

IMMUNOGLOBULINS

- Ig is structural & chemical concept.
- Ab is biological & functional concept.
- Ig when released in the blood then only called as Antibodies.

"Following the introdⁿ of an Ag into the animal body, certain subs appear in the tissue and blood fluid & serum, and react to the Ag specifically are known as Ab."

St of Ig

L-CHAIN

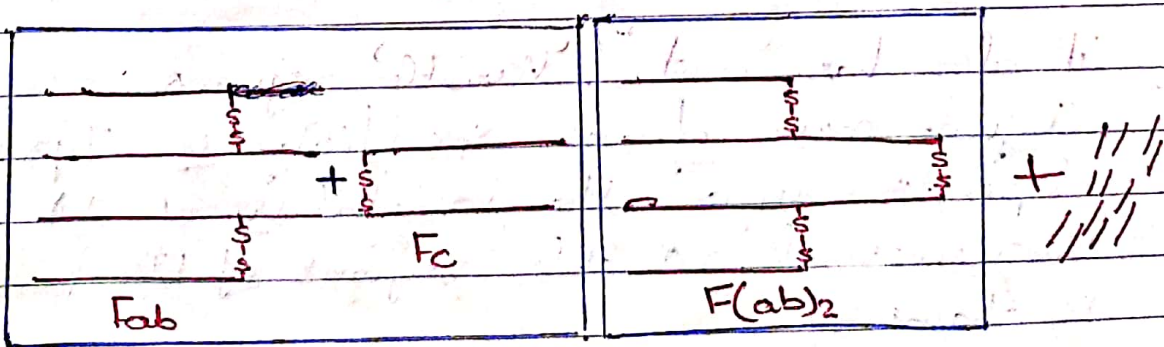
H-CHAIN

N
(Aminotermius)

C
(Carboxytermius)

PAPAIN

PEPSIN



Basic st of Ig molecule & the fragments obtained by cleavage by papain & pepsin.

Igs are glycoproteins, each molecule consists of two pairs of polypeptide chains of diff sizes. Smaller chains are called as 'light' (L) chains & the larger ones 'heavy' (H) chains. L chain has mol wt of 25,000 & H chain has 50,000. Both are attached together by di-sulphide bond.

H-chains are distinct for each class.

• L-chains are similar in all classes of Ig. They occur in two varieties, kappa (κ) & lambda (λ). A mole of Ig may have only one of these chains not both together.

• One end of molecule is Amino terminus while other is Carboxy terminus.

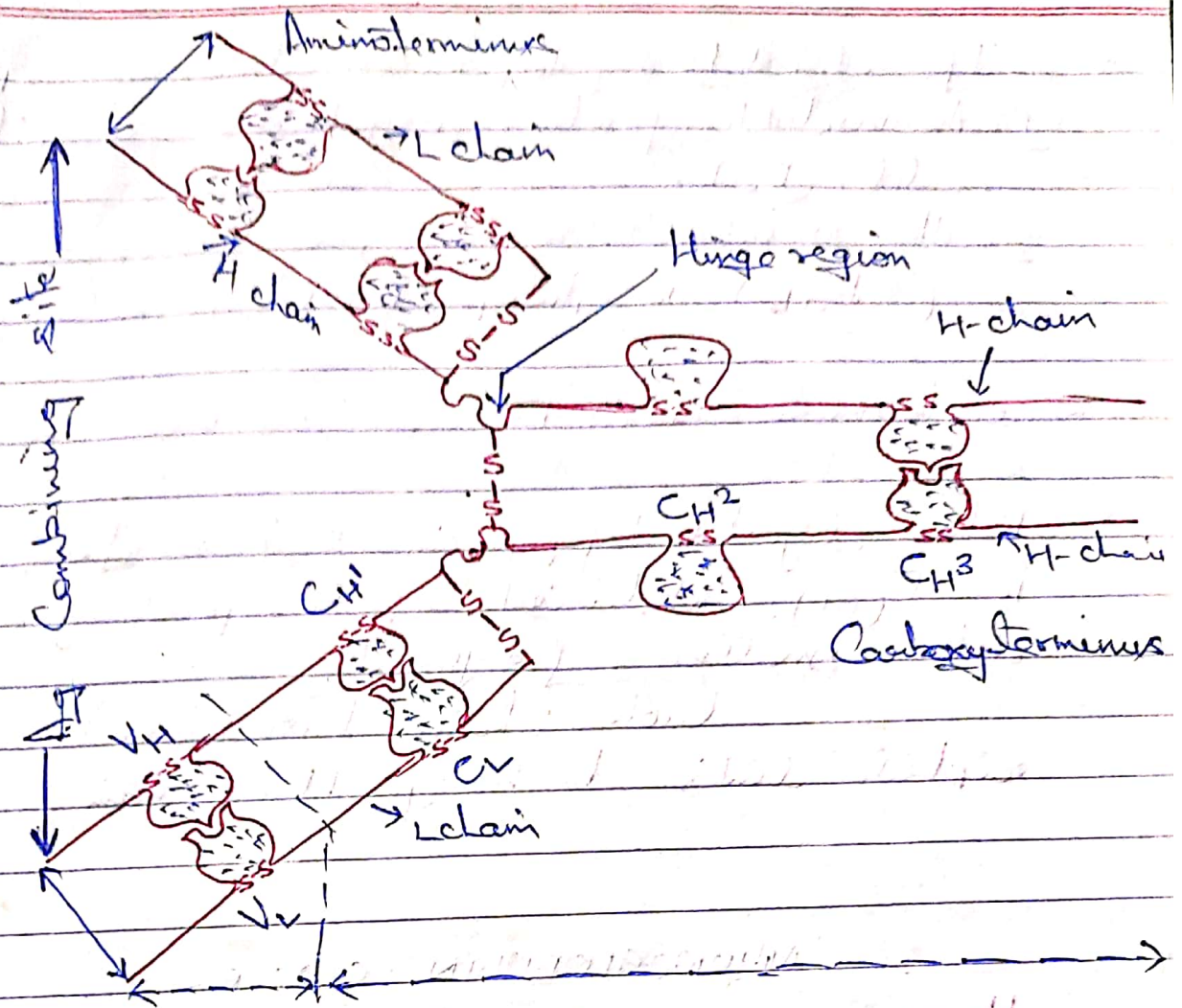
- Ag combining site is at amino terminus, composed of both L & H chains.

In the L-chain A.A. sequence, in amino terminus half is highly variable determining the specificity of ab so called 'Variable region'. 107 A.A. occur in a const region sequence & thus make the 'constant region'.

In the H-chain it also has 'const' & 'variable' regions.

* infinite range of ab specificity of Ig depends upon the variability of AA sequences, at 'variable' regions of H & L chains.

Highly variable zones are called 'Hot-spots'.



The 4 peptide chains of IgG mole composed of 2 identical H & two identical L chains, linked by interchain disulphide bonds.
 Loops formed by one domains.
 Each chain has one Domain in Variable region (VH + VL)
 Each L-chain has one Domain in the const' region while each H-chain has 3-Domain in the const-region (CH₁, 2 & 3)
 b/w CH₁ & CH₂ is the Hinge region.

- ⇒ IgG digested by Papain splits into 2 parts
1. An insoluble fraction, crystallised in the cold (F_c).
 2. The soluble fragment, c binds antigen (F_{ab}) is Antigen Binding Fragment.

- each mole has 1 F_c & two F_{ab} pieces.

⇒ When digested by pepsin 2 F_{ab} fragments ie $F(ab)_2$ obtained & F_c portion digests into smaller fragments.
Each chain has internal disulphide links to bridge H & L chain.

IMMUNOGLOBULIN CLASSES

Human sera contain IgG , IgA , IgM , IgD , IgE in descending order of concⁿ

	IgG	IgA	IgM	IgD	IgE
Placental transport	+	-	-	-	-
not in milk	+	+	-	-	-
Heat stability (56°C)	+	+	+	+	-
Serum conc ^t	1/2	1/2	1/2	1.03	0.00004

IgG is 80% of the total Ig.

- When its level is raised as in Chronic malaria, kala azar or myeloma, it catabolises rapidly & may result in the particular Ab deficiency.

- conversely in Hypogammaglobulinemia, IgE given for treatment will be catabolized only slowly.

- IgE is only Ig that can cross the placental barrier & reach newborn to provide Natural Passive immunity. (because it is not synthesized)

- IgE participates in many immune reactions: complement fix, precipitate & neutralization of toxins & viruses.

- 4 subclasses of IgE -

IgE1, IgE2 & IgE3 & IgE4

IgA i - II most abundant class. it is major Ig in saliva & tears.

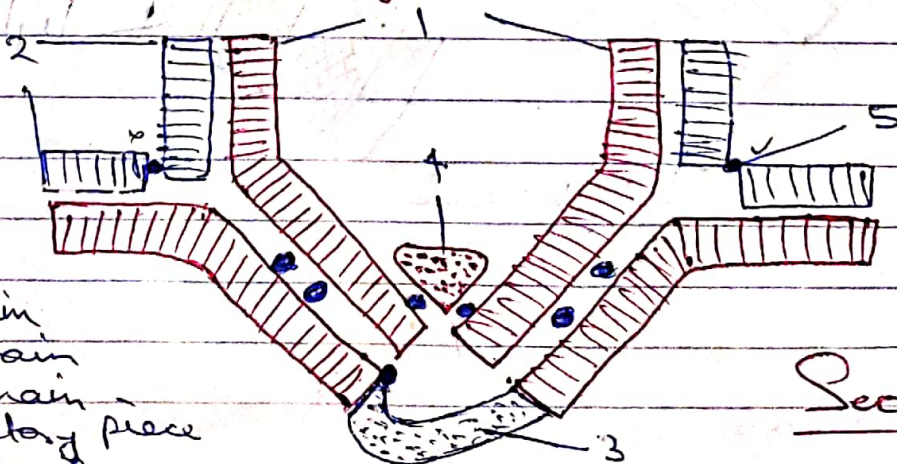
- occurs in 2 forms -

i) Serum IgA → a monomeric 7S mole.

ii) Secretory IgA (SIgA) → Dimer & found in mucosal surface & in secretions. Formed by 2 monomeric units joined by J-chain (J is joining). it has another polypeptide chain called secretory piece or component. it is believed to protect Ig from denaturation by bacterial proteases.

- 2 subclasses are -

IgA1 & IgA2.



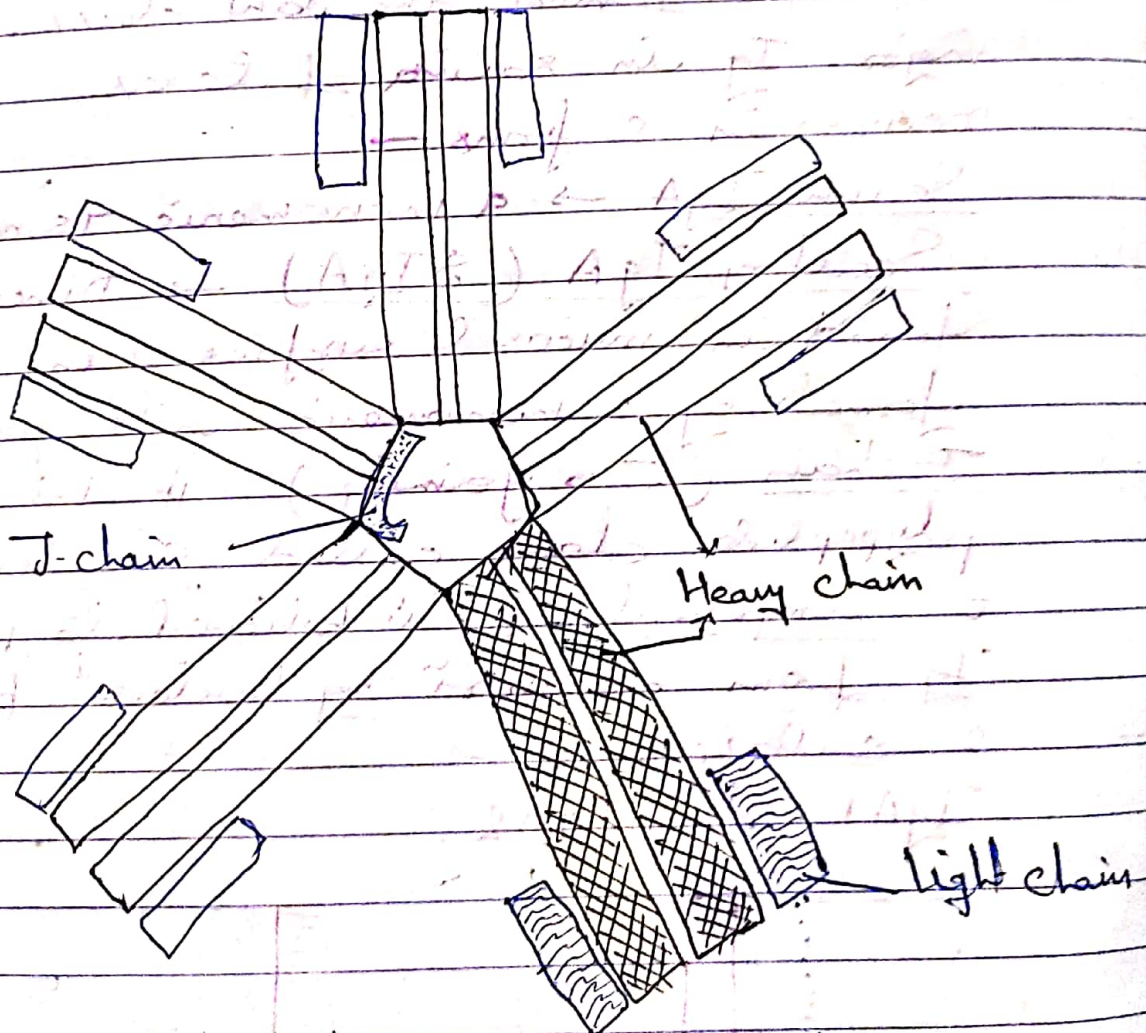
- 1 - H-chain
- 2 - L-chain
- 3 - J-chain
- 4 - secretory piece
- 5 - S-bond

Secretory IgA

- IgM :- constitutes 5-8% of serum Ig.
 IgM moles are polymers of five Y-peptide sub-units, each bearing an extra CH domain. IgM is the oldest Ig class. Earliest Ig to be synthesised by the fetus, beginning by about 20 weeks of age.

IgM are relatively short-lived, hence their demonstration indicates a recent infection.

- A single mole of IgM can bring about immune hemolysis, whereas 1000 mole of IgG required for the same. IgM is 50-1000 times more effective in opsonisation & 100 times more effective in bactericidal action.



IgM molecule

IgD :- Structurally resembles IgG.
IgD & IgM occur on the surface of unstimulated B lymphocytes & serve as recognition receptors for Ag.
IgD₁ & IgD₂, two subclasses are described.

IgE :- It does not pass the placental barrier. It is chiefly produced in the linings of resp. & intes. tract.
It has a wider role in hypersensitivity & in helminthic infections.

<u>IgG</u>	protects	body fluid
<u>IgA</u>		body surfaces
<u>IgM</u>		blood stream
<u>IgE</u>		hypersensitivity.
<u>IgD</u>	not known.	