



Immunology team - 437

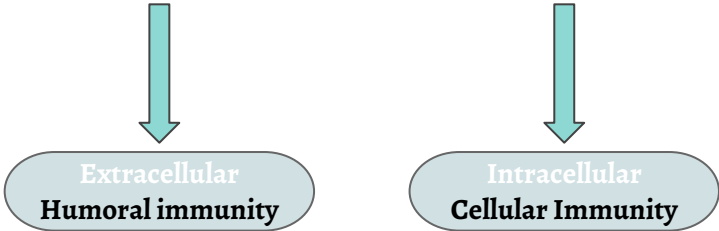
4- Antibody-Mediated Immunity

Objectives :

- 1- To describe B cells as the mediators of humoral immunity, (antibody-mediated immunity).
- 2- To describe activation of B cells which involve :
 - Antigen recognition. - T-dependent & T-independent antigens. - Requirement for T-helper cells.
- 3- To explain clonal selection, clonal expansion & generation of plasma cells & memory cells.
- 4- To describe primary & secondary immune responses.
- 5- To describe the structure & function of immunoglobulins. .

Humoral Immune Response

Types of Response:
Determined by the Nature of Antigen

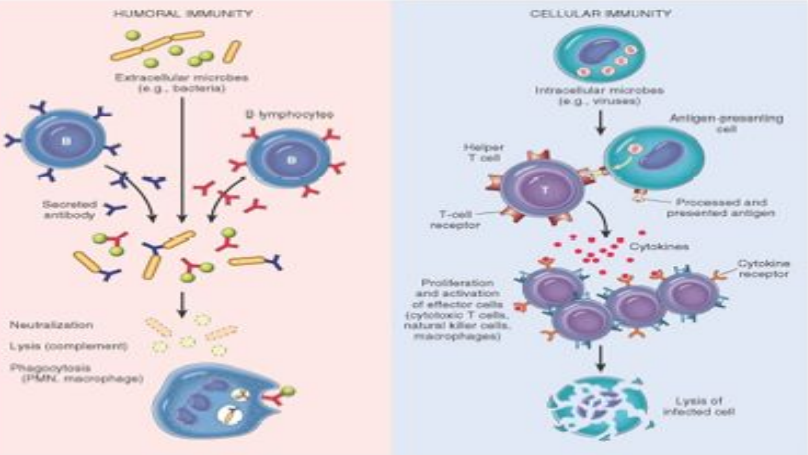


Definition:
It is the aspect (part) of Immunity that is mediated by **Secreted ANTIBODIES**

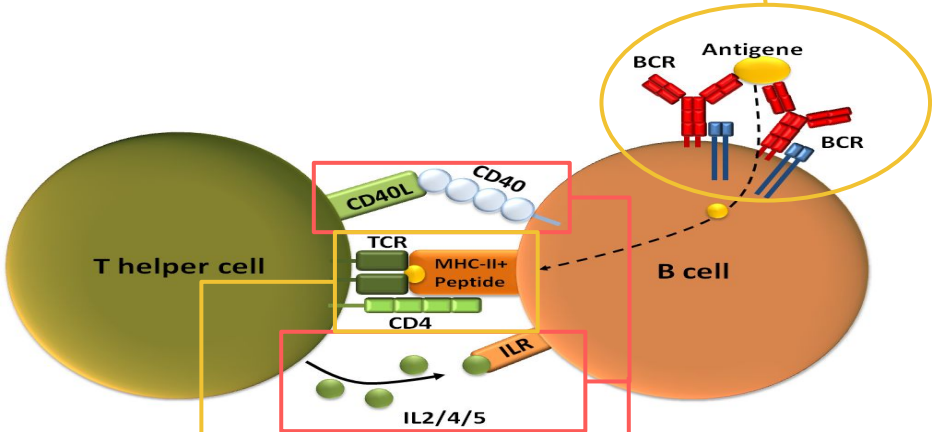
Why it's called humoral?
Because it involves substances found in the **Humours** or Body Fluids.

Activation of B-Cells by Antigens

T-dependent Antigen	T-independent Antigens
<p>Antibody production by B-Cell require T-Helper cells.</p> <p>1-Antigen Presenting Cells (Monocyte-Macrophage-Dendritic cell-B lymphocyte) <u>recognize</u> antigen and <u>present</u> it to T-helper cells.</p> <p>2-T-helper cells stimulate B-cells <u>specific</u> for that Antigen to become Plasma Cells</p> <p>T-dependent antigens are mainly PROTEINS</p>	<p>B-cells do not require T-helper cells to produce antibody.</p> <p>Immune responses induce the production of IgM of <u>low affinity</u> for the antigen and <u>no immunologic memory</u>.</p> <p>T-independent Antigens are mainly POLYSACCHARIDES or LIPOPOLYSACCHARIDES with repeating subunits (bacterial capsules).</p>



The Antigen is recognized by the B-cells via B-Cell Receptor (BCR) "Immunoglobulin"

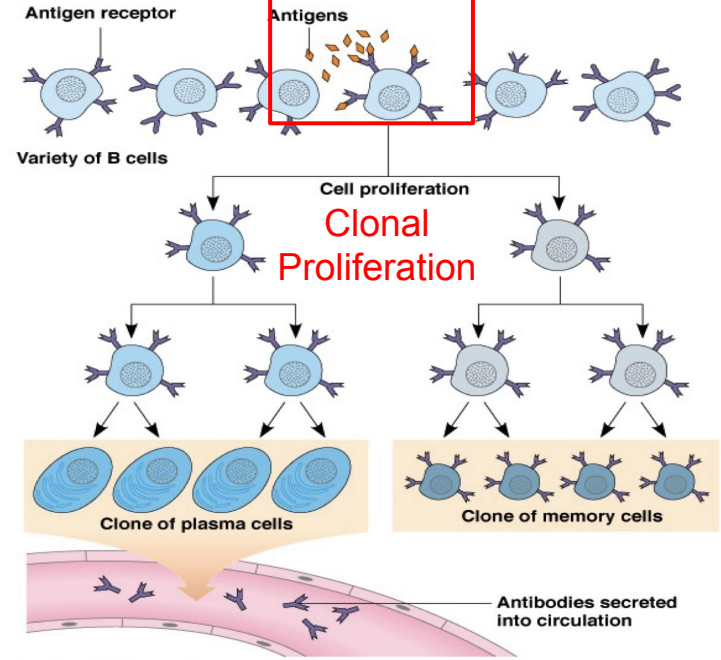


B-cell present the antigen (after processing) to the T-helper with the help of MHC/HLA and CD4 (tighten the interaction "present on T-cell")

After Activation of T-helper:
 Many molecules will be expressed
 1- CD25 "part of IL Receptor" T-cell will produce IL2.
 2- CD40L - binds with CD40 on B-cells.

Clonal Selection

The antigen picks a specific B-cell to proliferate



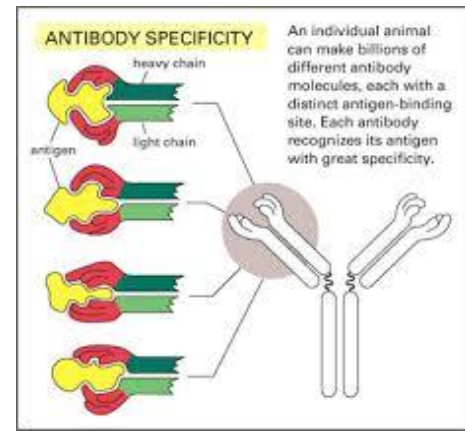
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Differentiation: also occur on B-Cells just like T-cells
 1- Plasma Cells. 2- Memory Cells (only in T-dependent)

Antibodies

- 1- Antibodies are immunoglobulins with specific functions.
- 2- Antibodies bind to specific sites on antigen surfaces called (**epitopes**) and perform protective functions by different mechanisms.

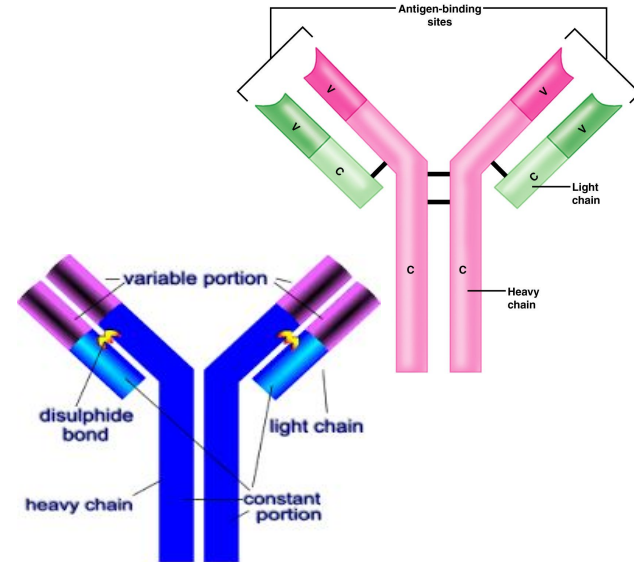
There is **SPECIFIC** antibody for any one given type of antigen.



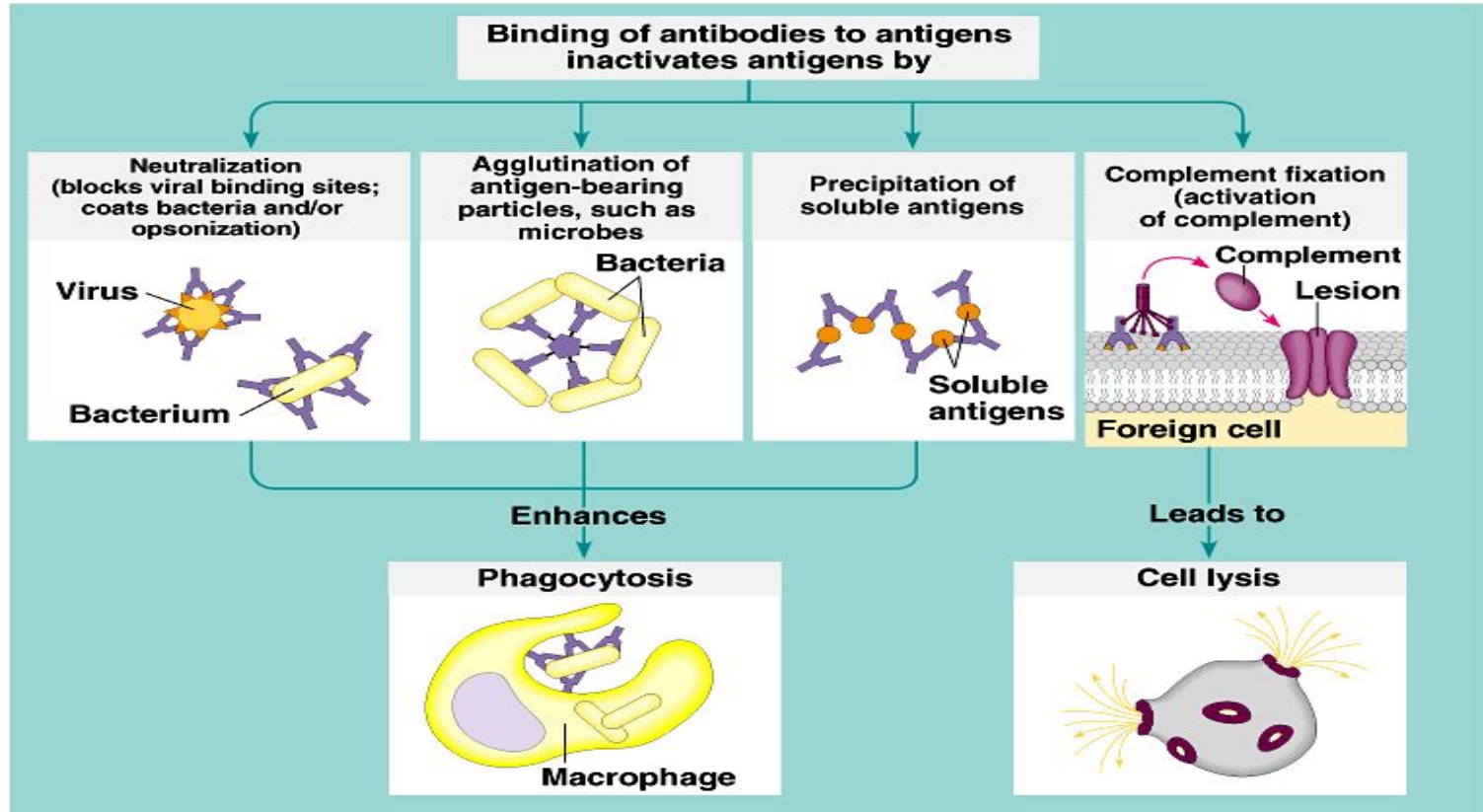
Antibody structure and functions

1. Made up of **four polypeptides chains**
2. Mwo longer and larger (**heavy chains**) and the other two shorter and smaller(**light chains**)
3. Has the shape of the letter “y”

Variable region has the potential to bind with particular classes of antigens. Once a raw antibody is stimulated to fit to a specific antigen, it can then react with **ONLY that antigen** This is known as **SINGLE SPECIFICITY**
Can fit as precisely as a lock---and---key to an antigen.



Protective functions Of antibodies



Electron micrographs of the effect of antibodies and complement upon bacteria




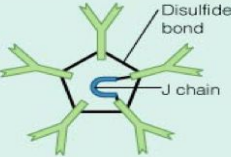
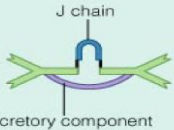


Healthy E. coli



Antibody + complement-mediated damage to E. coli



A Summary of Immunoglobulin Classes

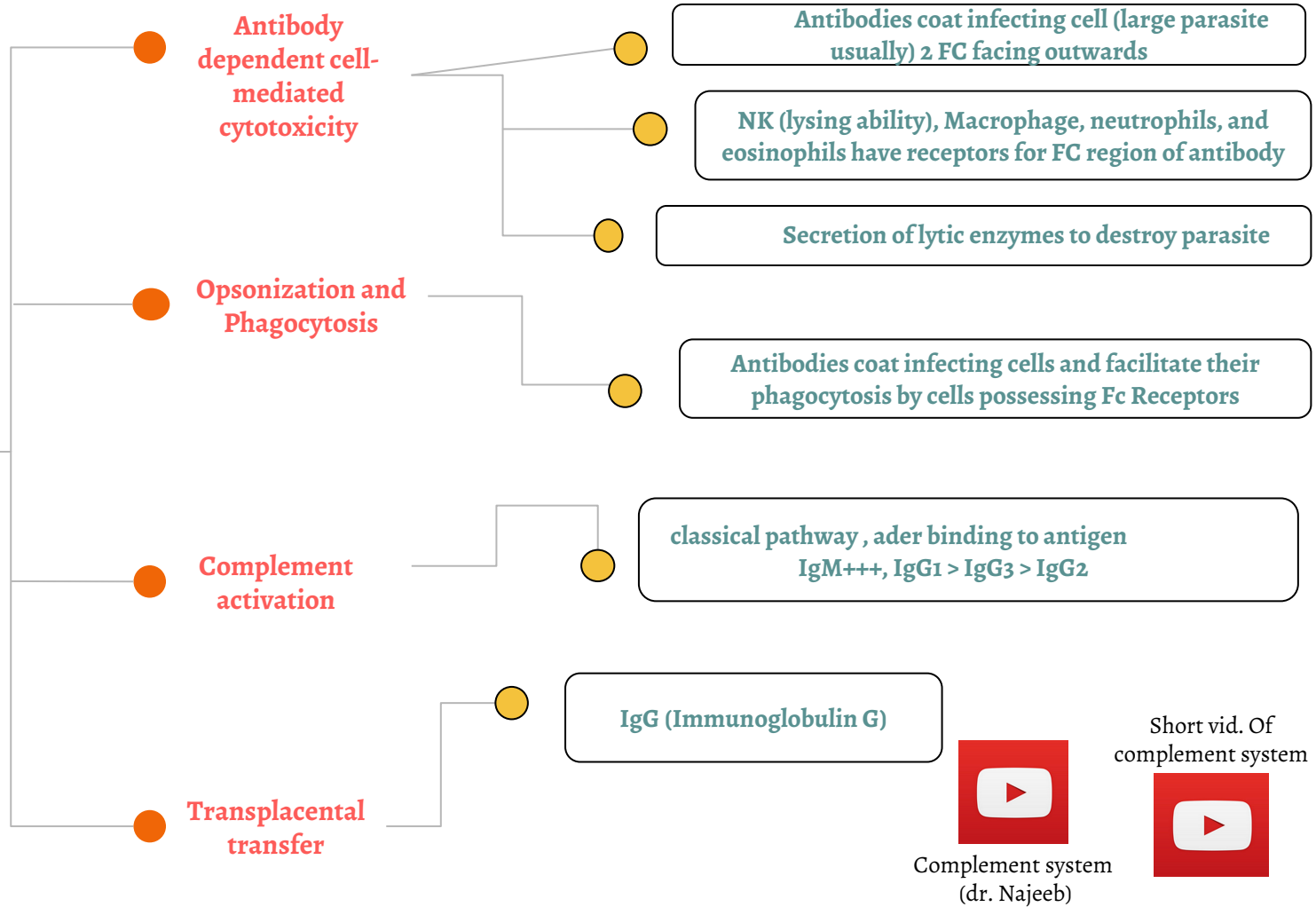
Characteristics	IgG	IgM	IgA	IgD	IgE
					
Structure	Monomer	Pentamer	Dimer (with secretory component)	Monomer	Monomer
Percentage of total serum antibody	80%	5–10%	10–15%*	0.2%	0.002%
Location	Blood, lymph, intestine	Blood, lymph, B cell surface (as monomer)	Secretions (tears, saliva, mucus, intestine, milk), blood, lymph	B cell surface, blood, lymph	Bound to mast and basophil cells throughout body, blood
Molecular weight	150,000	970,000	405,000	175,000	190,000
Half-life in serum	23 days	5 days	6 days	3 days	2 days
Complement fixation	Yes	Yes	No [†]	No	No
Placental transfer	Yes	No	No	No	No
Known functions	Enhances phagocytosis; neutralizes toxins and viruses; protects fetus and newborn	Especially effective against microorganisms and agglutinating antigens; first antibodies produced in response to initial infection	Localized protection on mucosal surfaces	Serum function not known; presence on B cells functions in initiation of immune response	Allergic reactions; possibly lysis of parasitic worms

*Percentage in serum only; if mucous membranes and body secretions are included, percentage is much higher.

[†] May be yes via alternate pathway.

Important !!
you should know everything in, not just the red !

Functions of Antibodies



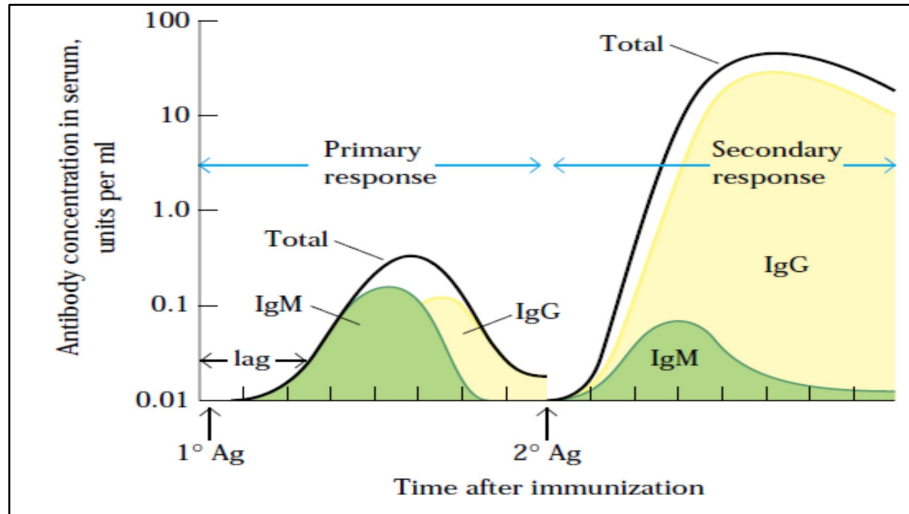
Complement system (dr. Najeeb)



Short vid. Of complement system

Primary & Secondary immune responses

- ❖ Initial encounter with antigen produce primary immune response
- ❖ Subsequent challenge with same antigen produces secondary immune response

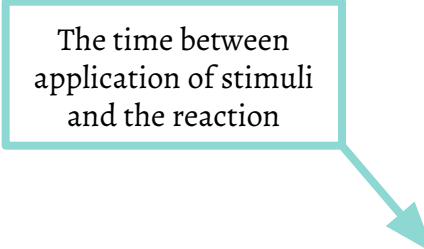


Concentration and type of antibody in primary & secondary immune response



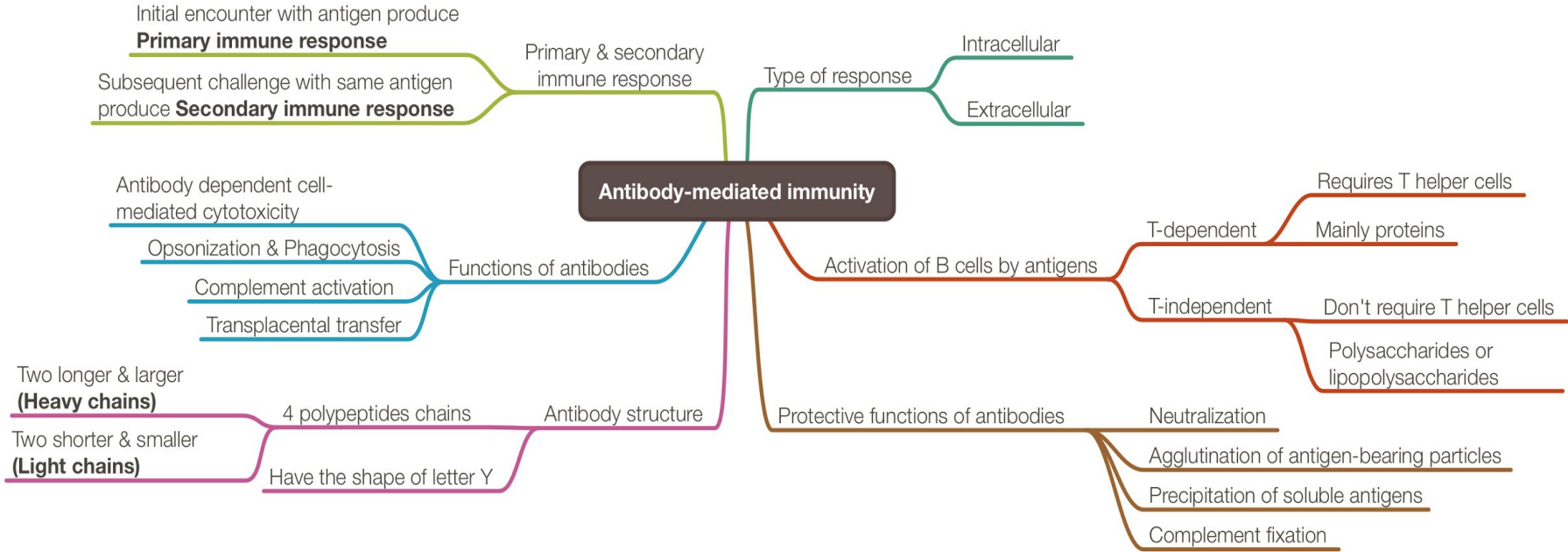
Comparison between primary and secondary responses

The time between application of stimuli and the reaction



Property	Primary response	Secondary response
Responding B cell	Naive (virgin) B cell	Memory B cell
Lag period following antigen administration	Generally 4-7 days	Generally 1-3 days
Time of peak response	7-10 days	3-5 days
Magnitude of peak antibody response	Varies depending on antigen	Generally 100-1000 times higher than primary response
Isotype produced	IgM predominates early in the response	IgG predominates

Antibody-mediated immunity



MCQ

1-it is the aspect of immunity that is mediated by secreted antibodies

- A- Humoral Immunity
- B- cell mediated immunity
- C-A&B
- D-neither A or B

2-Antibody production by B-cells require T-helper cells is

- A- T-independant
- B- T-dependant
- C-A&B
- D-neither A or B

3-recognize antigen & present it to T-helper cells

- A- proteins
- B- antibody
- C- Antigen presenting cells
- D- cytotoxic

4-Antibodies bind to specific sites on antigen surfaces called

- A- receptor
- B- epitopes
- C- protein
- D-antigen

5-There is a SPECIFIC antibody for any one given type of an antigen

- A- false
- B- true

6- it is consist of two heavy chains and two light chains

- A- protein
- B- antigen
- C- antibody
- D- T cells

Team members :

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