

# Immunoglobulins & Antibodies:-

- Immunoglobulins are glycoproteins.

Antibodies are <sup>20% of protein in plasma</sup> gamma globulins (Ig) that react to specific antigens that stimulated their production.

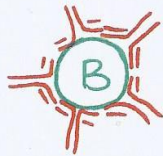
## \* Functions of the Antibodies:-

1- Osonize the Bacteria/Microbes:



to mark it  $\rightsquigarrow$  phagocytosed easily.

2- Neutralize toxins & viruses & 3- Prevent the attachment to mucosal membranes



bind to all the active sites  $\rightsquigarrow$  ineffective.

4- Activate the complement system:



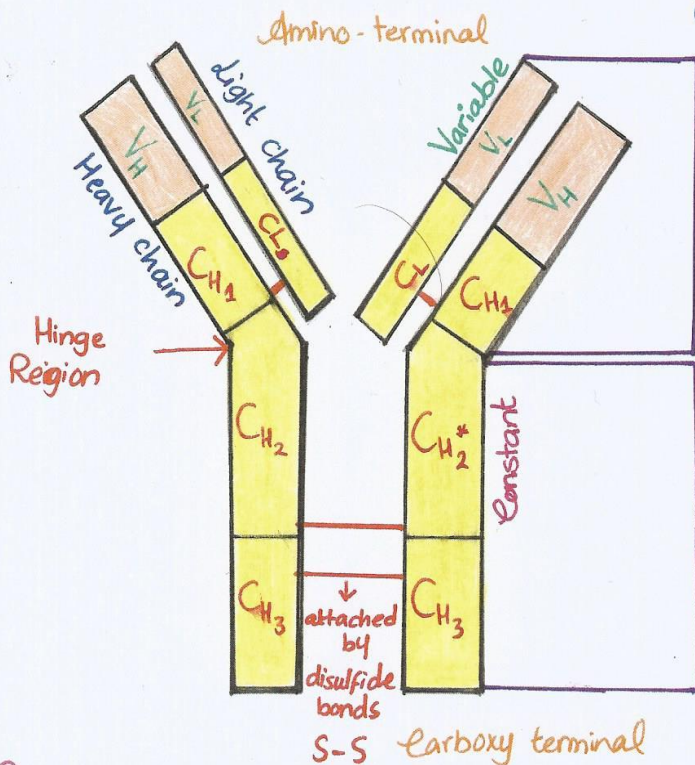
\* Membrane attack complex



to introduce the MAC to the microbe so it can make a pore into its wall & enter it & kill it!

5- Have a catalytic capability:

\* Structure of the Immunoglobulins: simple structure  $\rightarrow$  4 chains  $\left\{ \begin{array}{l} 2 \text{ identical H} \\ 2 \text{ identical L} \end{array} \right.$  (Y)

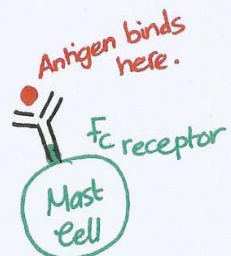


Fab fragment: binds to specific antigen.

\*  $V_H$  is responsible for antigen binding (5-10 AAs)

\*  $C_H$  is for various biological functions

$F_C$ : binds to other biological structures.

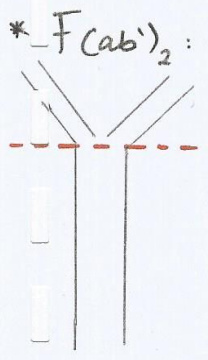


\*  $C_{H_2}$   $\rightarrow$  Complement binding site.

- Antigen- antibody binding is via electrostatic, van der Waals' forces, hydrogen, hydrophobic bonds NOT covalent bonds.

- L chains belong to (only one)  $\begin{cases} \rightarrow \text{K (Kappa)} \\ \rightarrow \lambda \text{ (lambda)} \end{cases}$   $\rightarrow$  based on differences in the AAs in the constant region.

-  $V_H$  is made by VDJ genes  
 $V_L$  is made by VJ genes  $\rightarrow$  to make specific antibodies we choose specific genes from each region to do that.



treated with proteolytic enzyme (e.g papain) it will cleave the hinge region  $\rightarrow$  2 Fab regions which are inactive/ineffective due to the missing  $F_c$  fragment.

\* Immunoglobulin Classes:

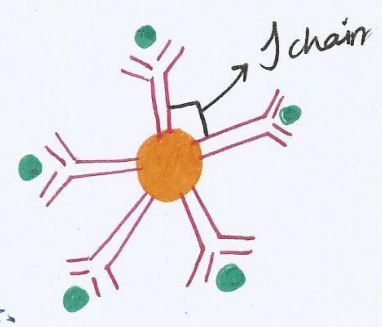
1. IgG:

- main globulin in the blood
- most abundant in newborns  $\rightarrow$  as  $F_c$  works on placental cells.
- delayed response (secondary). (chronic infections 3-4 weeks)
- Does ALL functions.

From sugar attached to  $C_{H2}$   $\rightarrow$  Proinflammatory effect  $\rightarrow$  NAG bind to mannose-binding ligand  $\rightarrow$  activate complement.  
 $\rightarrow$  Anti-inflammatory effect  
 $\rightarrow$  sialic acid chain  $\rightarrow$  won't bind  $\rightarrow$  anti.inflam.

2. IgM:

- Acute infection (Primary/ immediate response)
- Pentamer & found on B cells
- Can be produced by fetus
- most efficient in agglutination, activation of complement.

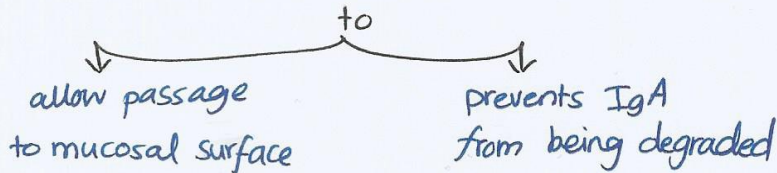
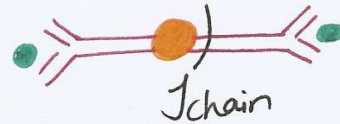




- If we take a patient's blood sample & we saw that h&she has IgG #3  
then this means that the patient had this organism for a period of time.

### 3 IgA:

- main globulin for secretions.
- prevents attachment of microbes to mucous membranes
- structure dimeric
- it also has a secretory component



### 4 IgD:

- found on B cells.

### 5 IgE:

→ Helminthes: sends signals to eosinophils to attach to helminthes & release contents to kill them.

→ Mast cells & Basophils:



# Immunoglobulin Classes

#4

Category	IgG	IgM	IgA	IgD	IgE
Structure	Monomer	Pentamer	Dimer	Monomer	Monomer
special features	- most abundant in blood of newborns - delayed response	- Acute response	- <del>in</del> secretions	-	
found in B cells	-	+	-	+	-
functions	- fixation of complement - opsonize - neutralize	- fixation of complement - agglutination	- prevents attachments of microbes to mucosal cells.	Unknown function :-)	- against helminths - mediates hypersensitivity
fixation of comple.	+	+	-	-	-
found in Fetus	yes, transplacental as the $F_c$ work on the placenta cells.	made by fetus in some infections	-	-	-
J chain	-	+	+	-	-
Heavy chain symbol	$\gamma$	$\mu$	$\alpha$	$\delta$	$\epsilon$

