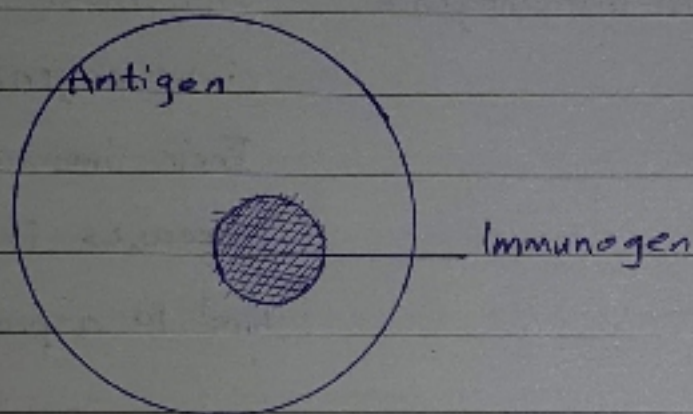


# Antigen Recognition, Antibody Structure #3 7/7/2020

- Antigen: all foreign, non-self molecules
- Immunogen: any agent capable of inducing an immune response



Not all antigens can illicit an immune response. Hence the difference.

- $> 6$  kilodalton = an effective immunogen.
- Hapten: non-immunogen normally  
immunogen when it binds to a protein / carrier  
example: Penicillin binds with a protein in some people's bodies, forming a hapten-carrier complex = immunogenic
- Epitope: part of an antigen. An antigen can have more than one epitope. Binds to receptors on self cells / non-self bodies.

Ⓐ Linear: in a single line / curve

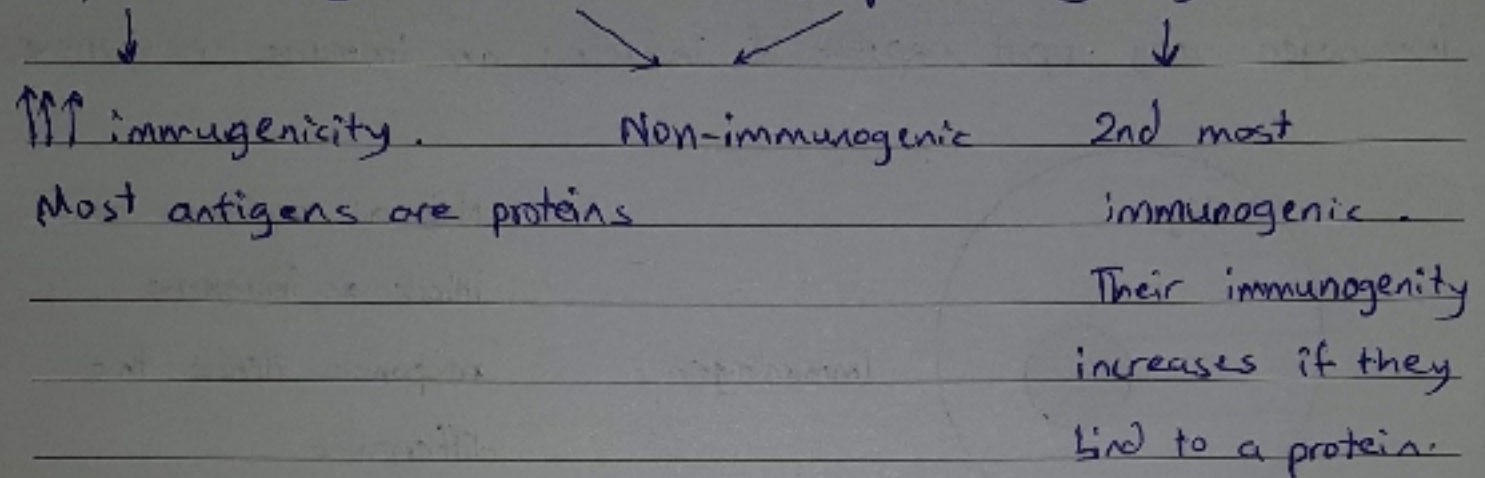
Ⓑ Discontinuous: can involve twists "المنعرج"

- foreignness  $\uparrow$ , immunogenicity  $\uparrow$
- molecular weight  $\uparrow$ , immunogenicity  $\uparrow$  due to an increase in number of epitopes
- complexity  $\uparrow$ , immunogenicity  $\uparrow$ . Example: Protein structures



4 biological molecules:

① protein    ② nucleic acids    ③ lipids    ④ sugars



• Auto-immune diseases:

Self protein changes to non-self, forming an immunogen.

• Antibody: A glycoprotein (sugar + protein)  
Produced by B lymphocytes

5 types of antibodies:

① IgG: virus attachment. 150 kilodalton, longest half life.

② IgA: ↓ in serum ↑ in secretions (tears, milk, guts)

③ IgM: 900 kilodalton. Primary response. Complement system activation, opsonization

④ IgD: 180 kilodalton. Receptor on B lymphocyte. low half life  
healthy

⑤ IgE: not present in serum because it is released in small amounts in cases of allergies, inflammation, parasitic infection. Eosinophils, mast cells contain IgE receptors.

They differ in size, function.

B cell myeloma electrophoresis: (checks the amount of  $\gamma$  in blood)

Patient A:  $\gamma$  is heterogeneous. A group of antibodies, each responds to a different antigen. They have different shapes, binding sites but the same size. This is normal ~~and healthy~~. RUT!!!  
The amount of  $\gamma$  globulin is more (than B).  
This means there is inflammation / infection going on

Patient B: Heterogeneous and limited amount. Normal, healthy. Infection free

Patient C: 1 band of  $\gamma$  globulin. Has B cell malignancy.  
One B cell releases one antibody. X heterogeneous.  
X Antibody production. Only produces one kind of antibody.

Basic Antibody Structure:

- 2 heavy chains, identical (pink), 50 kilodalton each
- 2 light chains, identical (green), 25 kilodalton each  
= 150 kilodalton

Heavy + light attach to disulfide bond

Heavy + Heavy attach to disulfide bond



V : variable domain = antigen binding sites. So 2.  
1 antibody binds 2 antigens. Same antigens. Not!  
Different! 2 identical antigens. ★

VH : variable heavy , VL : variable light  
Called variable as it varies from antibody to antibody

C : constant domain = does not change between antibodies  
1C in light . 3C in heavy.

Hinge region: grants antibody flexibility  
cysteine, proline as they grant most flexibility  
allows antibody to rotate

Above hinge region: FAB region (fragment antigen binding)  
Under hinge region: FC region (fragment of crystallization),  
allows us to isolate + crystallize  
the antibody .

Carbohydrate residues : (Red) Protect antibodies from  
degradation by covering a specific  
region where the enzymes attach  
to degrade the antibody