

Humoral immunity

Antibody Mediated Immunity (AMI)

By
Dr. Raghed M. Jassem

Adaptive (acquired) immunity

Is the term refers to antigen-specific defense mechanisms that take several days to become protective and are designed to react with and remove a specific antigen and it has memory. This is the immunity one develops ,it will be continuous throughout the life.

Humoral immunity
Antibody Mediated Immunity
(AMI)

•Mediated by B-lymphocytes

Cellular immunity
Cell Mediated Immunity
(CMI)

•Mediated by T-lymphocytes

•**Humeral (antibody-mediated) immunity-**

Production of antibodies against foreign organisms or substances:-

1. B cells (B lymphocytes) transform into plasma cells
2. Plasma cells synthesized and secrete antibodies
3. Primarily, it is a defense against bacteria, bacterial toxins, and viruses (working outside of the cells).

Cell mediated immunity

1. Involves specialized T cells (T lymphocytes) that act against intracellular bacteria, viruses, fungi, protozoa, helminthes, and transplanted tissue
2. CD4⁺ regulates the activation and proliferation of other immune cells such as the B cells and macrophages depending on the types of the cytokines production
3. CD8⁺ T cells proliferate into cytotoxic T cells that directly attack the invading antigen

Lymphocytes Development

```
graph TD; A[Lymphocytes Development] --> B[Antigen independent]; A --> C[Antigen dependent]; B --> D[Take place in bone marrow and thymus]; C --> E[Require antigen challenge either directly or by APCs]
```

The diagram is a flowchart with a central title box at the top. Two arrows point downwards from the title box to two separate boxes. From each of these boxes, a second arrow points downwards to a final box. All boxes have a red border and white background. The text is in a black, sans-serif font.

Antigen independent

Take place in bone marrow
and thymus

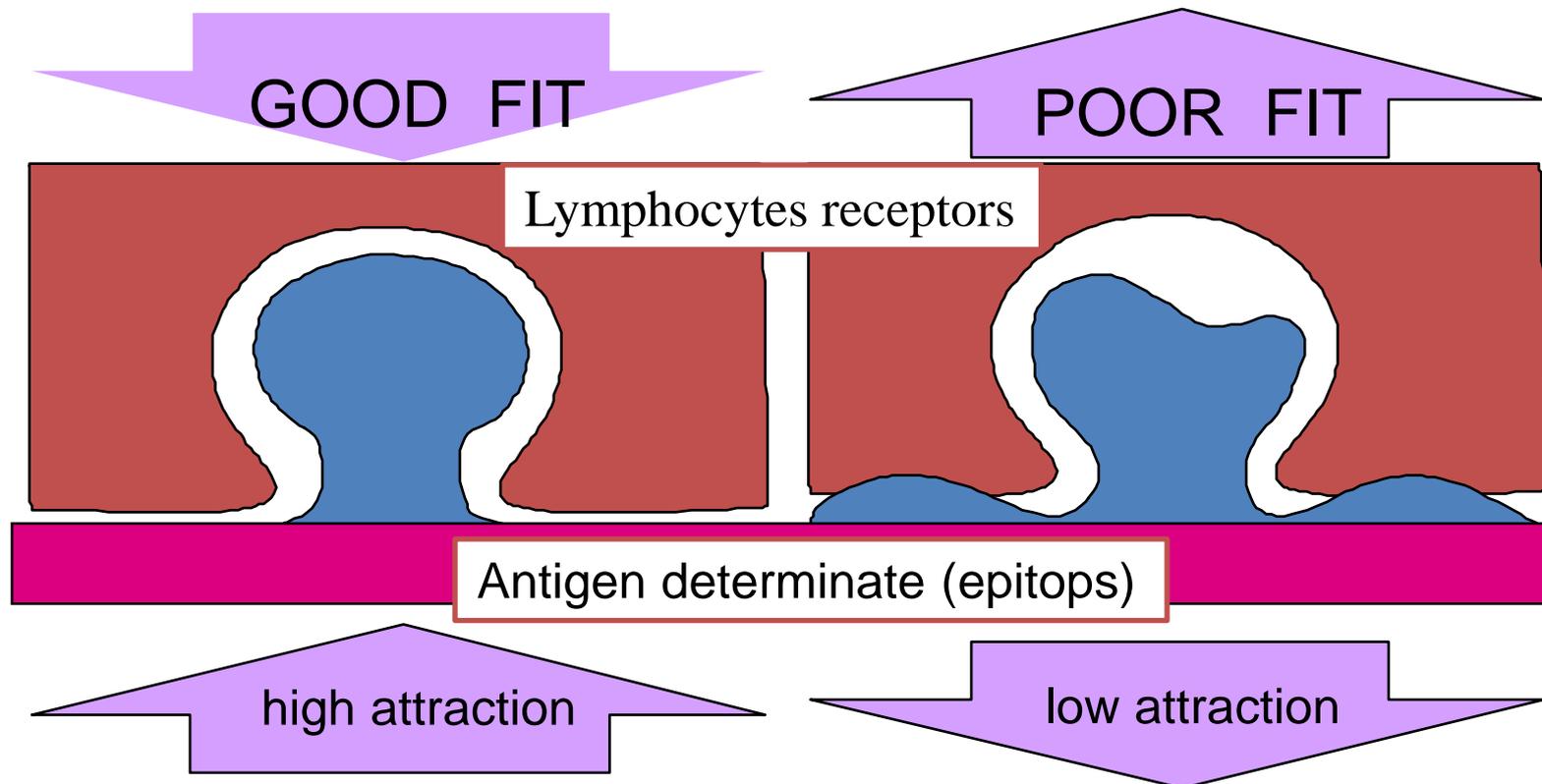
Antigen dependent

Require antigen challenge
either directly or by APCs

Clonal selection theory of lymphocyte

1-Each naïve lymphocyte bear single type of receptor with single specificity

2-Intrection of the lymphocyte receptor with antigen lead to active the lymphocyte



3-Activated of naïve B-lymphocyte lead it to differentiated to the effector cells (plasma cells) that bear of receptors identical to the parental cell from which that lymphocyte was derived and that lymphocyte cells produce antibodies

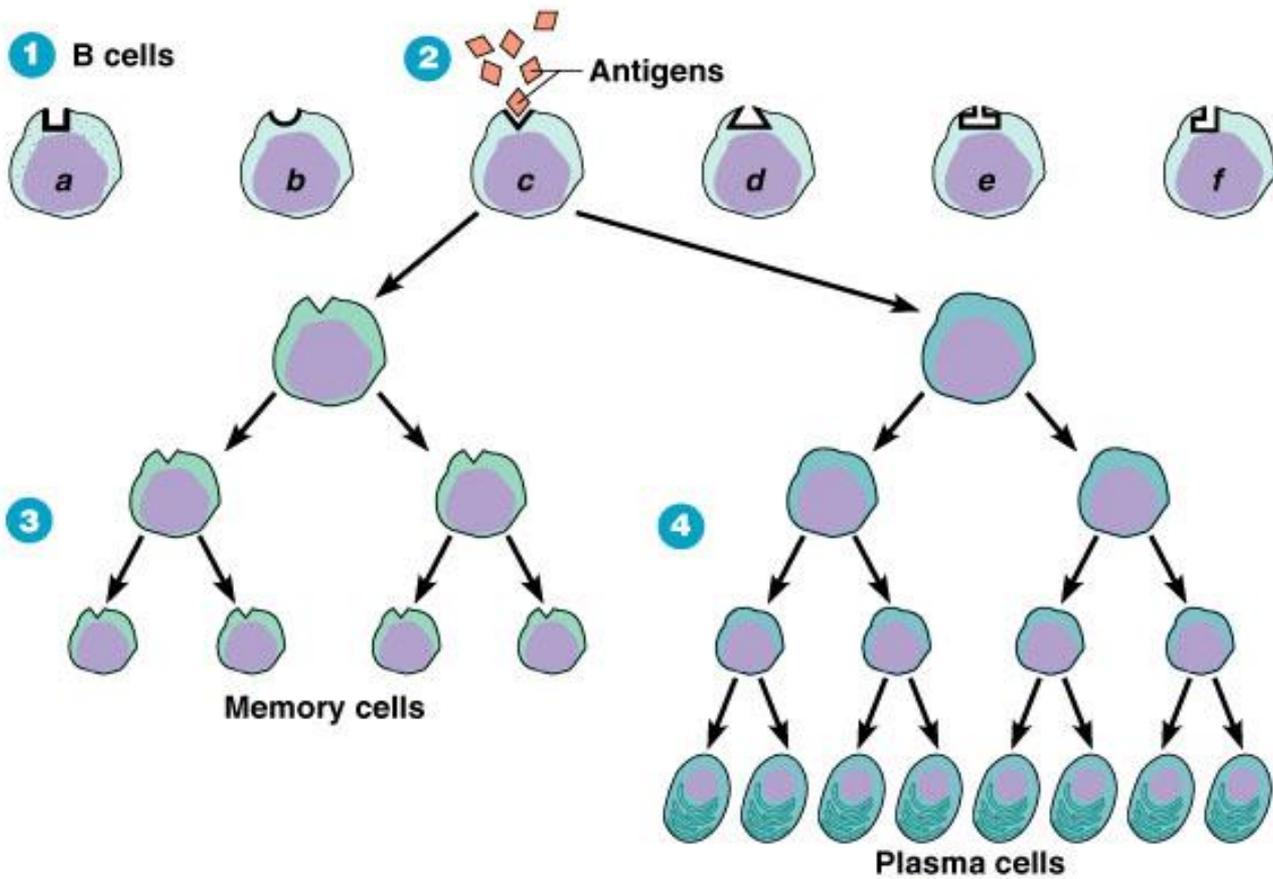
4- A few days after exposure to an antigen, a plasma cell is secreting hundreds of millions of antibodies daily and the secretion occurs for about 4 or 5 days, until the plasma cell dies

5- most antibodies travel in lymph or blood to the invasion site

6- some activated B cells do not differentiate into plasma cells

-they remain as *memory B cells* which they remain for long period of time and respond more rapidly on re-exposure

Why don't we produce antibodies against our own antigens?



1 B cells encounter and bind to antigen.

2 B cell *c* responds to antigen by proliferating.

Clone of B cells

3 Some B cells differentiate into long-lived memory cells.

4 Other B cells differentiate into plasma cells.

5 Plasma cells secrete antibodies into circulation.

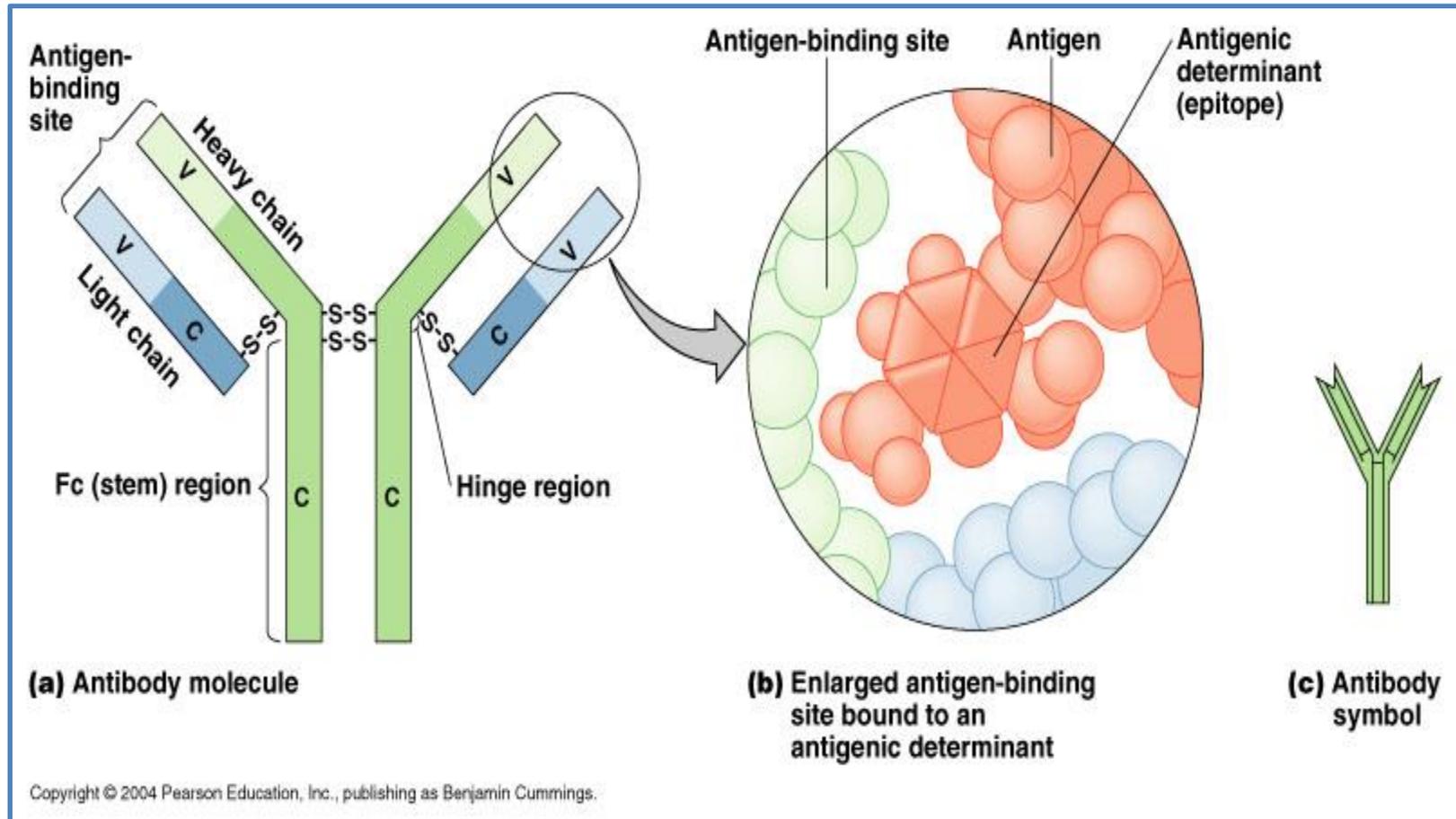
I. Humoral (Antibody) Immunity

Antibodies made by B cells in response to specific antigen primarily defends against bacteria, viruses, and toxins and they found in body fluids (blood and lymph).

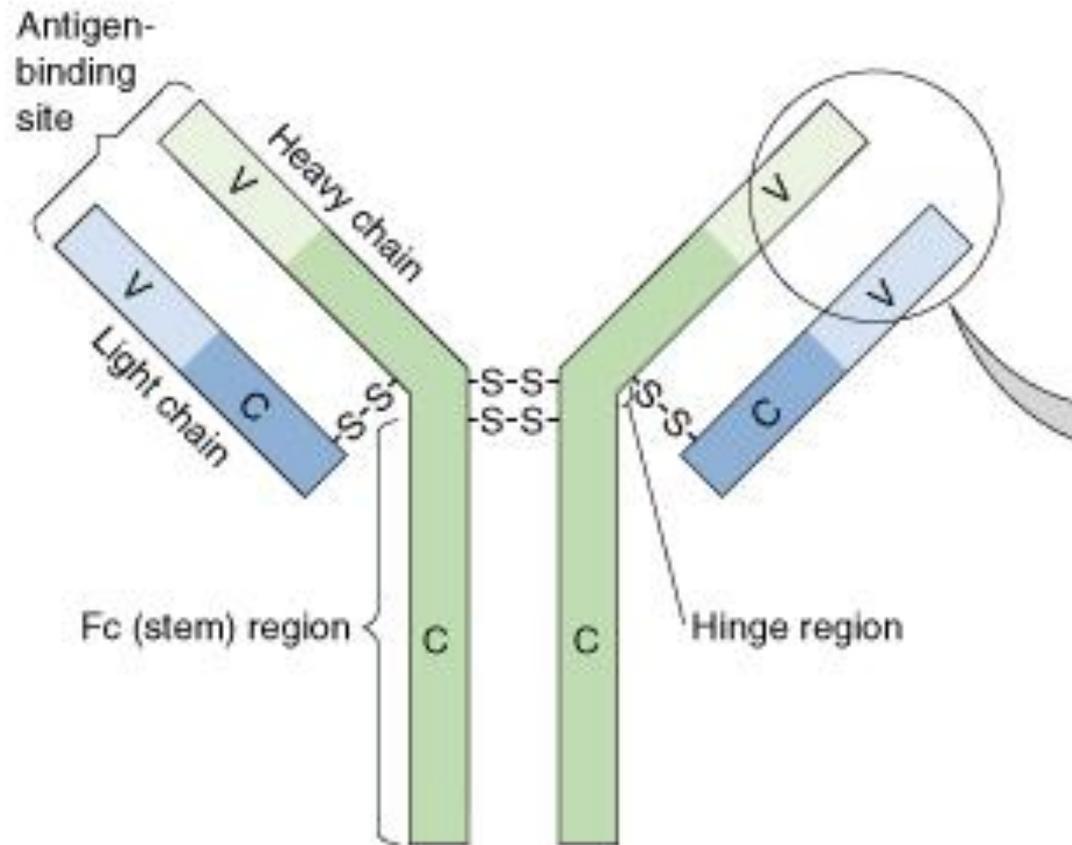
Nature of Antibodies

A protein (immunoglobulin) produced by plasma cells in response to an antigen, capable of binding to the antigen that stimulated its production. They make up about 20% of plasma protein.

Structure of an Antibody



Structure of an Antibody

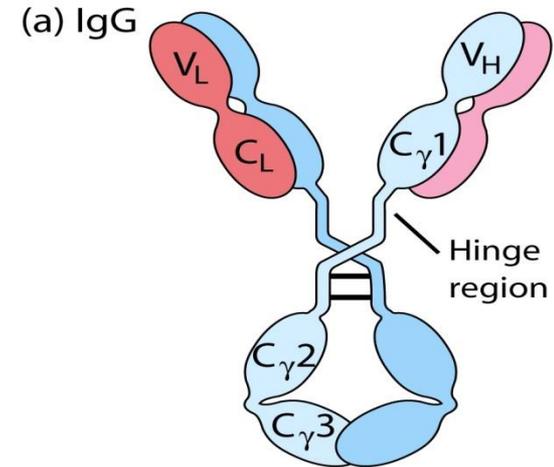


(a) Antibody molecule

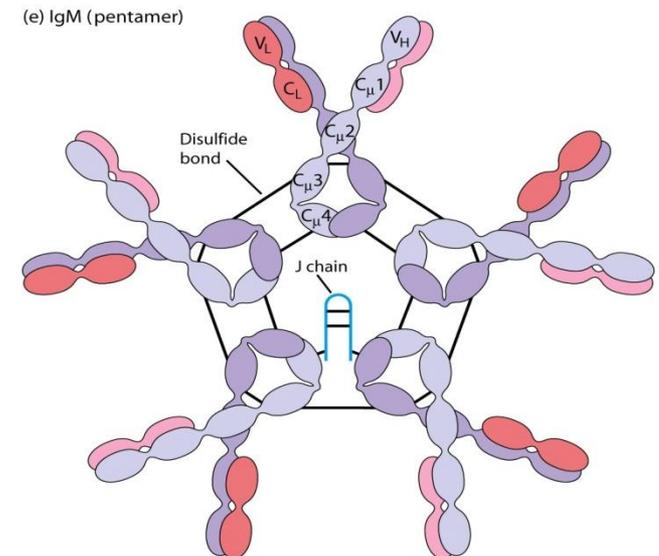
Basic Antibody Structure

- Five heavy chains
 - Gamma γ
 - Delta δ
 - Alpha α
 - Mu μ
 - Epsilon ϵ
- Two identical light chains
 - Kappa κ or
 - Lambda λ

This structure of Ab molecules is called Monomer - a single bivalent antibody unit



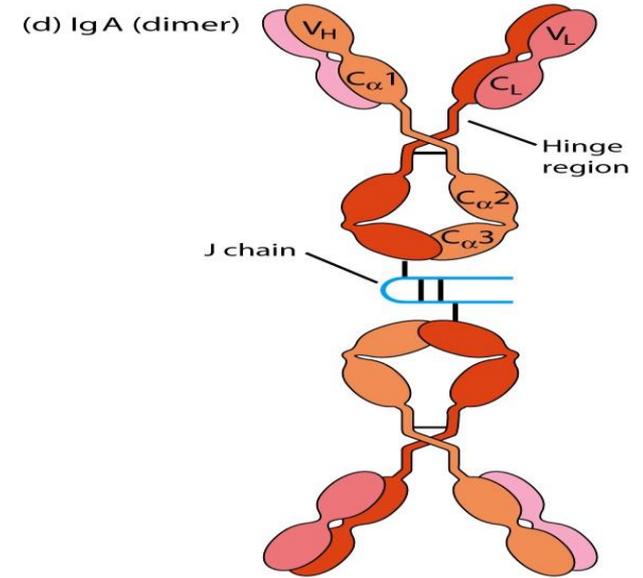
Multivalent antibodies are composed of more than one monomer



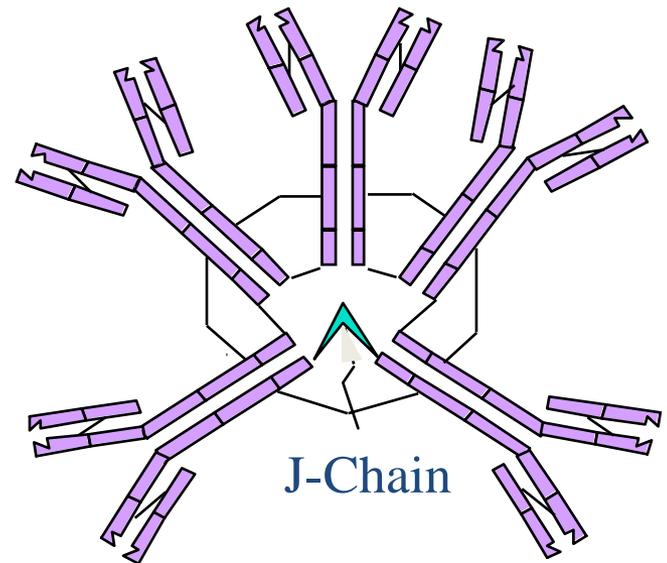
Accessory molecules on the immunoglobulin:-

Two additional accessory molecules are :-

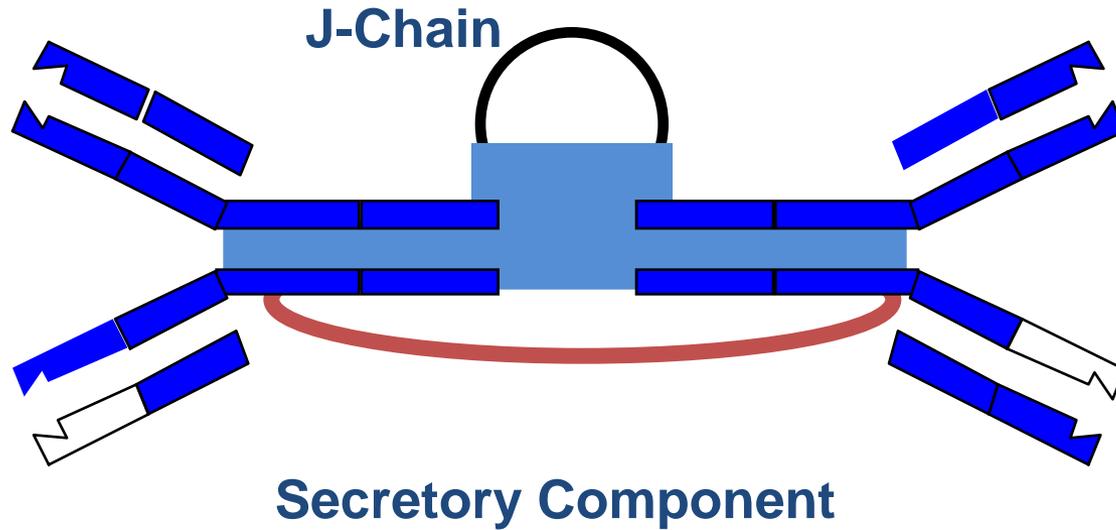
❖ *J chain* that joins the monomers of IgA and IgM



IgM pentamer



Secretory component, which helps Ig across mucous membranes.
This portion occur only in certain immunoglobulin class (IgA)



Function of Antibodies

