



EDITING FILE

\*check this frequently\*

# ANTIBODY MEDIATED IMMUNITY

Color Index:

Main Text

Important

Female Slides

Male Slides

Dr's Notes

Extra

# OBJECTIVES

01

To describe B-cells as the mediators of humoral immunity (antibody-mediated immunity)

02

To describe activation of B-cells which involve:  
- Antigen recognition,  
- T-dependent, T-independent antigens  
- Requirement for T-helper cells.

03

To explain clonal selection, clonal expansion & generation of plasma cells & memory cells.

04

To describe primary & secondary immune responses

05

To describe the structure & function of Immunoglobulins

# TYPES OF IMMUNITY

## adaptive immunity



cell mediated  
immunity (CMI)



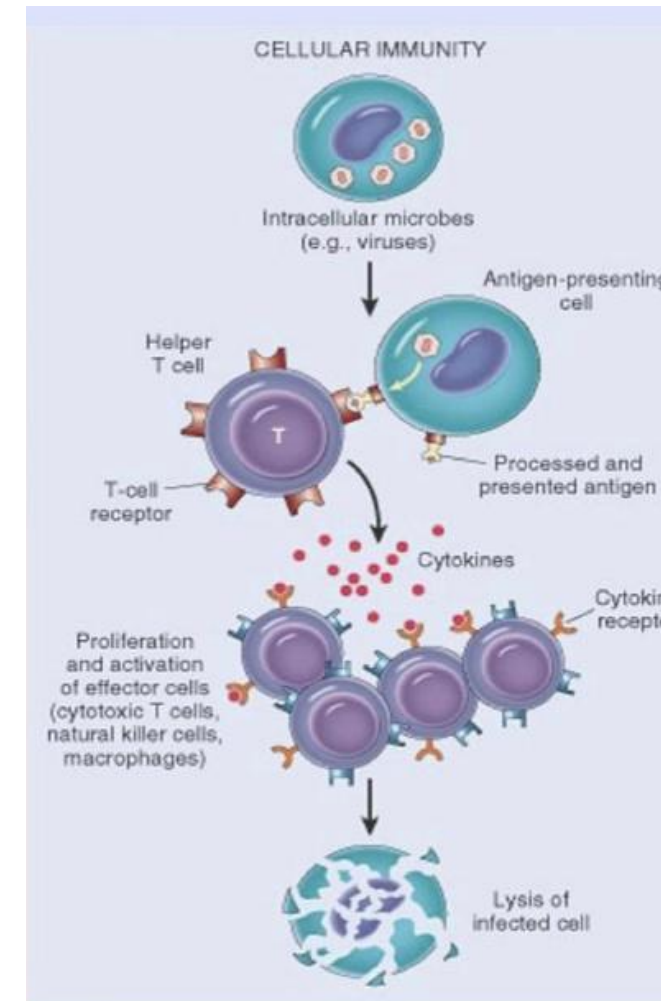
humoral  
immunity (AbMI)

The Humoral Immune Response is the aspect of immunity that is mediated by secreted **antibodies**.

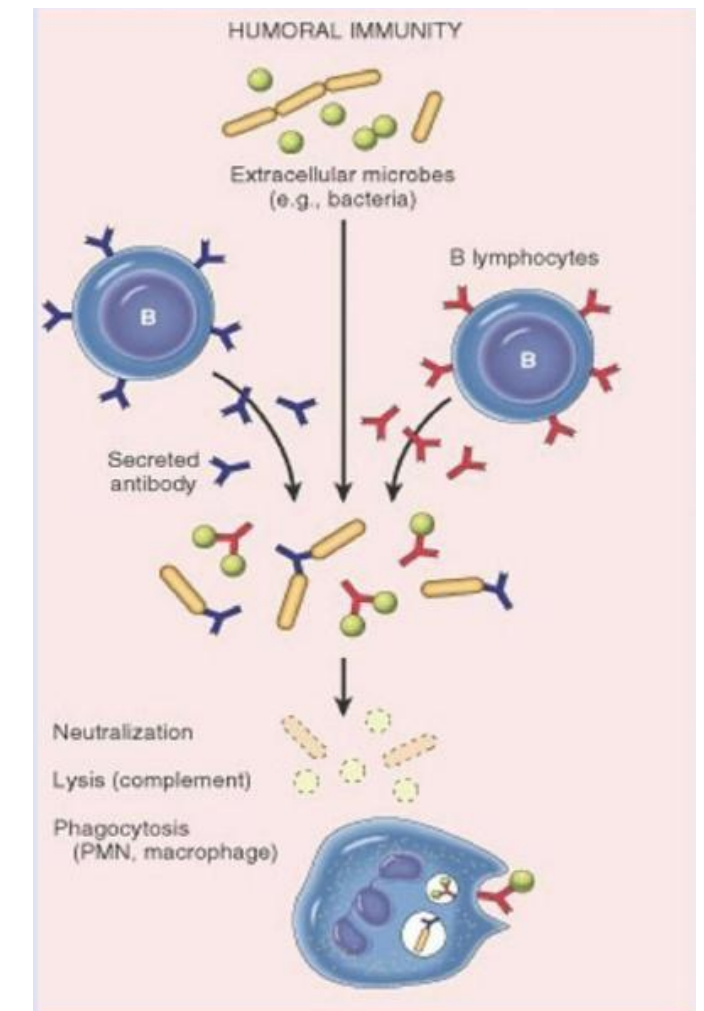
- The response takes place in **body fluids/humor** such as blood and lymph.

## innate immunity

### INTRACELLULAR



### EXTRACELLULAR




# ACTIVATION OF B CELLS BY ANTIGENS

## T-dependent antigens

- Antibody production by B-cells **requires T-helper cells**.
- Antigen presenting cells (APC) recognizes the Antigen & presents it to T-helper cells.
- T-helper cells stimulate B-cells specific for that antigen to **become Plasma cells**.
- T-dependant antigens are mainly **proteins** on viruses, bacteria & other foreign materials.

## T-Independent antigens

- B-cells Do Not require T-helper cells to produce antibody.
- Antigens are mainly polysaccharides or lipopolysaccharides with repeating subunits (bacterial capsules). 
- Immune responses **induce the production of IgM of low affinity** for the antigen and **No immunologic memory**.

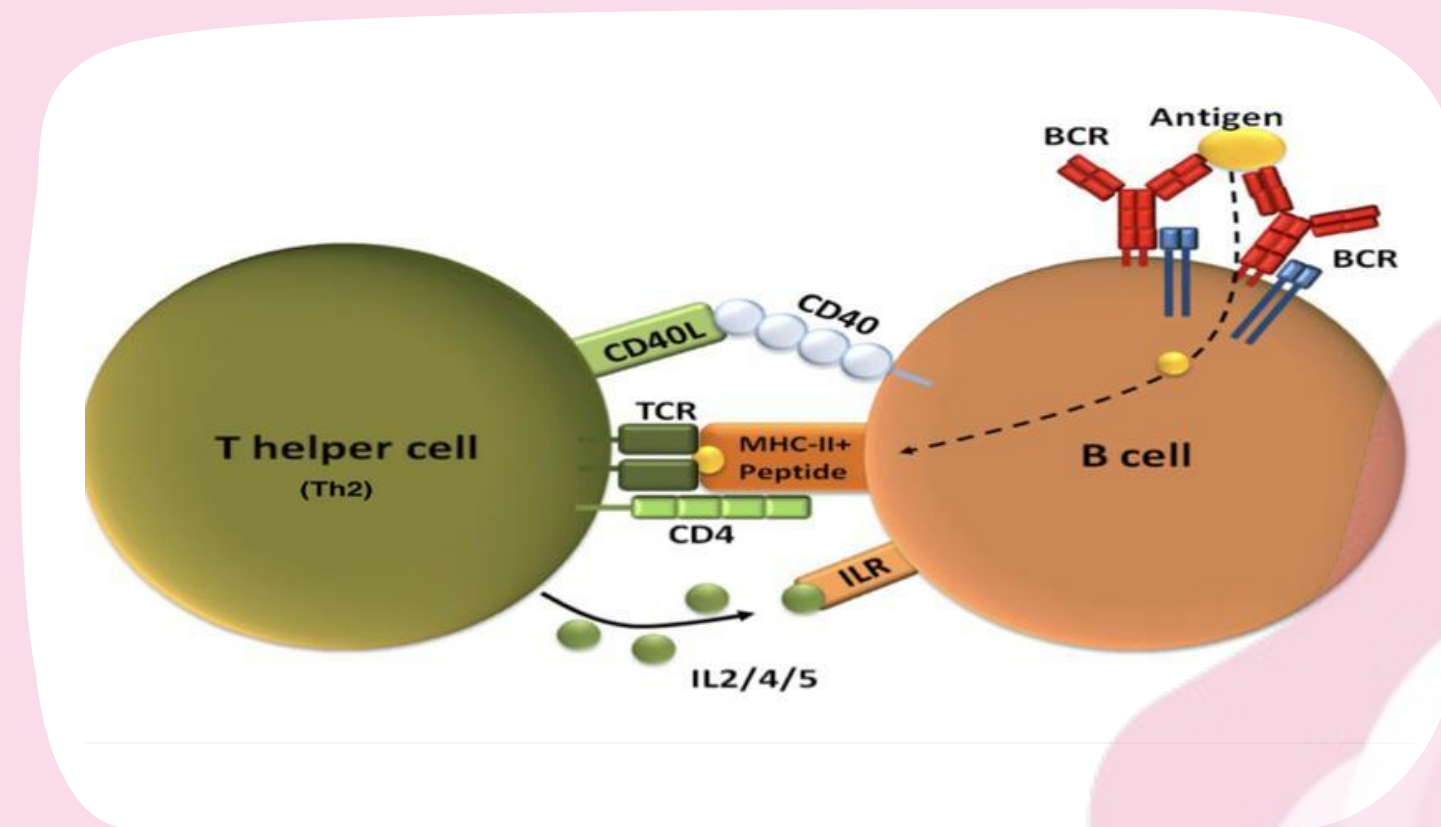
# ACTIVATION OF B CELLS (T-DEPENDENT)

from 443 and was repeated in 444:

**Th1** (T helper 1) is a **CD4** cell which promotes cell mediated immunity (previous lecture).

**Th2** (T helper 2) is a **CD4** cell which promotes antibody mediated immunity (this lecture).

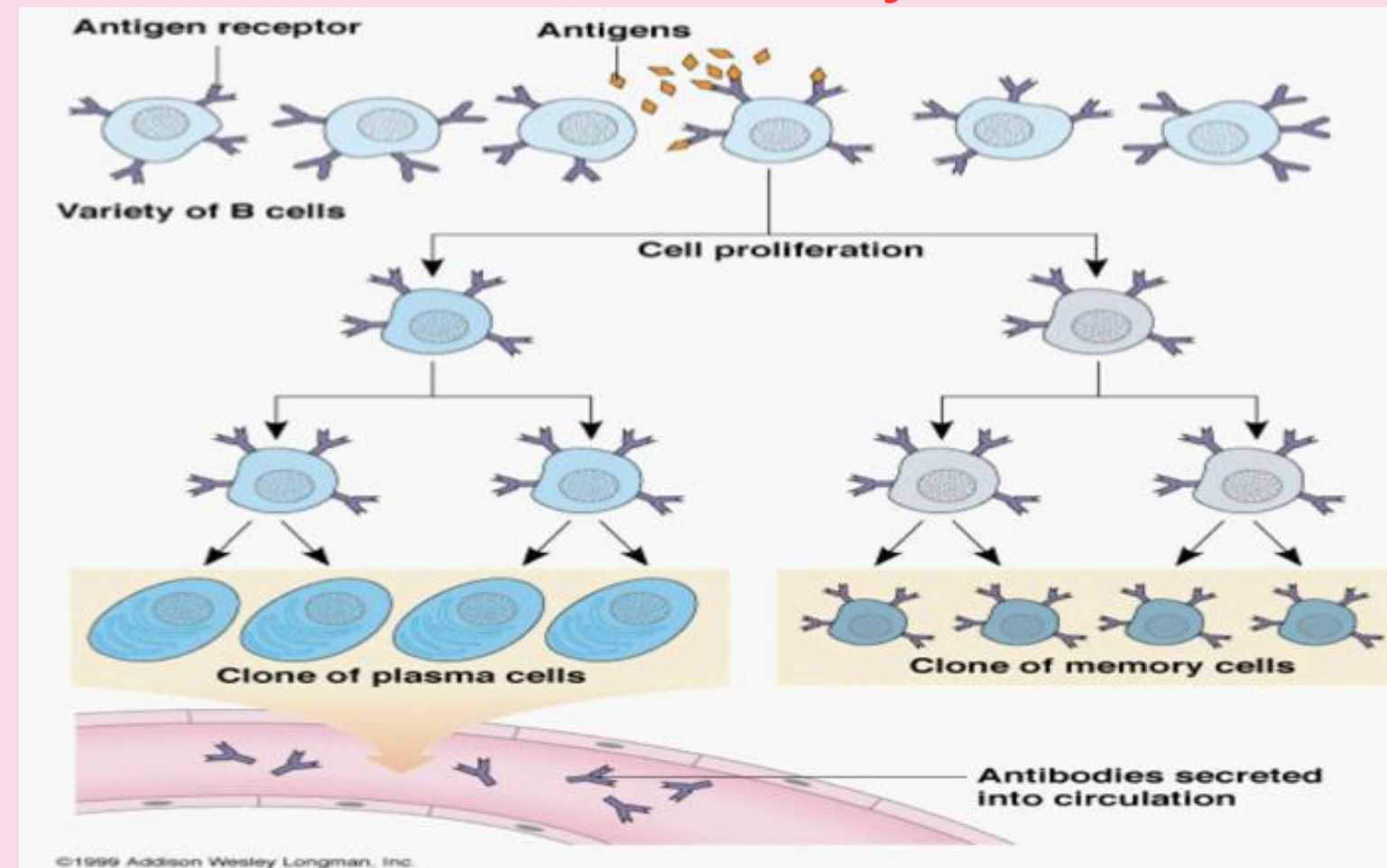
- Cell activation leads to
  - o Proliferation (تكاثر / انتشار)
  - o Release of cytokines (lecture 2)



# CLONAL SELECTION AND CLONAL PROLIFERATION

team 439:

B-cells are activated by the binding of an antigen to a specific receptor on its surface, which stimulates the cell to divide and proliferate (multiply very fast ) in the end it produces **plasma cells** and **memory cells**.



# ANTIBODIES

## Features and structure

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**.

Antibodies bind to specific sites on antigen surface called **(epitopes)** and perform protective functions by different mechanisms.

Antibodies are immunoglobulin (Ig) with specific functions. .

Can fit as precisely as a lock-key to an antigen.

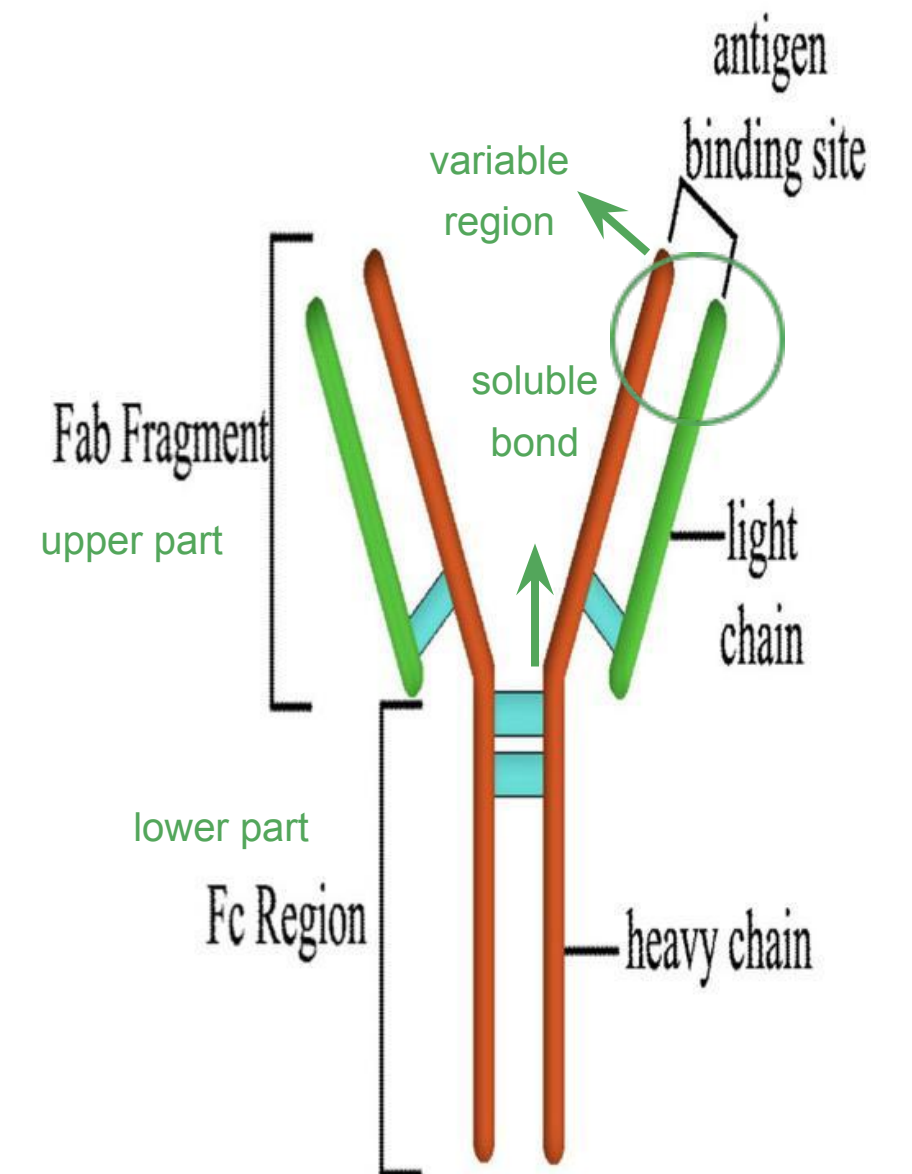
**there is a specific antibody for any one given type of antigen**

Variable region has the potential to bind with particular classes of antigens.

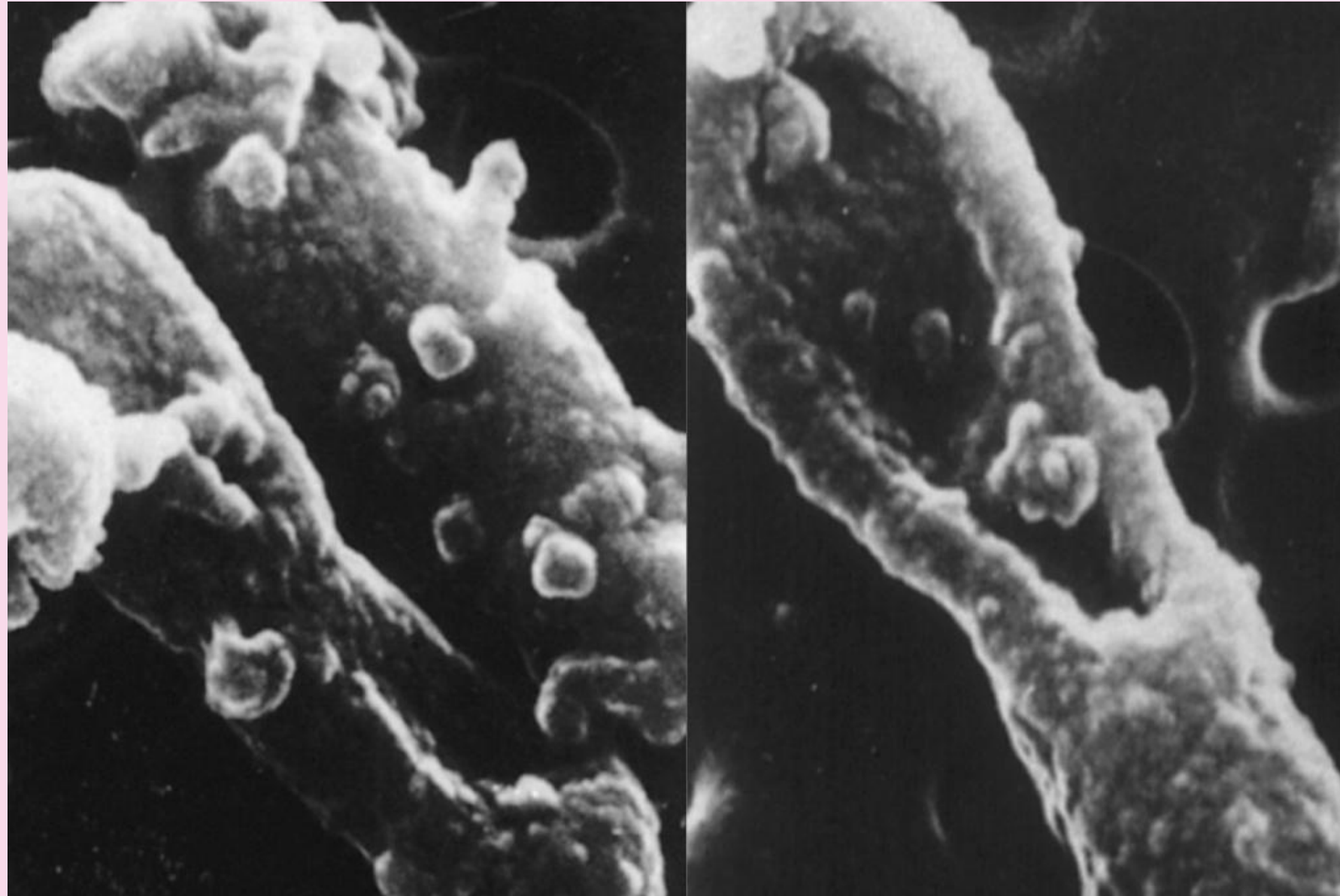
Made up of four **polypeptides** chains.

Two longer and larger (**heavy chains**) and the other two shorter and smaller (**light chains**)

Have the shape of a letter "Y".



# ELECTRON MICROGRAPHS OF THE EFFECT OF ANTIBODIES AND COMPLEMENT UPON BACTERIA



Antibody + complement-mediated  
Damage to E. coli

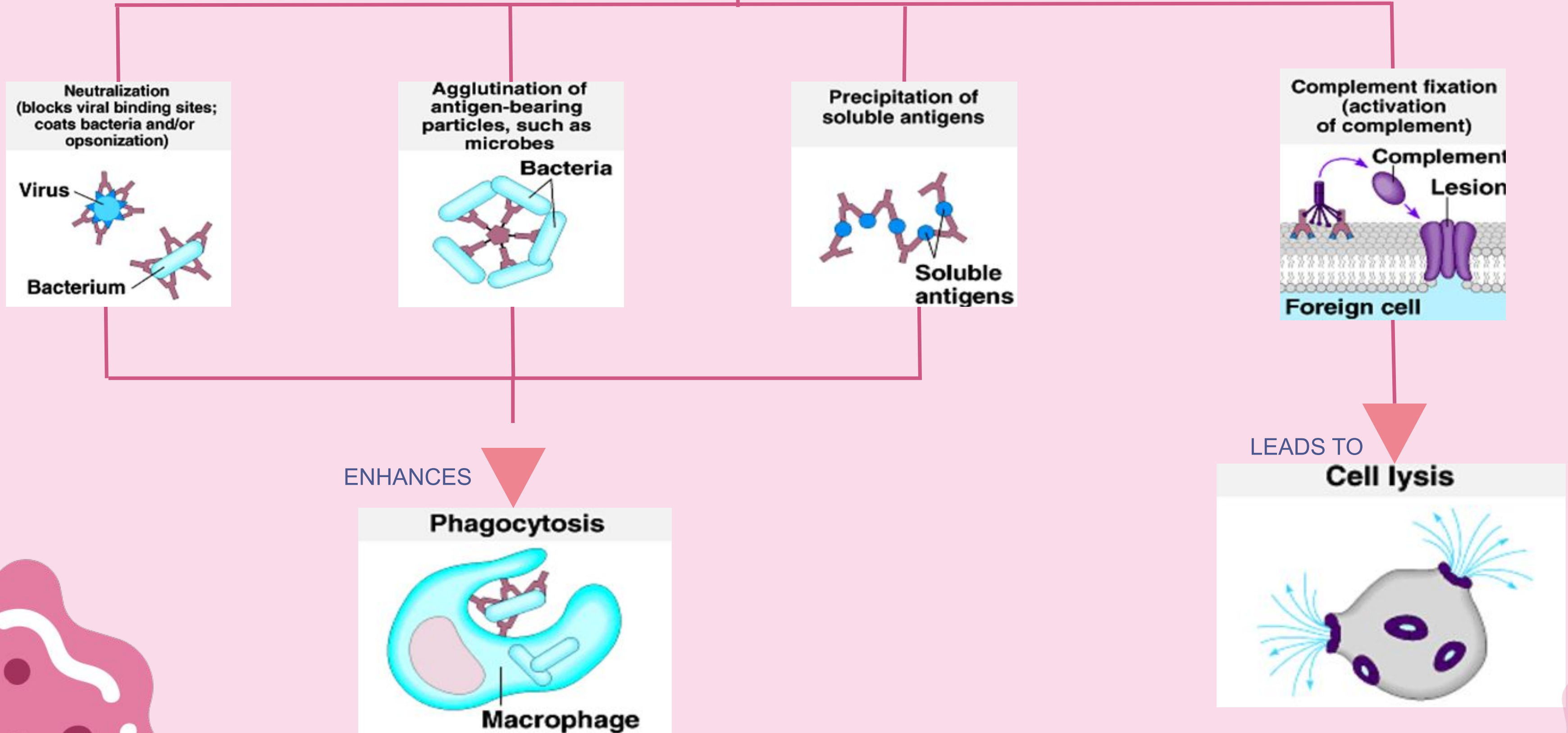


Healthy E. coli




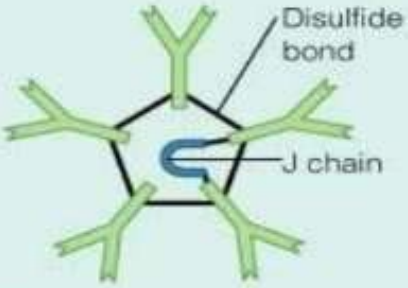
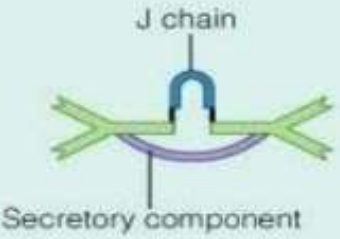


# PROTECTIVE FUNCTIONS OF ANTIBODIES:

Binding of antibodies to antigens inactivate antigen by



# IMMUNOGLOBULIN CLASSES

IMPORTANT SLIDE\*

A Summary of Immunoglobulin Classes					
Characteristics	IgG	IgM	IgA	IgD	IgE
					
<b>Structure</b>	Monomer	Pentamer	Dimer (with secretory component)	Monomer	Monomer
<b>Percentage of total serum antibody</b>	80%	5–10%	10–15%*	0.2%	0.002%
<b>Location</b>	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
<b>Molecular weight</b> <small>اعرفوا الترتيب</small>	150,000	970,000	405,000	175,000	190,000
<b>Half-life in serum</b>	23 days	5 days	6 days	3 days	2 days
<b>Complement fixation</b>	Yes	Yes	No <sup>†</sup>	No	No
<b>Placental transfer</b>	Yes	No	No	No	No
<b>Known functions</b>	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.

<sup>†</sup> May be yes via alternate pathway.

# FUNCTIONS OF ANTIBODIES :

SPECIAL THANKS FOR 442 TEAM

## Antibody dependent cell-mediated cytotoxicity

Antibodies coat infecting cell (large parasite usually) - FC facing outwards

NK (lysing ability), Macrophage, neutrophils, and eosinophils have receptors for FC region of antibody

Secretion of lytic enzymes to destroy parasite

FC is an antibody receptor involved in antigen recognition which is located at the membrane of certain immune cells including B cells

## Opsonization and phagocytosis

Antibodies coat infecting cells and facilitate their phagocytosis by cells possessing Fc Receptors

## Complement activation

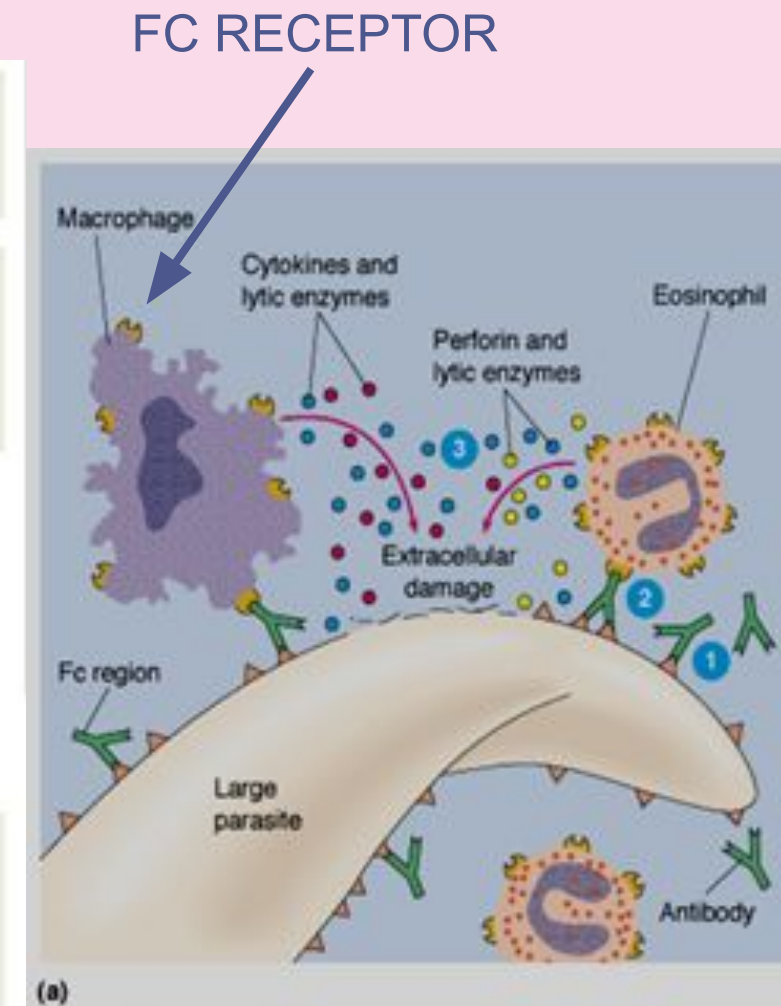
classical pathway , after binding to antigen

IgM+++ , IgG1 > IgG3 > IgG2

## Transplacental transfer

IgG

Its a link that transfer maternal autoantibodies from the pregnant mother to the fetus through the placenta.



# PRIMARY & SECONDARY IMMUNE RESPONSES :

01

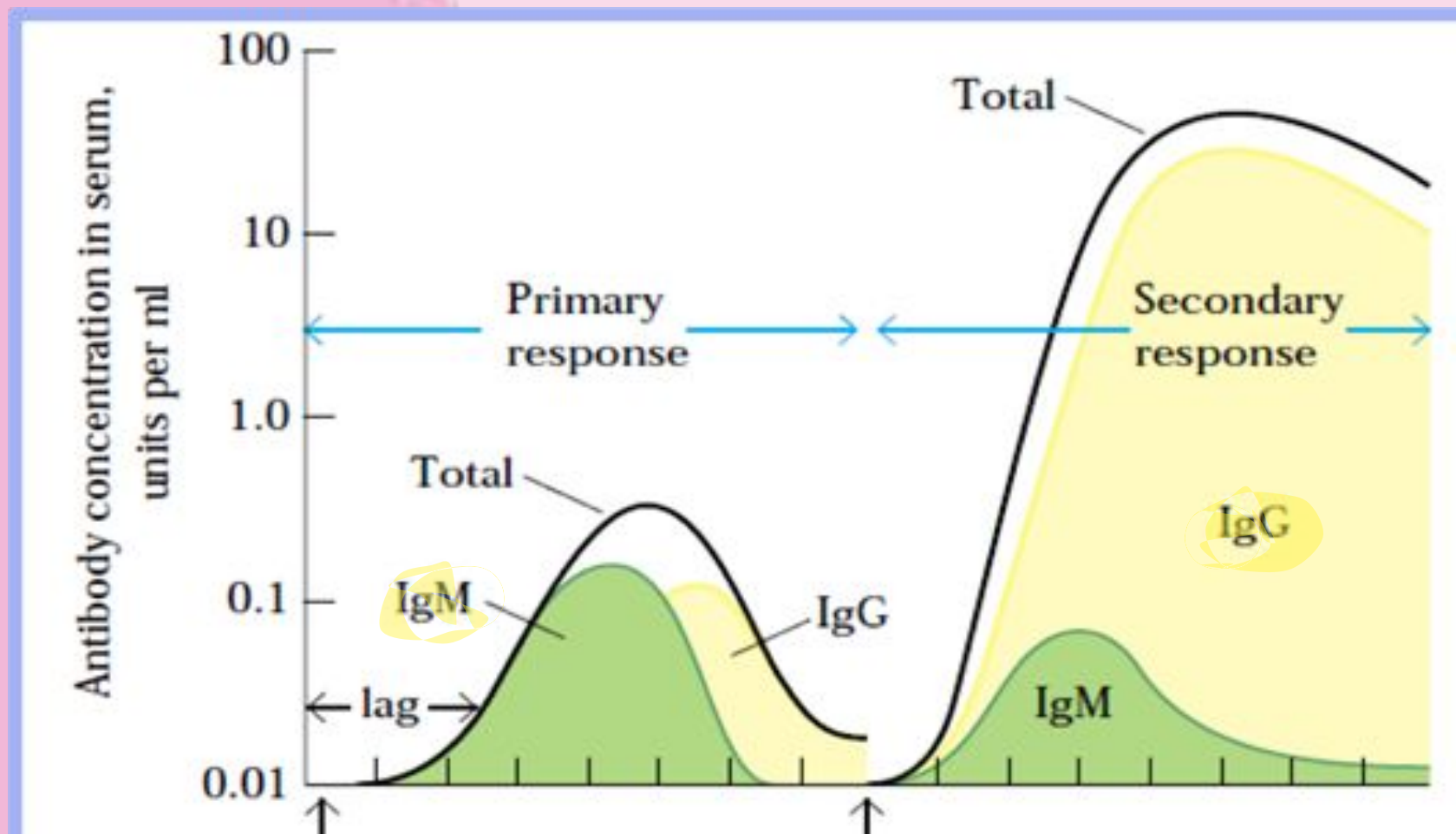
PRIMARY IMMUNE RESPONSE:  
produced by **initial** encounter with antigen

The main antibody involved is  
IgM

02

SECONDARY IMMUNE RESPONSE:  
produced by **subsequent** challenge with same antigen

The main antibody involved is  
IgG



## COMPARISON BETWEEN PRIMARY & SECONDARY RESPONSES

Property	Primary response	Secondary response
Responding B cell	Naive B cell (virgin) (no memory)	Memory B cell
Lag period following antigen administration	4-7 days	1-3 days
Time of peak response	7-10 days (takes time)	3-5 days (faster)
Magnitude of peak antibody response	Varies depending on antigen	100-1000 times higher than primary
Predominant type	IgM	IgG

# TAKE HOME MESSAGES:

01

B cells can be activated by antigen to produce antibodies either with the assistance of helper T cells or directly by the antigen itself.

02

Antibodies are made up of two heavy and two light amino acid chains and have a shape of letter "Y".

03

Different types of antibodies are located at various sites to provide protection by agglutination, precipitation, complement fixation etc.

04

Secondary humoral immune response is swift and a stronger immune response mediated by IgG class of antibodies because of the memory cells

# MEET THE TEAM

Abdullah Alzoom



## LEADERS



Sadeem Alsaadoon

## MEMBERS

Abdulhadi Alqahatani

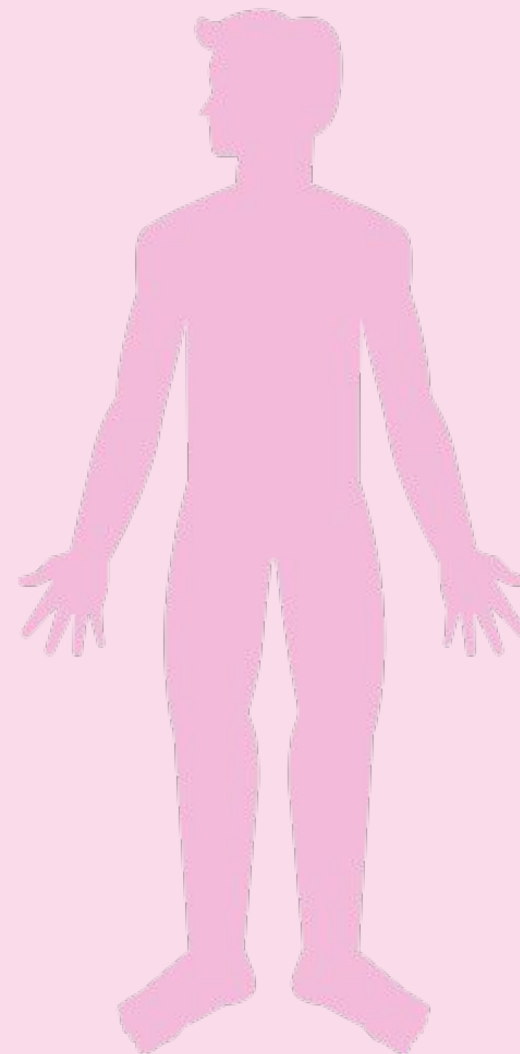
Bandar Alzaaidi

Faisal Alaowairdhi

Homoud Alsuhal

Omar Alattas

Ziyad Bukhari



Alanoud Alnajawi

Basmah Alghamdi

Lama Alhayan

Manar Alqahtani

Shahad Alzenaidy

Shaden Alotaibi