

A study material for M.Sc. Biochemistry (Semester: III) Students
on the topic (CC-12; Unit II)

Antibody

Hinge Region and J Chain

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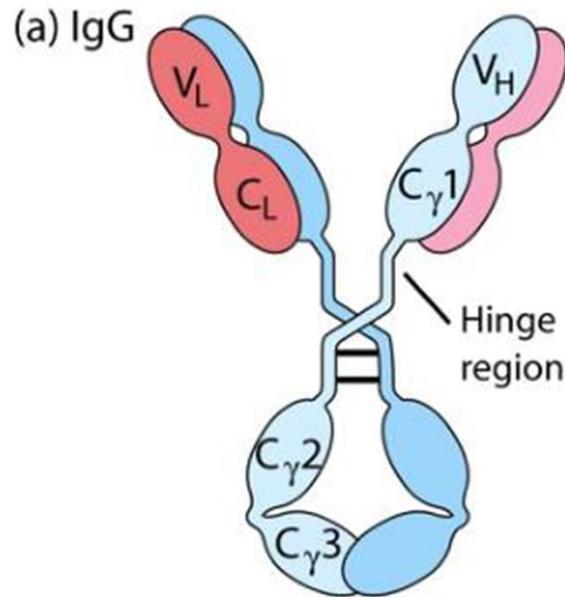
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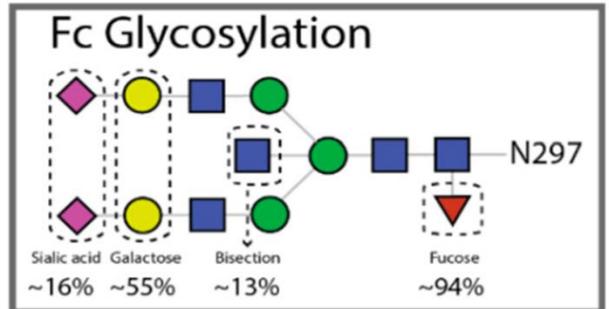
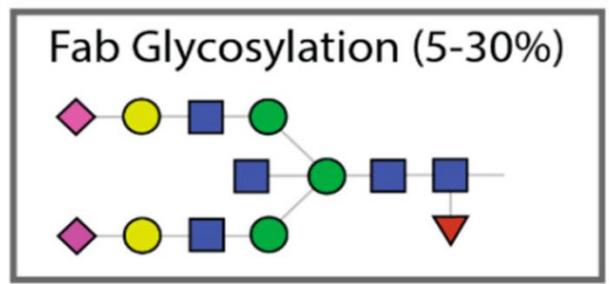
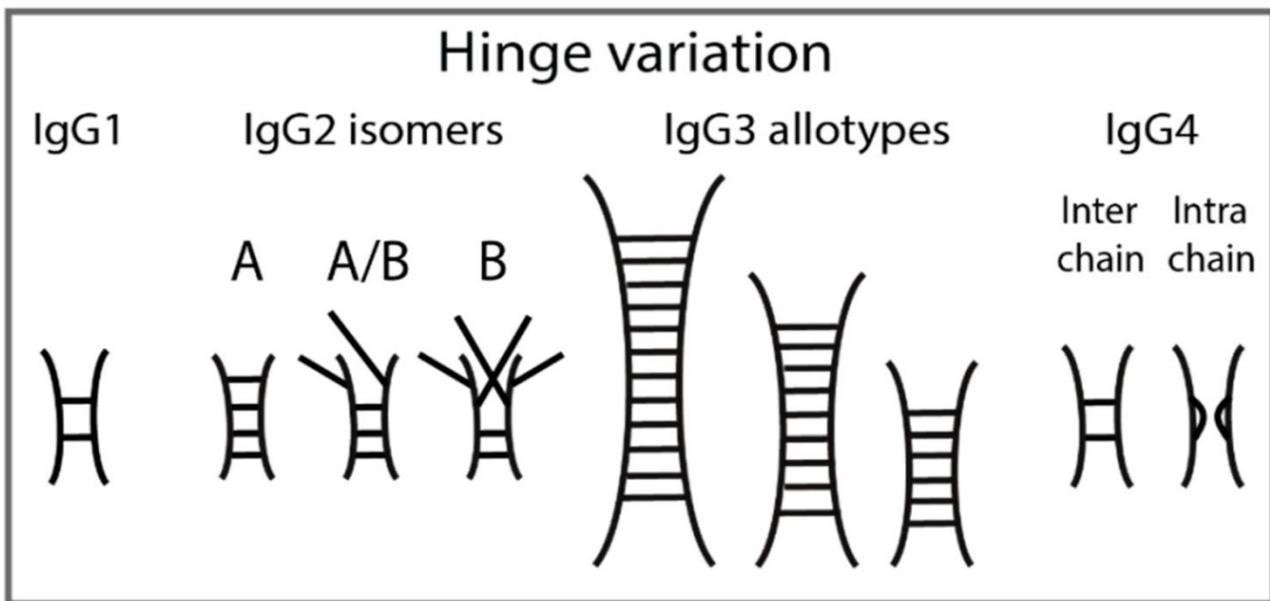
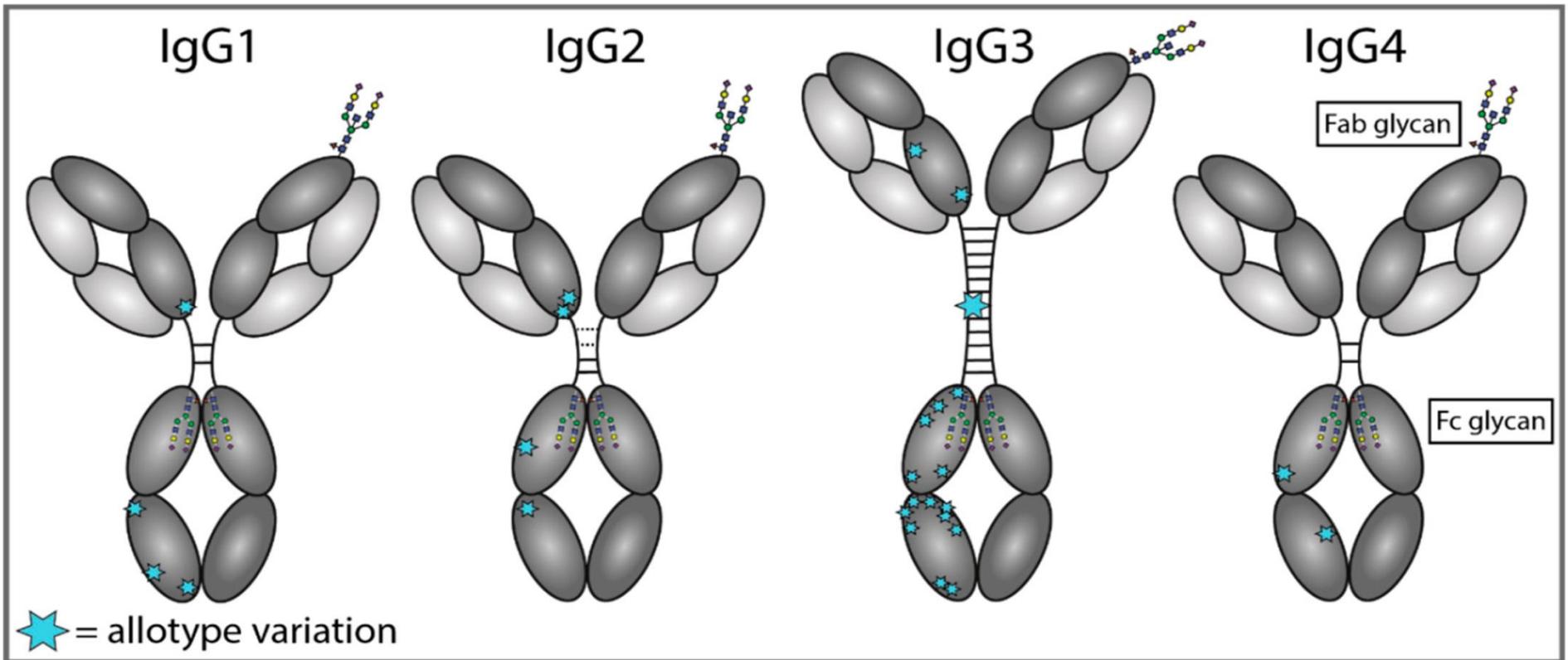
Hinge region:

- Hinge region is present between C_{H1} and C_{H2} domains of IgG, IgA and IgD molecules.
- Both the heavy chains are attached in the hinge region by inter-chain disulphide bonds.
- Hinge region gives flexibility to the Fab arms of the antibody molecule.
- This region is rich in Proline and Cysteine.
- Hinge region is absent in IgM and IgE antibodies.
- IgM and IgE class of antibody molecules have an additional constant region domain and have characteristics of hinge region.

Hinge Region Component of Ig

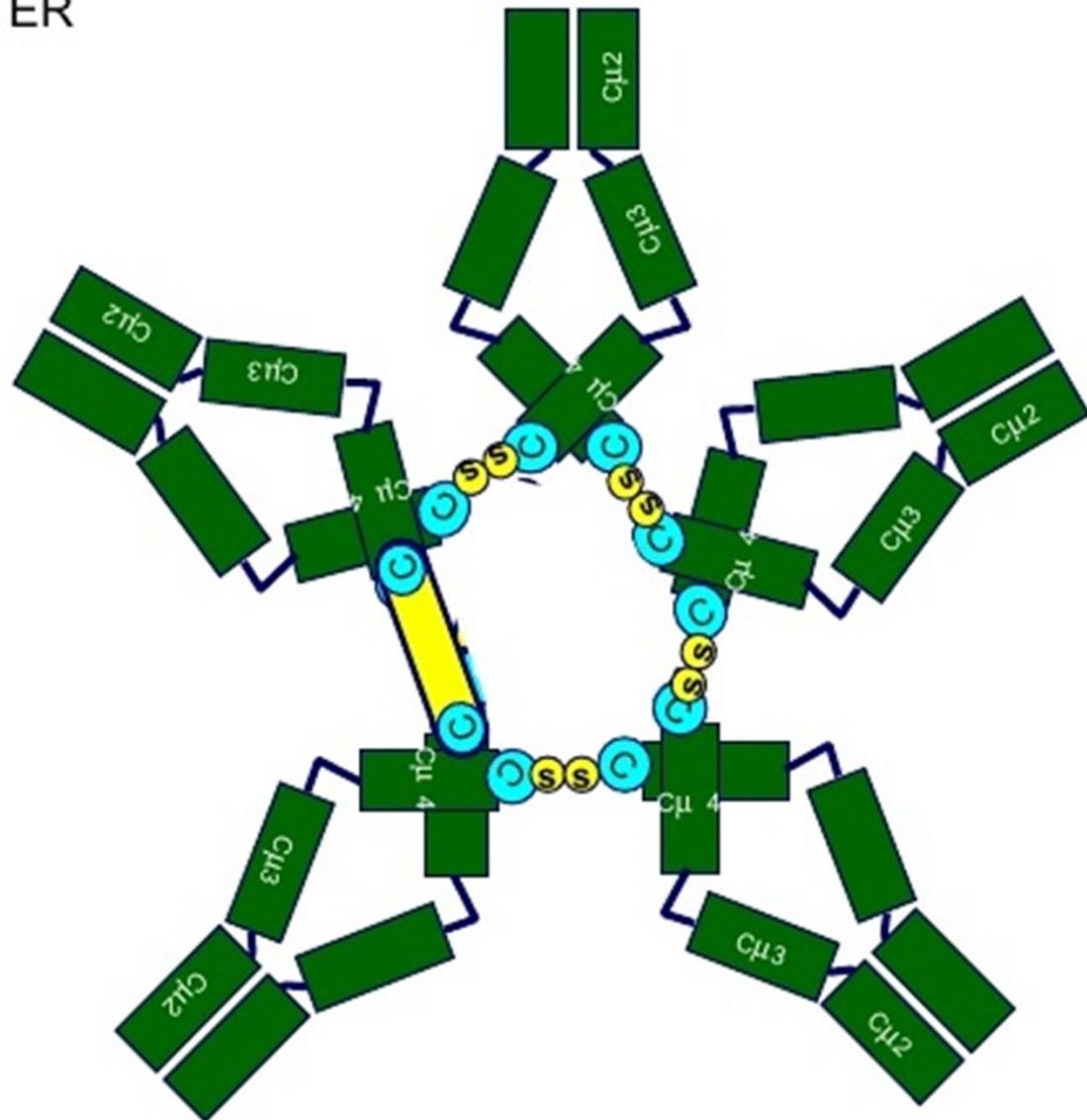


- IgG, IgD, and IgA H-chains contain an extended peptide sequence between C_H1 and C_H2 domains that is called the hinge region
- Hinge region is rich in proline residues which gives IgG, IgD, and IgA Fab arms flexibility when bound to Ag
- Extended polypeptide region makes Ig bearing hinge region more susceptible to proteolytic enzymes

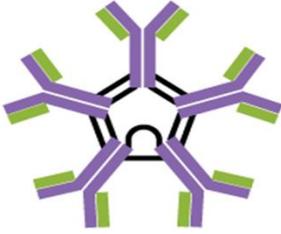


The J chain and Multimerisation of Ig M

1. Two IgM monomers in the ER (Fc regions only shown)
2. Cysteines in the J chain form disulphide bonds with cysteines from each monomer to form a dimer
3. A J chain detaches leaving the dimer disulphide bonded.
4. A J chain captures another IgM monomer and joins it to the dimer.
5. The cycle is repeated twice more
6. The J chain remains attached to the IgM pentamer.



The Five Immunoglobulin (Ig) Classes

Properties	IgG monomer	IgM pentamer	Secretory IgA dimer	IgD monomer	IgE monomer
Structure			 Secretory component		
Heavy chains	γ	μ	α	δ	ϵ
Number of antigen-binding sites	2	10	4	2	2
Molecular weight (Daltons)	150,000	900,000	385,000	180,000	200,000
Percentage of total antibody in serum	80%	6%	13% (monomer)	<1%	<1%
Crosses placenta	yes	no	no	no	no
Fixes complement	yes	yes	no	no	no
Fc binds to	phagocytes				mast cells and basophils
Function	Neutralization, agglutination, complement activation, opsonization, and antibody-dependent cell-mediated cytotoxicity.	Neutralization, agglutination, and complement activation. The monomer form serves as the B-cell receptor.	Neutralization and trapping of pathogens in mucus.	B-cell receptor.	Activation of basophils and mast cells against parasites and allergens.

Acknowledgement and Suggested Readings:

1. Kuby Immunology; Sixth Edition; Kindt, Goldsby and Osborne; W. H. Freeman and Company
2. Fundamental Immunology; 5th edition; William E., Md. Paul (Editor) ; Lippincott Williams & Wilkins Publishers
3. Roitt's Essential Immunology; Tenth Edition; Roitt and Delves; Blackwell Science
4. Cellular and Molecular Immunology; 6th Edition; Abbas, Lichtman and Pillai; Saunders Elsevier

Thanks