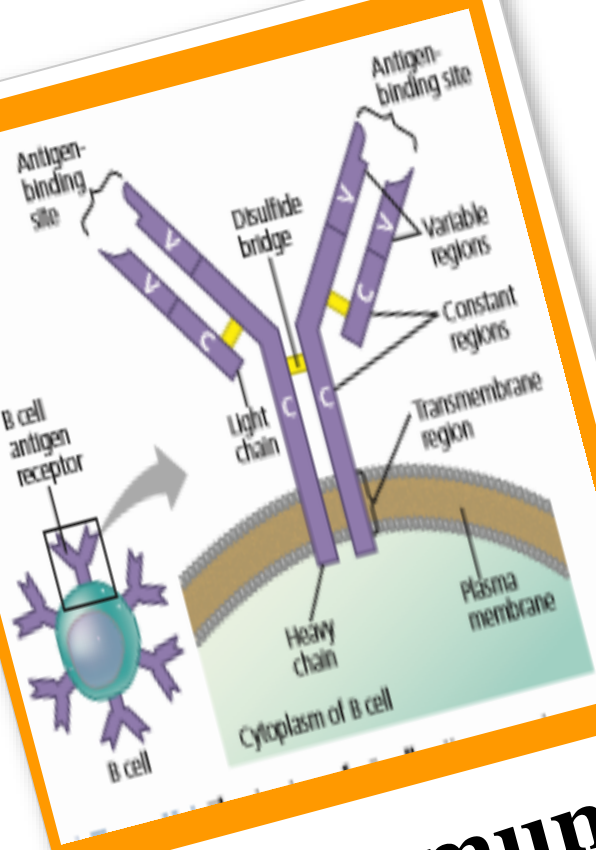
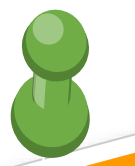




CHAPTER 11 IMMUNITY

IMMUNITY





11.1 Immune Response



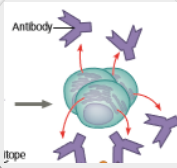
11.2 Development of Immunity



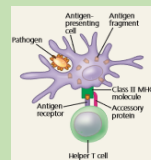
LEARNING OUTCOME

11.1 IMMUNE RESPONSE

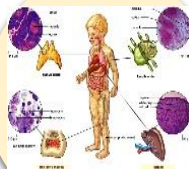
b. Describe the general structure of antibodies and state the classes based on its structure.



a. Define immunity and state the types of immunity.



c. State the roles of lymphoid organs in immunity: thymus, spleen, tonsil, lymph nodes, bone marrow.



d. Explain various types of antigen and antibody interaction: neutralization, opsonization, activation of complement system and pore formation.



IMMUNITY

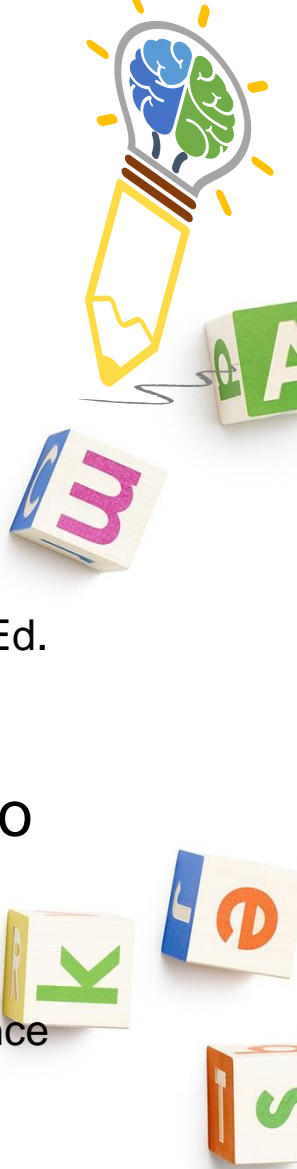
Definition:

The ability to recognize and destroy foreign or dangerous macromolecules

Solomon 10th Ed.

The capacity to recognize the intrusion of material foreign to the body, to mobilize cells and cell products to help remove that particular sort of foreign material with greater speed & effectiveness

Biological Science





TYPES OF IMMUNITY

Pathogens (such as bacteria, fungi, and viruses)

INNATE IMMUNITY

(all animals)

- Recognition of traits shared by broad ranges of pathogens, using a small set of receptors
- Rapid response

Barrier defences:

- Skin
- Mucous membranes
- Secretions

Internal defenses:

- Phagocytic cells
- Natural killer cells
- Antimicrobial proteins
- Inflammatory response

ADAPTIVE IMMUNITY

(vertebrates only)

- Recognition of traits specific to particular pathogens, using a vast array of receptors
- Slower response

Humoral response:

Antibodies defend against infection in body fluids.

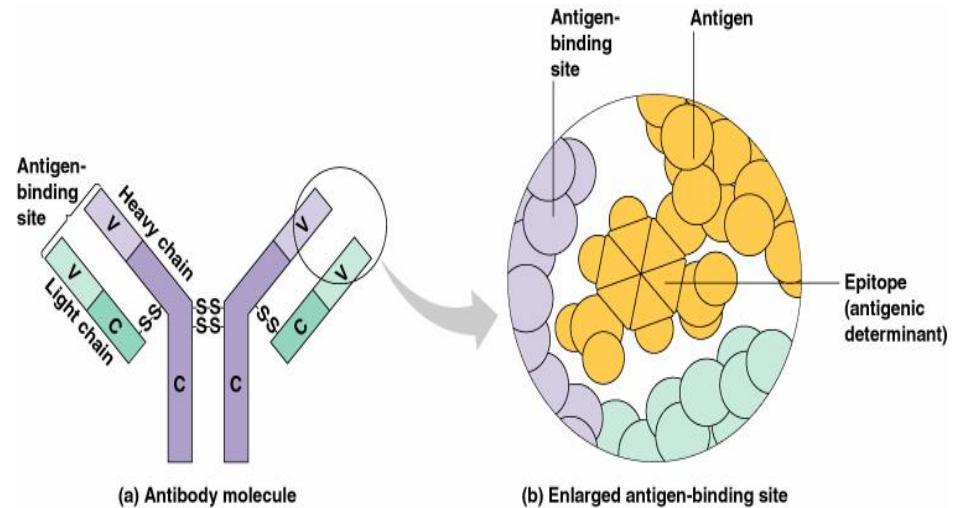
Cell-mediated response:

Cytotoxic cells defend against infection in body cells



ANTIBODY

A specific protein (immunoglobulin) that recognizes and binds to specific antigen which produced by plasma cells.



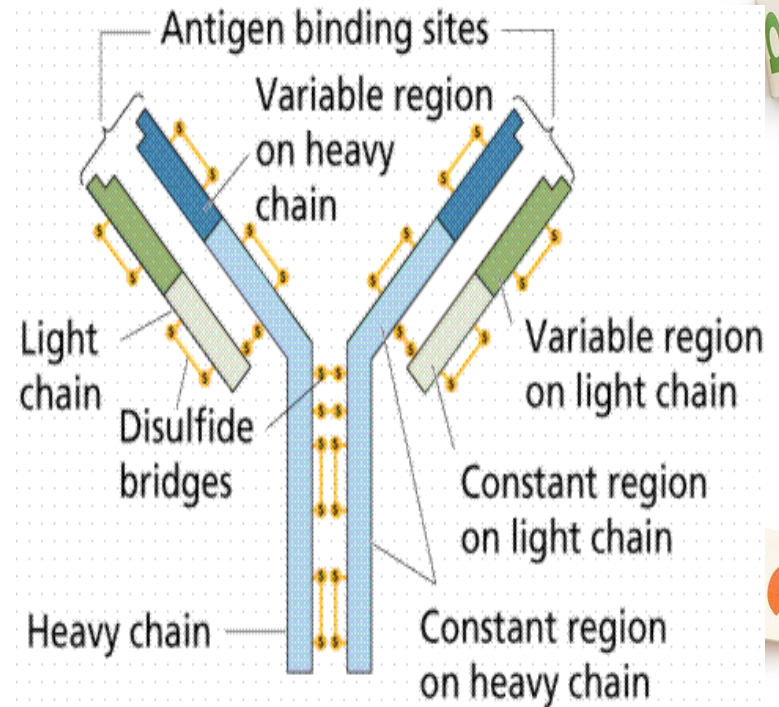
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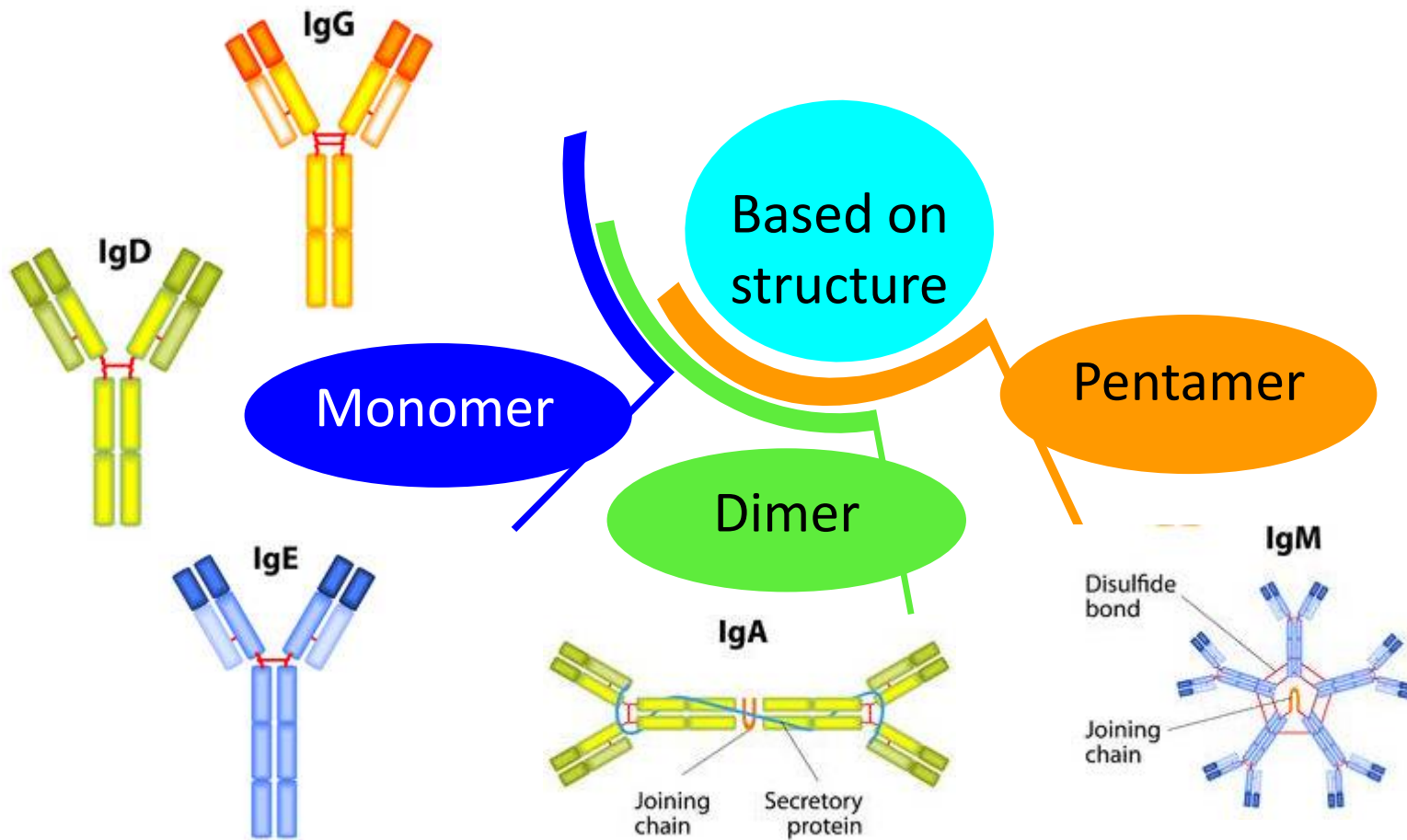
STRUCTURE OF ANTIBODY

- Y shaped
- 4 polypeptide chains:
 - ✓ 2 identical light chains
 - ✓ 2 identical heavy chains
- Linked by disulfide bridge
- Each chain contains:
 - ✓ variable segments (V)
 - ✓ constant segments (C)










CLASSES OF ANTIBODY





CLASSES OF ANTIBODY

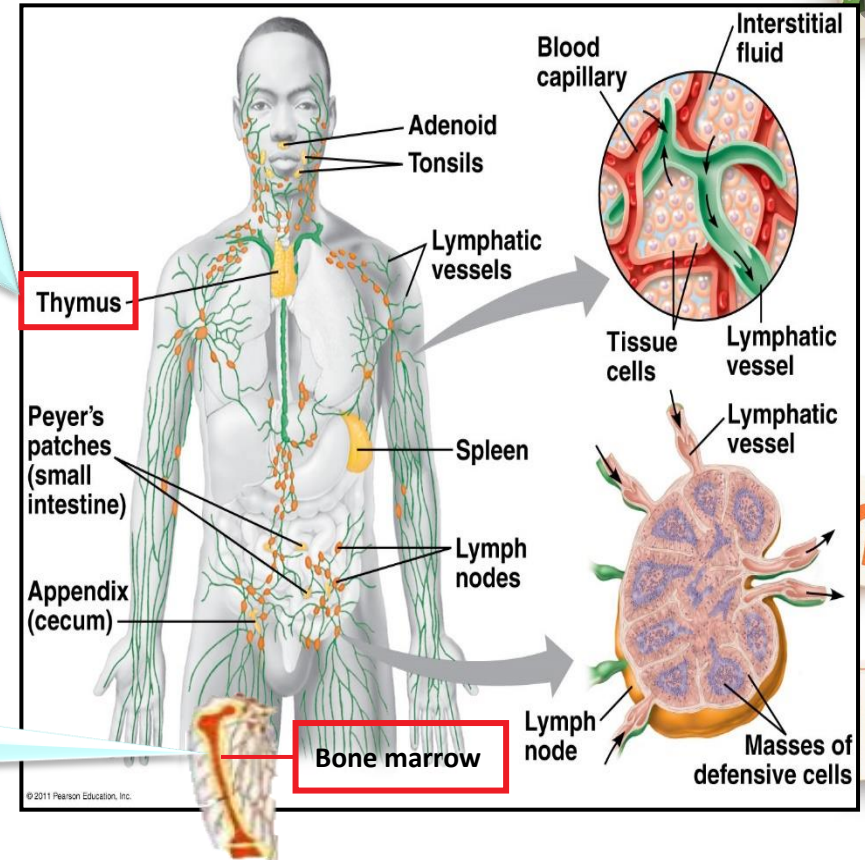
The Five Immunoglobulin (Ig) Classes					
Properties	IgG monomer	IgM pentamer	Secretory IgA dimer	IgD monomer	IgE monomer
Structure					
Heavy chains	γ	μ	α	δ	ϵ
Number of antigen-binding sites	2	10	4	2	2
Molecular weight (Daltons)	150,000	900,000	385,000	180,000	200,000
Percentage of total antibody in 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.



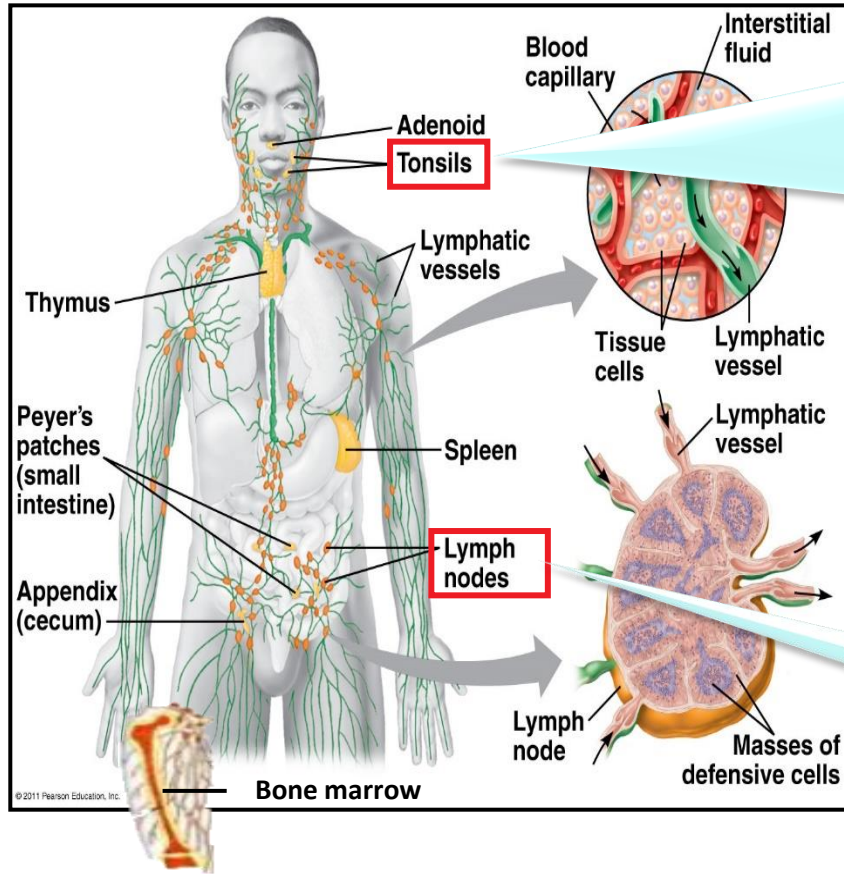
ROLES OF LYMPHOID ORGANS

1. Gland that produces several hormones that are important in developing & maintaining immune defenses (e.g.: thymosin)
2. Site where the **lymphocyte cells mature**

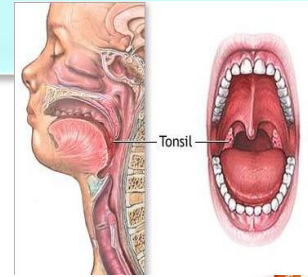
Site of origin of all types of blood cells



ROLES OF LYMPHOID ORGANS

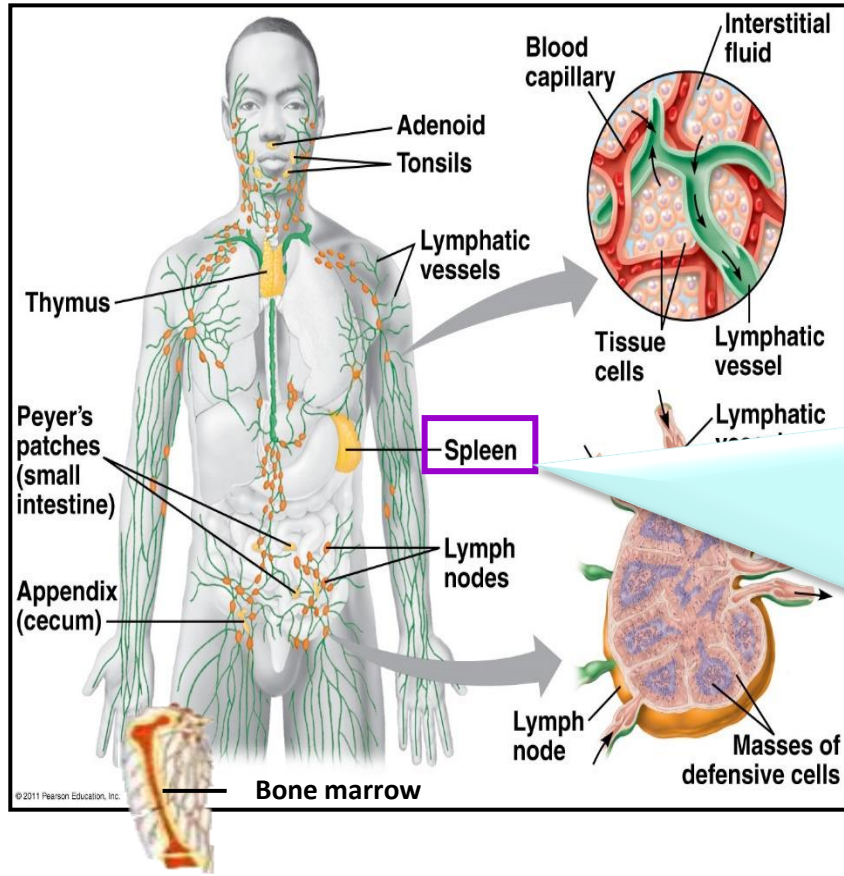


1. Trap bacteria and viruses which were breathe in
2. Antibodies and immune cells kills the pathogen
3. Prevents infections in the lung and throat

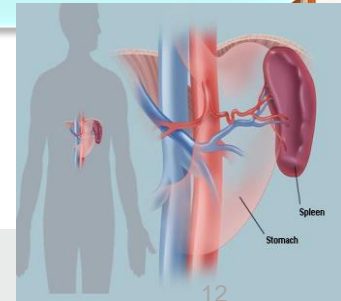


Filter and purifies lymph before it reach the veins

ROLES OF LYMPHOID ORGANS



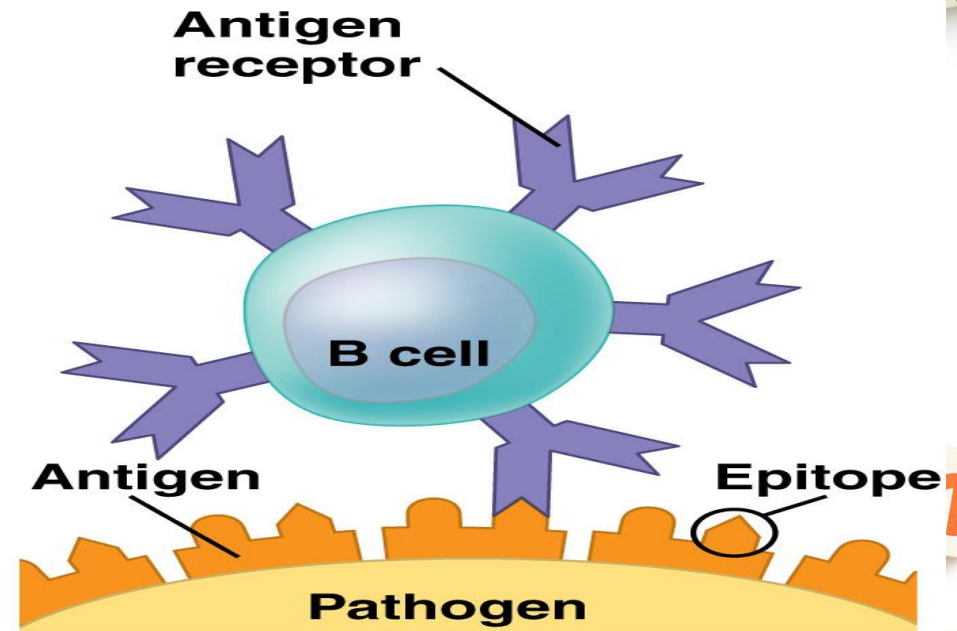
1. Remove abnormal blood cells & other components by phagocytosis
2. Store iron recycled from erythrocytes
3. Initiate immune responses by B cells and T cells in response to antigens in circulating blood





ANTIGEN

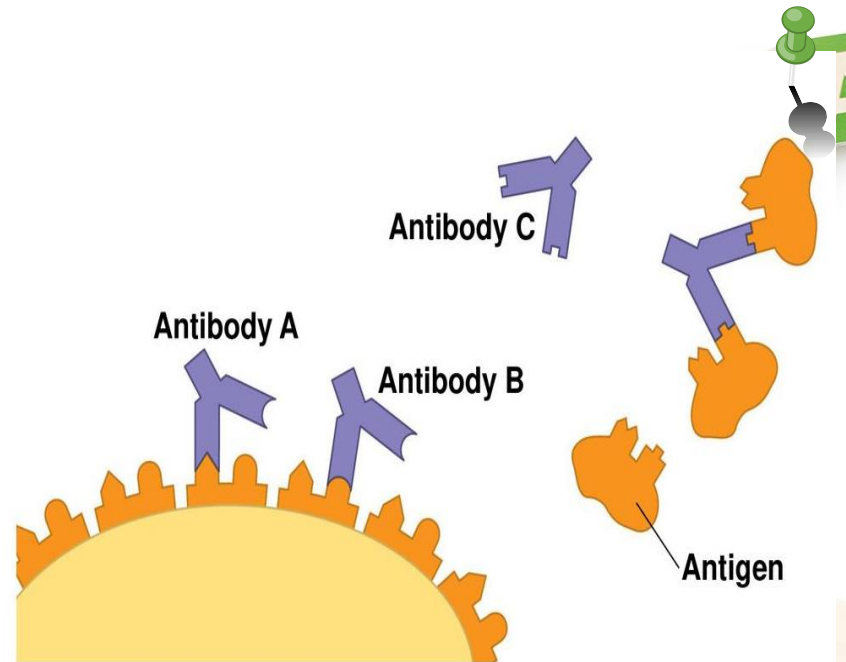
- Any **foreign molecule** that elicits an immune response by binding to receptors of B cells or T cells.
- Usually protein, glycoprotein or polysaccharide





ANTIGEN

- An antigen may have several different epitopes
 - ✓ Each epitope is recognized by a different antibody
 - ✓ Different antibodies can recognize distinct epitopes on the same antigen



Antigen receptor specificity

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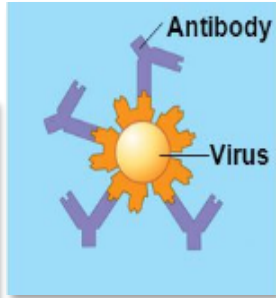
ANTIGEN ANTIBODY INTERACTIONS



01

NEUTRALIZATION

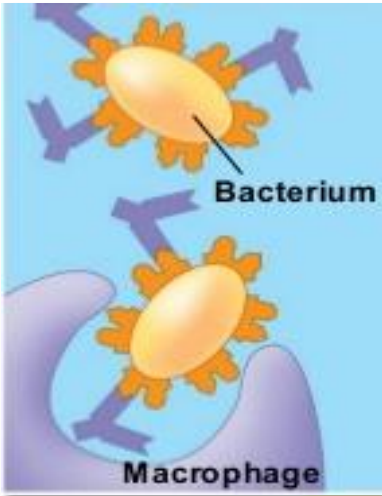
→ Antibodies bound to antigens on the surface of a virus neutralize it by blocking its ability to bind to a host cell



02

OPSONIZATION

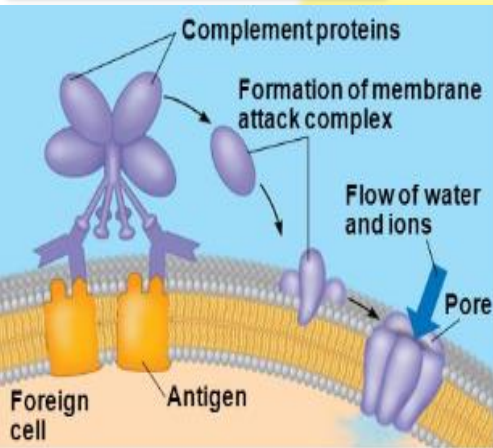
→ Binding of antibodies to antigens on the surface of bacteria promotes phagocytosis by macrophages and neutrophils.



03

ACTIVATION OF COMPLEMENT SYSTEM AND PORE FORMATION

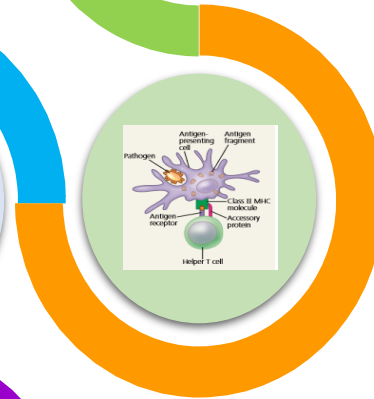
→ Binding of antibodies to antigens on the surface of a foreign cell activates the complement system. Followed by, the membrane attack complex forms pores in the foreign cell's membrane, allowing water and ions to rush in. The cell swells and eventually lyses.



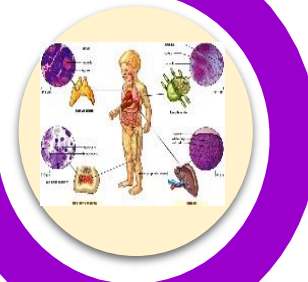
LEARNING OUTCOME

11.2 DEVELOPMENT OF IMMUNITY

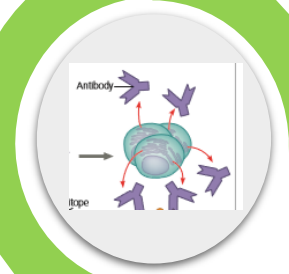
b. Explain humoral and cell mediated immune response against infection.



c. Explain the primary and secondary immune response.



a. State the two types of immune response.





TYPES OF IMMUNE RESPONSE

IMMUNE RESPONSE

Humoral Immune Response

The branch of adaptive immunity that involves the activation of B cells and that leads to the production of antibodies, which defend against bacteria and viruses in body fluids.

Cell Mediated Immune Response

The branch of adaptive immunity that involves the activation of cytotoxic T cells, which defend against infected cells.

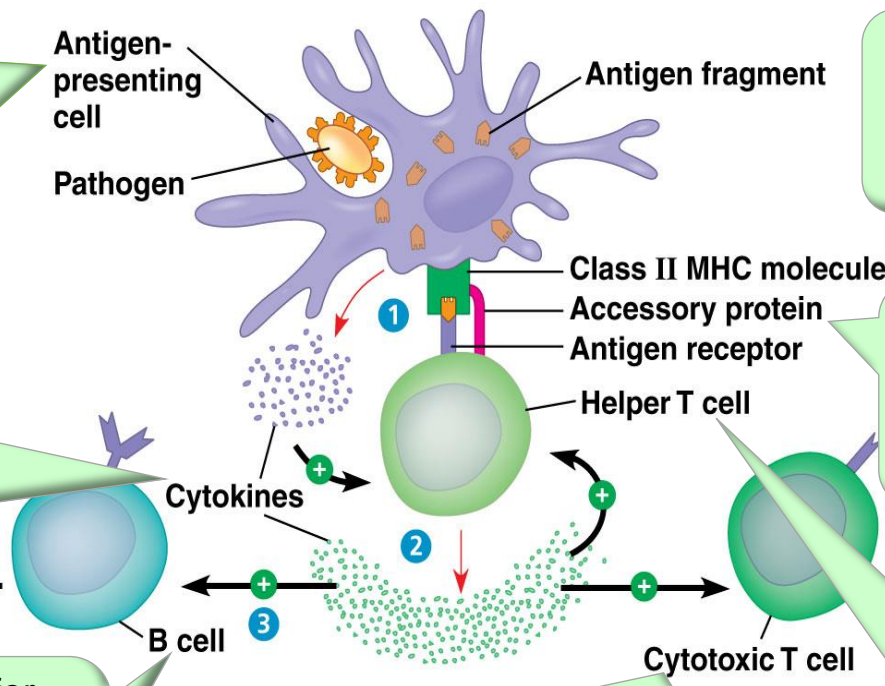


HUMORAL AND CELL MEDIATED IMMUNE RESPONSE

A cell that displays foreign antigens as well as its own surface proteins. (Dendritic cell, macrophages, B cells)

Signalling proteins that regulate interaction between cells in the immune system [eg: Interleukin (IL-1, IL-2)]

Type of WBC responsible for antibody-mediated immunity. When stimulated, B cells differentiate to become plasma cells that produce antibody



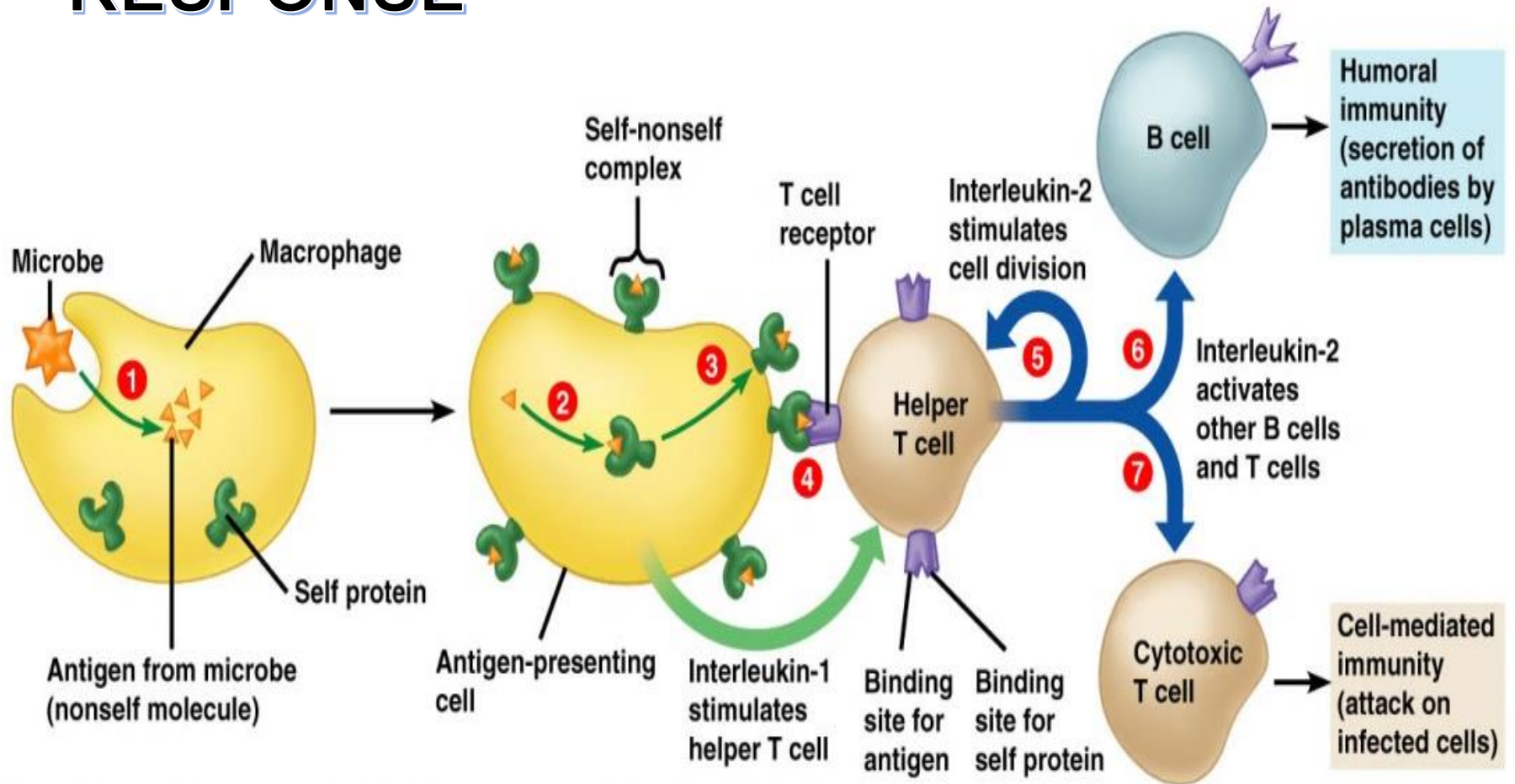
Major histocompatibility complex:
A host protein that functions in antigen presentation.

Antigen that associated with T cell
CD4 -> express by T_H
CD8 -> express by T_C & T_S

T cells that recognize and destroy cells infected with viruses or other intracellular pathogen.

T cell that activate B cells and stimulate Tc cell production

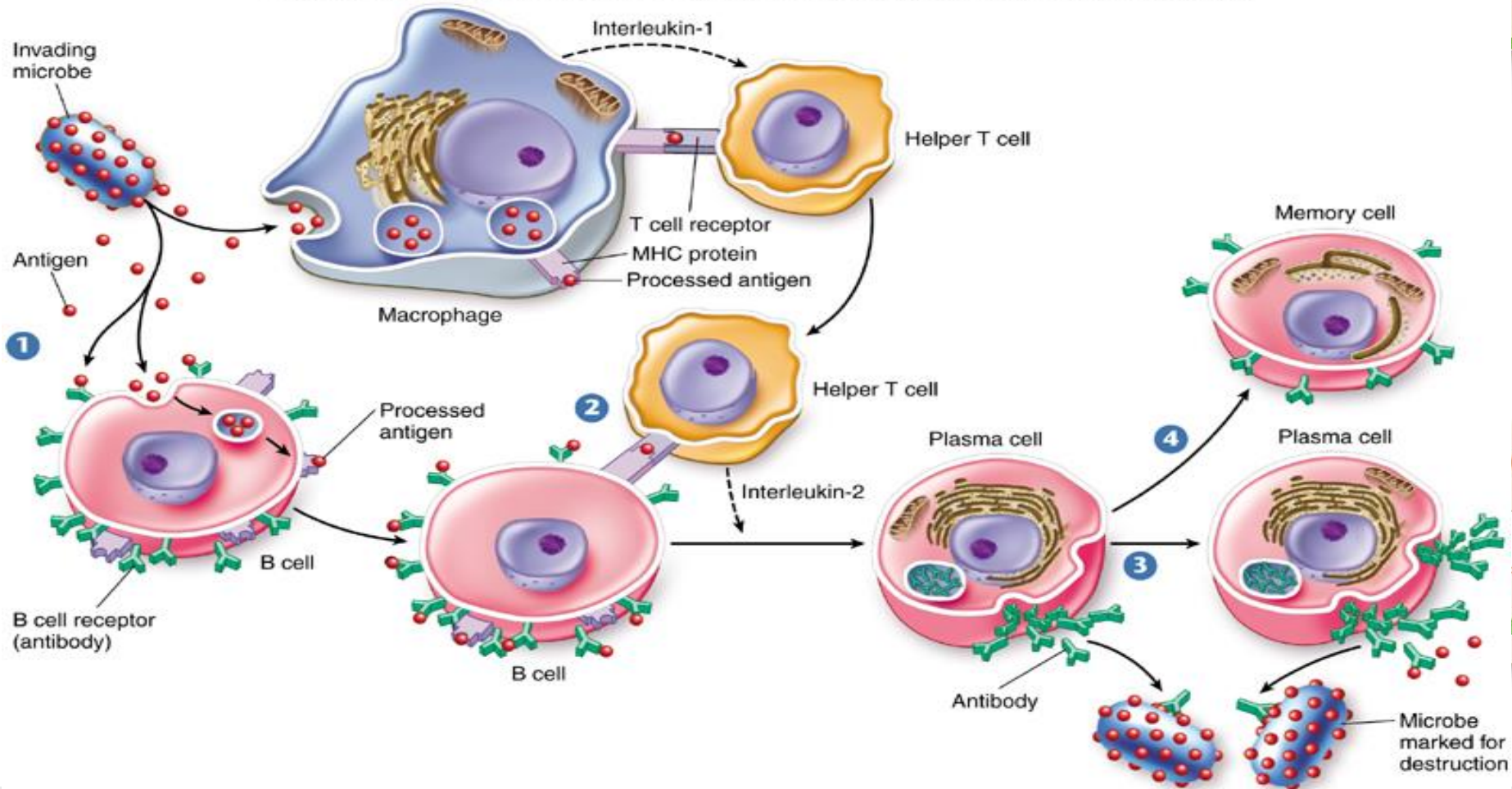
HELPER T CELLS STIMULATE HUMORAL AND CELL MEDIATED IMMUNE RESPONSE





HUMORAL IMMUNE RESPONSE

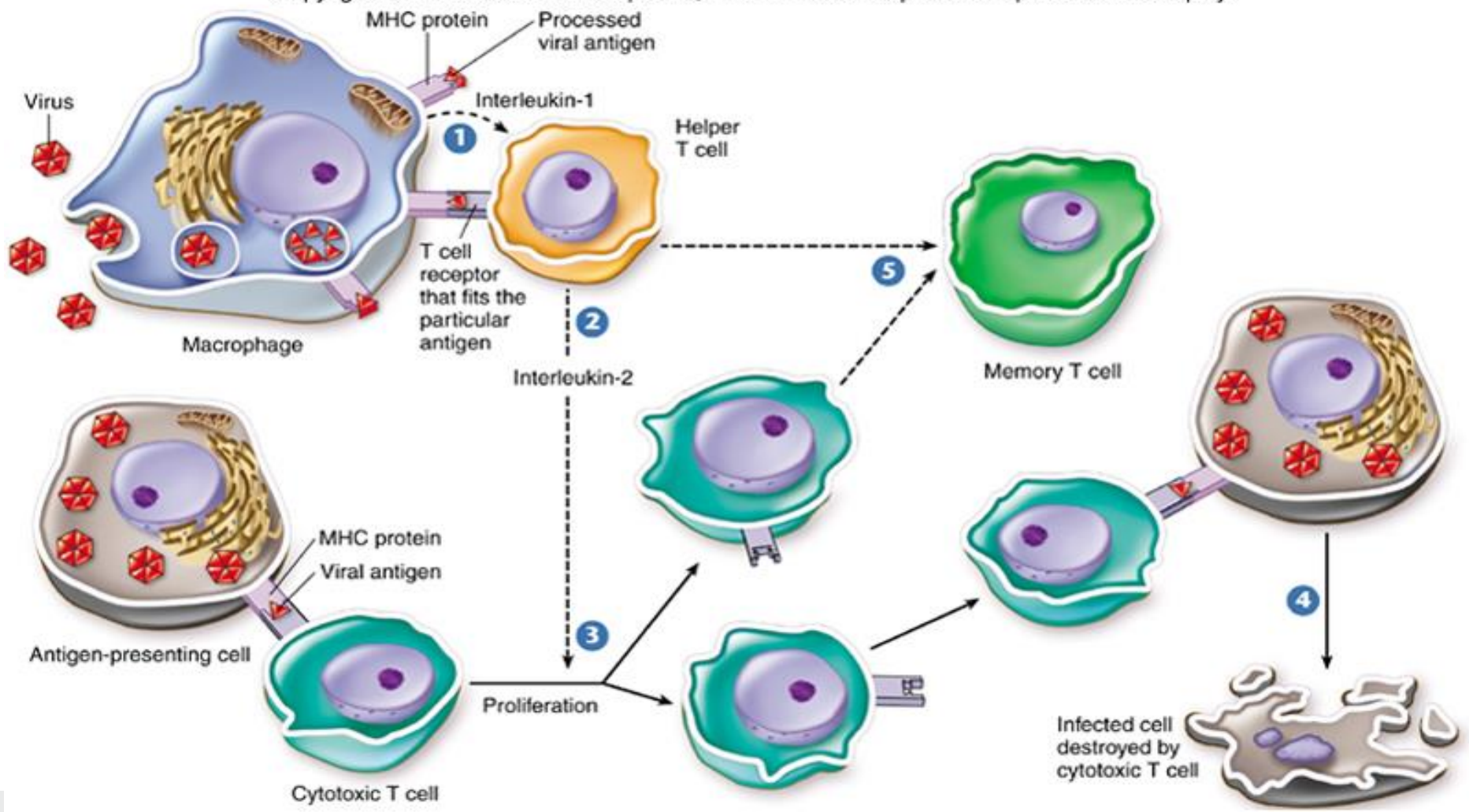
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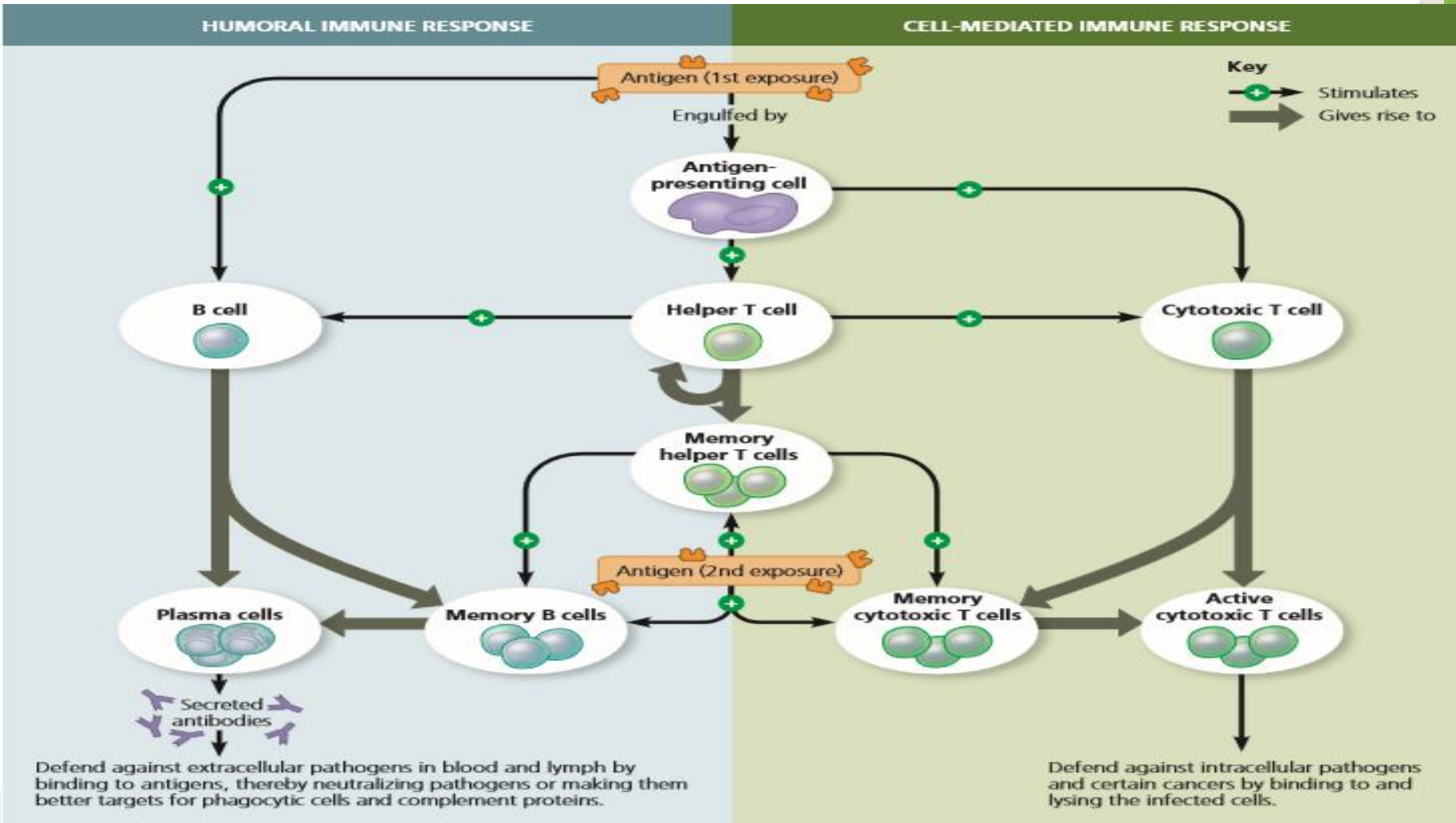
CELL MEDIATED IMMUNE RESPONSE

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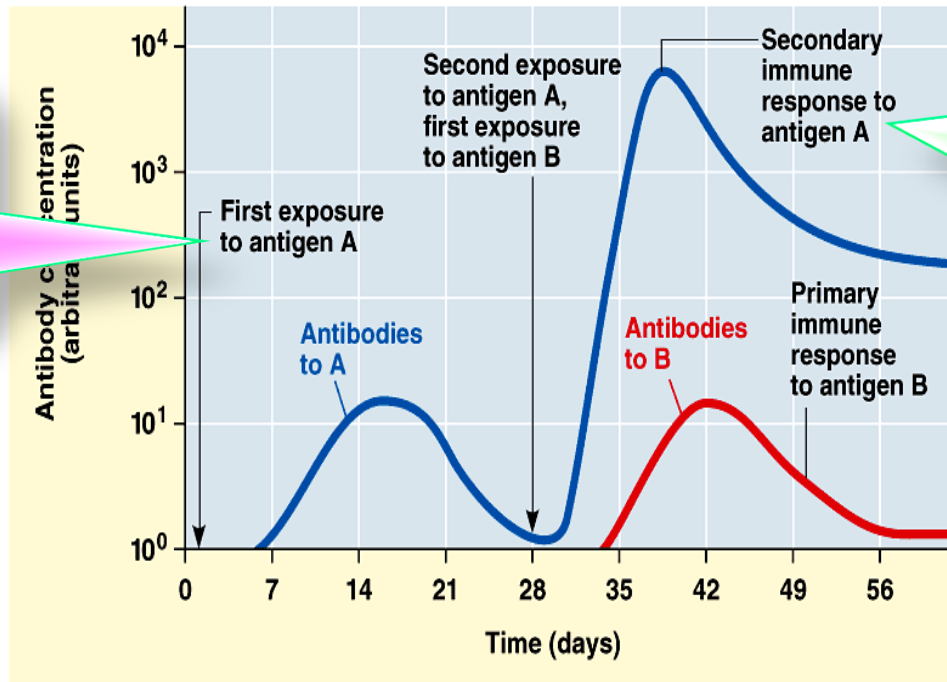




HUMORAL vs CELL MEDIATED IMMUNE RESPONSE



PRIMARY AND SECONDARY IMMUNE RESPONSE



Primary immune response:
Results from 1st exposure of B cell to an antigen

Low antibodies concentration produced at early stage

Has lag time to produce antibody

First antibody produced: **IgM**

Short time response

Secondary immune response:
Results from 2nd exposure of B cell to the **same** antigen

Produce higher antibodies concentration

Faster to produce antibody

First antibody produced: **IgG**

Longer lasting response



Thank You!



GOOD LUCK FOR PSPM II..!!!

