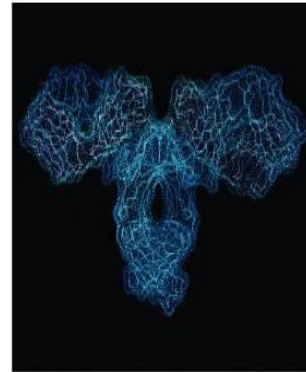


- Hinges region is rich in cysteine and proline
- Gives flexibility to antibody molecule

Antibody-Functional Structure




(a) Antibody molecule



(b)

Key:

 = Disulfide bond

 = Carbohydrate side chain

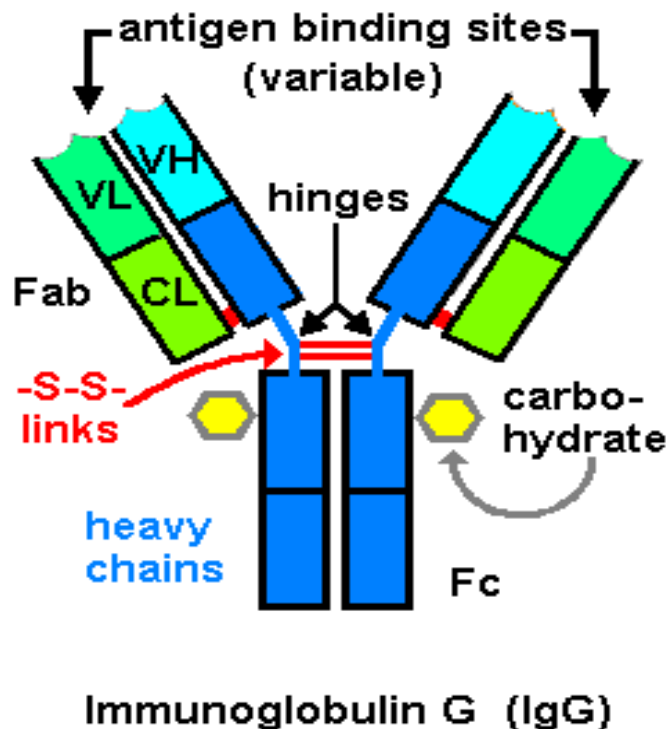
- Fab: antibody binding region
- Fc: cell binding region
- Complement binding region

Antibody - Heavy Chain Types

- Heavy chain types = Immunoglobulin classes

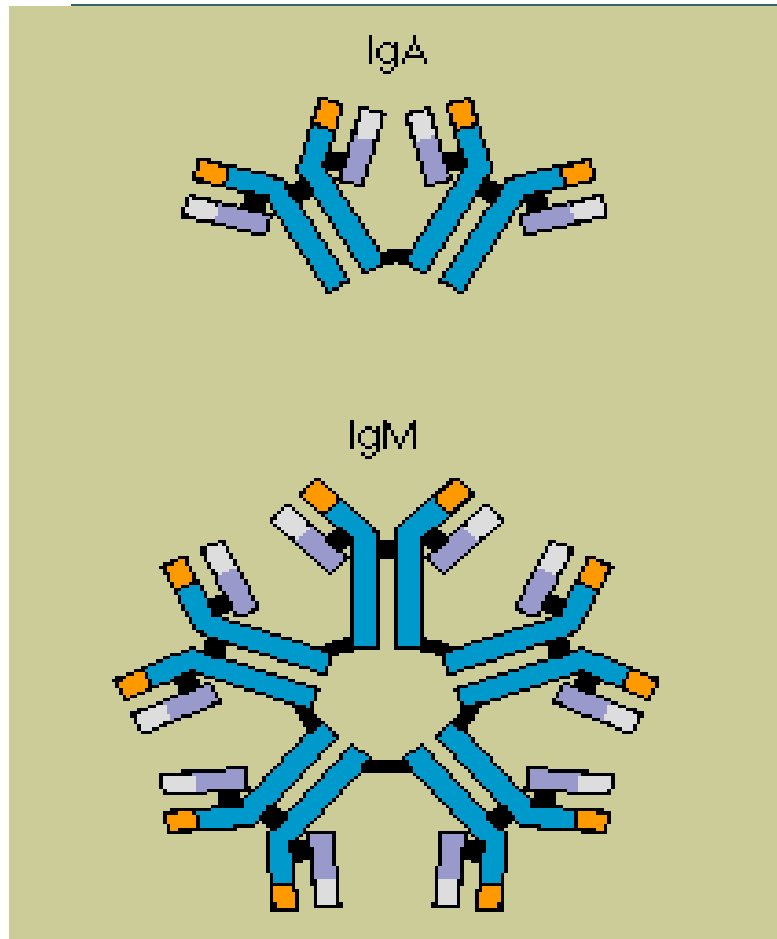
- Determines the amino acid sequence of the immunoglobulins in the constant region of the heavy chain.
- The structure of the heavy chain also determines the species specificity There are 5 different heavy chain types (Ig class)
 - -gamma-IgG
 - -alpha-IgA
 - -deltas-IgD
 - -mu-IgM
 - -epsilon-IgE

Immunglobulin G (gamma)



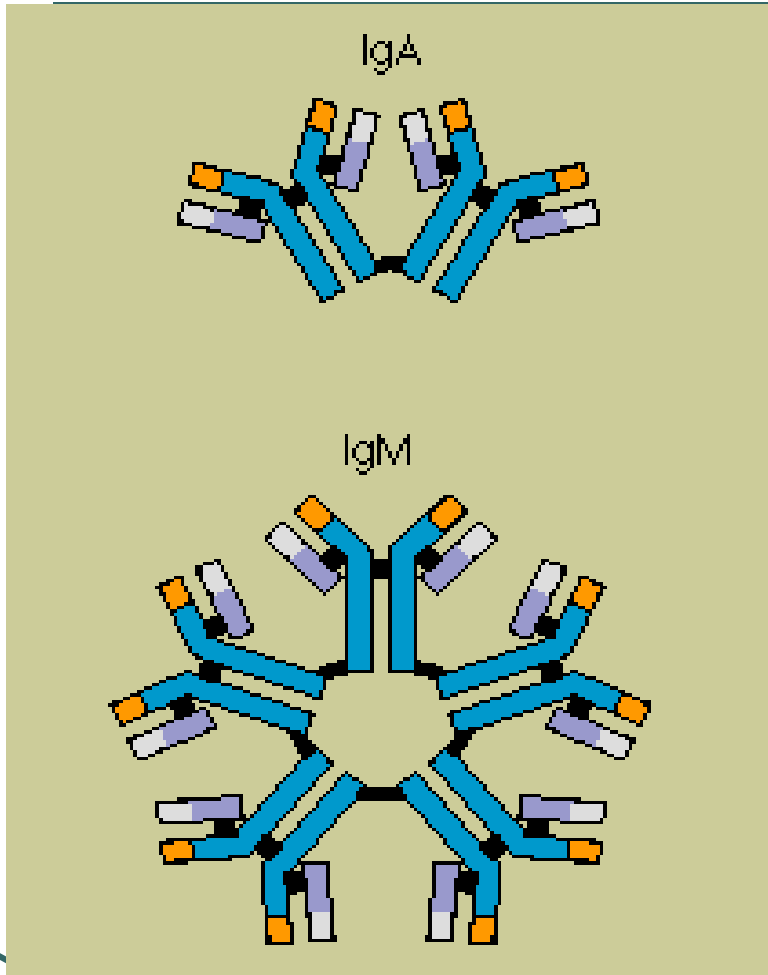
- Immunglobulin G is found in highest concentration in the blood(70-80%),
- It has a typical monomer structure,
- MW: 160-180 kDa
- Immunglobulin G molecules are the smallest molecules and they can pass through blood vessels more easily than others.
- IgG is produced by plasma cells in the spleen, lymph nodes and bone marrow
- Agglutination, opsonization, toxin neutralization
- It is active in blood, body fluids and mucosal surfaces

Immunglobulin M



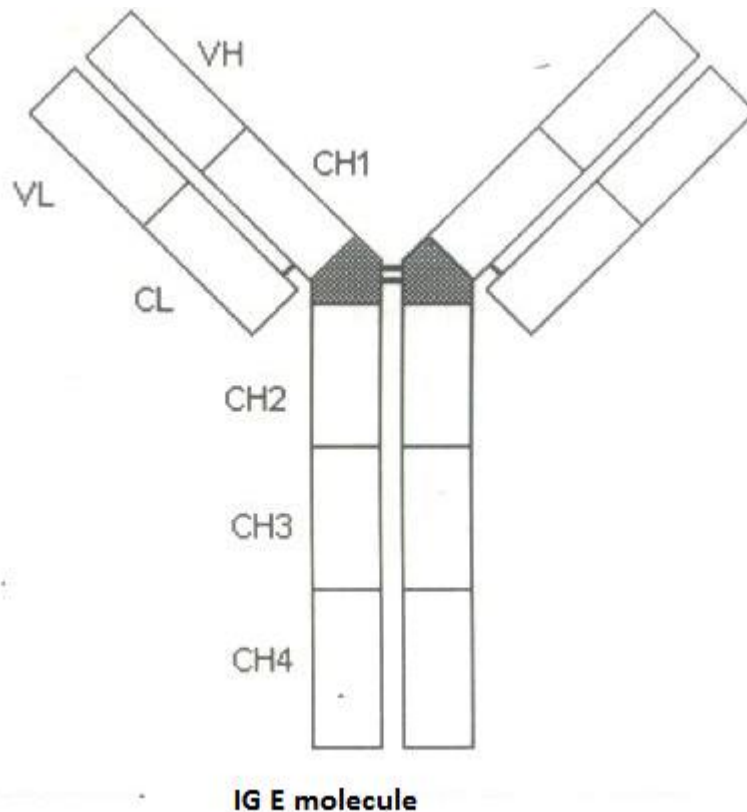
- It has monomeric and pentameric structure
- 5-15% in blood
- Monomeric-B cell surface receptor (180 kDa)
- Pentameric - free form in the bloodstream (900-950 kDa)
- Rich in J chain-cysteine Produced by spleen, In and bone marrow plasmacells
- Agglutination, opsonization, toxin neutralization (X5)
- Does not pass easily through blood vessels
- Active in blood
- High concentration of primary immune response

Immunglobulin A



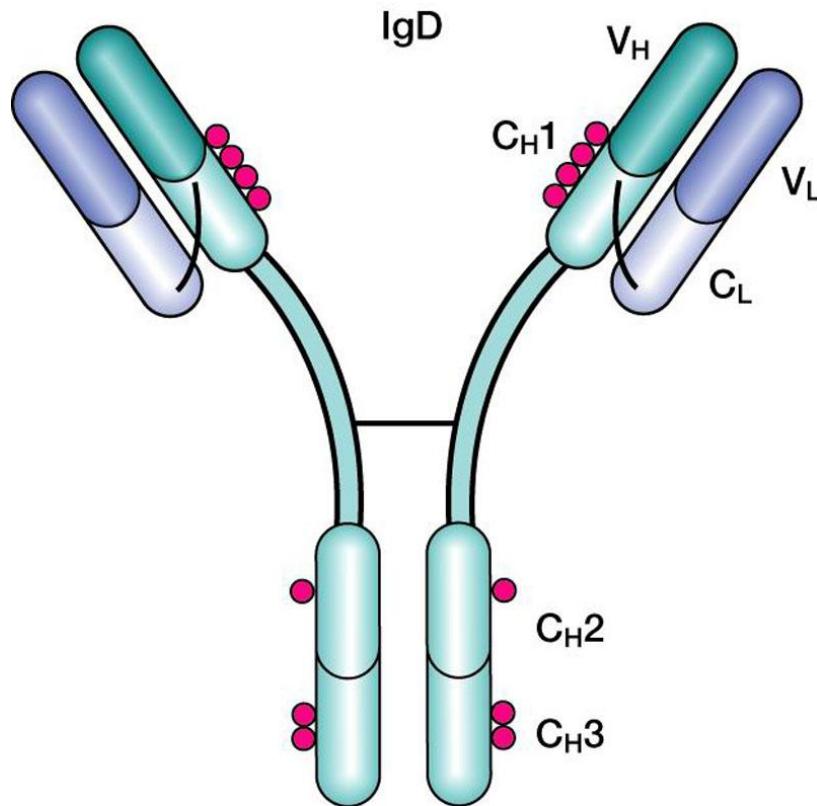
- Dimeric and monomeric structure
 - Low concentration in blood
 - (5-15%)
 - Dimeric on mucosal surfaces (400 kDa)
 - Monomeric in blood (160 Kda) structure
 - Produced by mucosal surface, lymph nodules and skin plasma cells
 - Dimeric form-J chain
 - Dimeric form-secretory part
 - Secretory fragment - resistance to enzymatic degradation
 - Monomeric form in blood: inactive
 - Dimeric form in mucosa: immune exclusion, toxin neutralization-
- MUCOSAL IMMUNITY**

Immunglobulin E



- The lowest concentration in the blood (0.005%)
- Has 4 CH
- MW 190 kDa
- Synthesized by plasma cells in lymphoid tissues on the body surface
- Function: parasitic reactions and allergic reactions
- Binds to mast cells and basophils (cytophilic-cytotropic)
Free form immunological activity is low

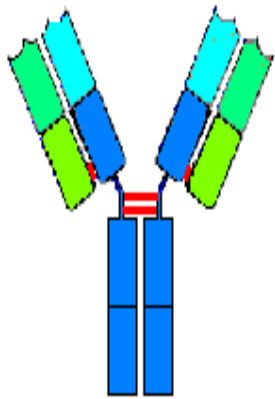
Immunglobulin D



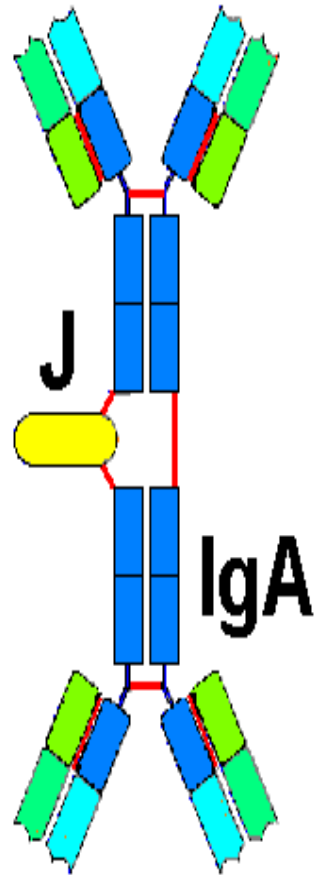
There is no C_H2 region. It has a long hinge region

- B cell antigen receptor
- MW170 kDa
- Heavy chain has two loop zones
Found in human, monkey, rats and mice
- Spontaneous and inactive in blood

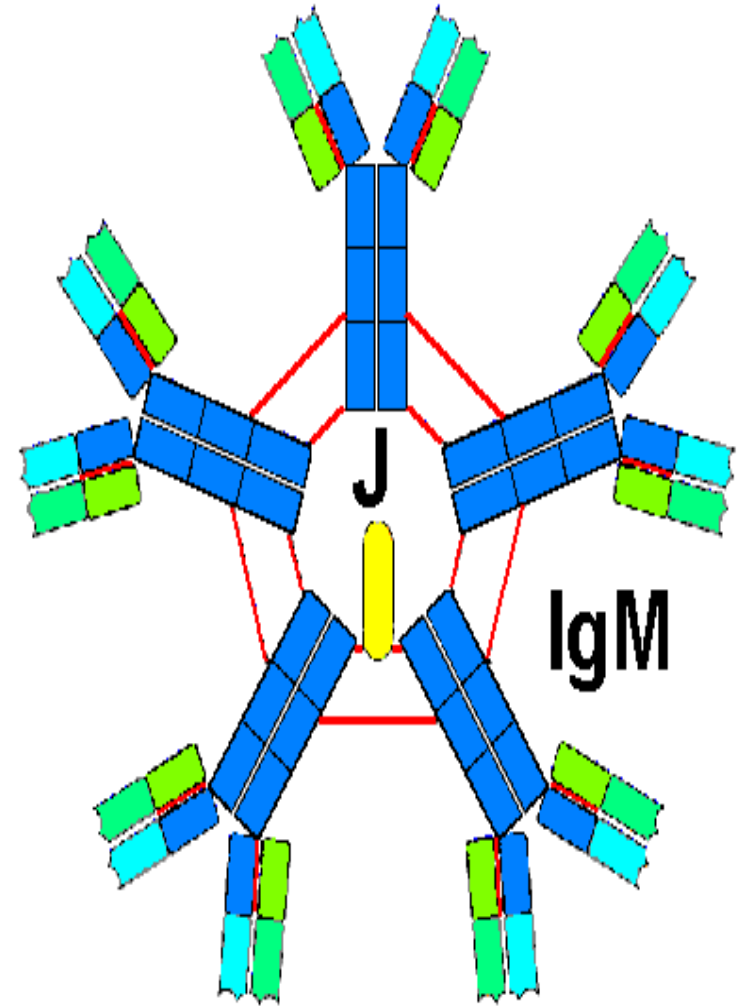
Immunoglobulin classes: IgG, IgA & IgM



IgG



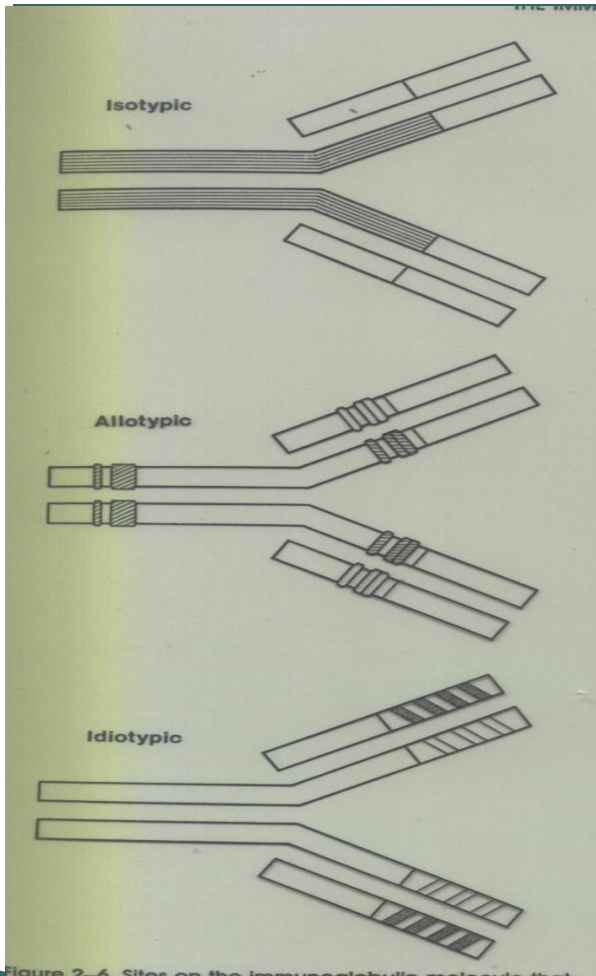
IgA



IgM

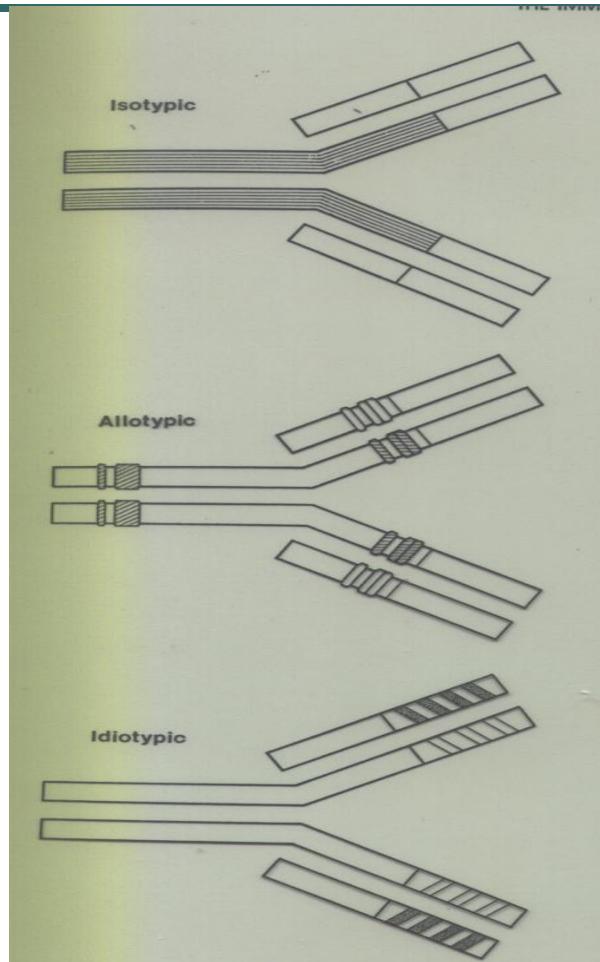
red - disulphide links
green - light chains
blue - heavy chains

Immunoglobulin Variants



- **ISOTYPES:**
- Changes in the amino acid sequence in the constant region of the heavy chain of the Ig molecule
- Determines Ig classes
- Determines the specific structure of Ig molecule
- For example: different structure of bovine and rabbit Ig molecule

Immunoglobulin Variants



ALLOTYPES

Changes in amino acid sequence in the constant region of the heavy and light chain of the Ig molecule

Minor changes between individuals of a species

IDIOTYPES

Changes in the amino acid sequence in the variable region of the heavy and light chain of the Ig molecule

Determines antigenic specificity

Figure 2-6. Sites on the immunoglobulin molecule that