A.S.D.GOVERNMENT DEGREE COLLEGE FOR WOMEN (AUTONOMOUS) KAKINADA

DEPARTMENT OF MICROBIOLOGY

Antigen –Antibody Interactions

II BSc CBMB SEM IV

BY

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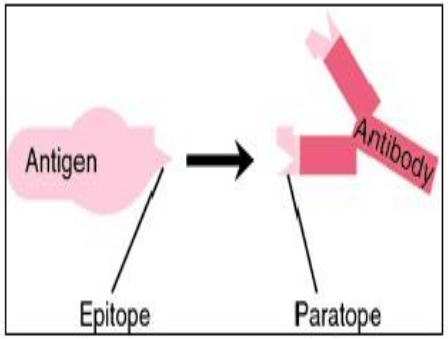
Lecturer in Microbiology

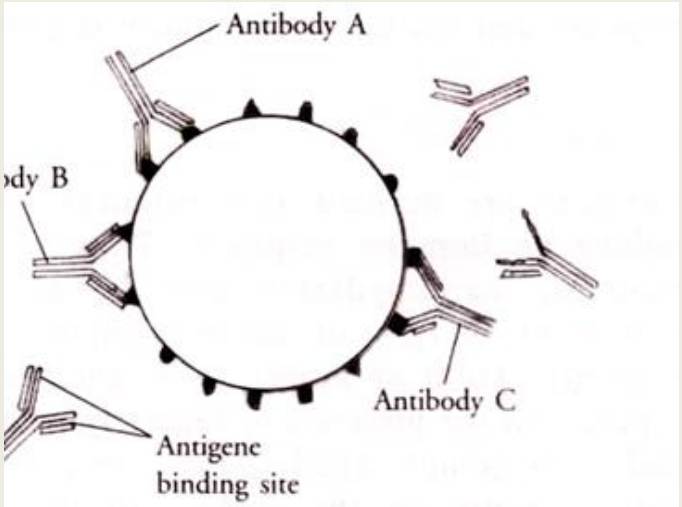
Introduction

Structure of Antigen and Antibody

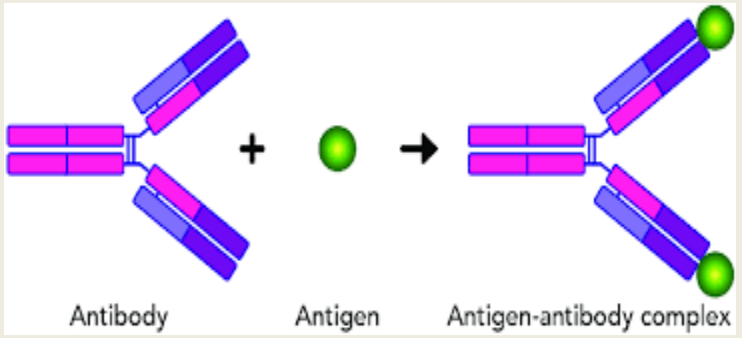


Antigen and Antibody to Show Epitope And Paratope

- The antigens and the antibodies combine specifically with each other. This interaction between them is called Antigen-Antibody reaction.
- It may be abbreviated as Ag – Ab reaction.
- These form the basis for humoral immunity or antibody mediated immunity.
- These reactions form the basis for detection of infectious disease causing agents and also some non-specific Ag's like enzymes.

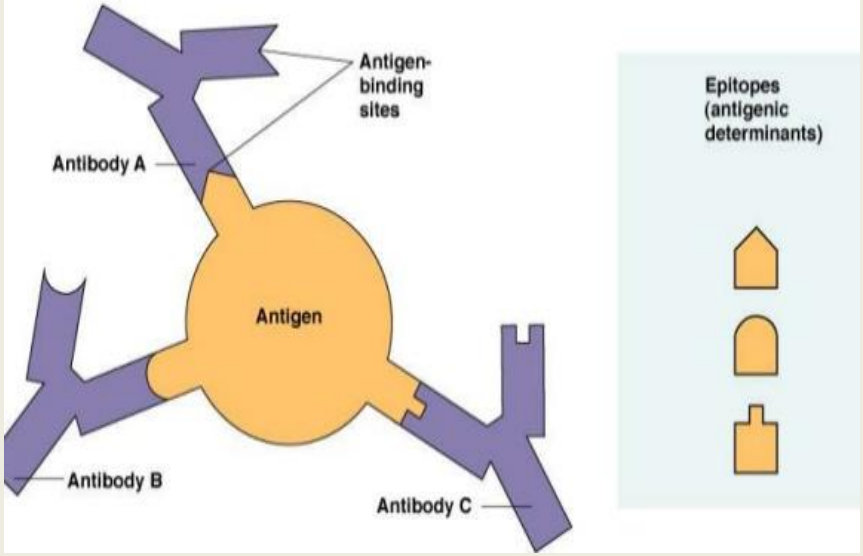


Structure of antigen with antigenic determinants.



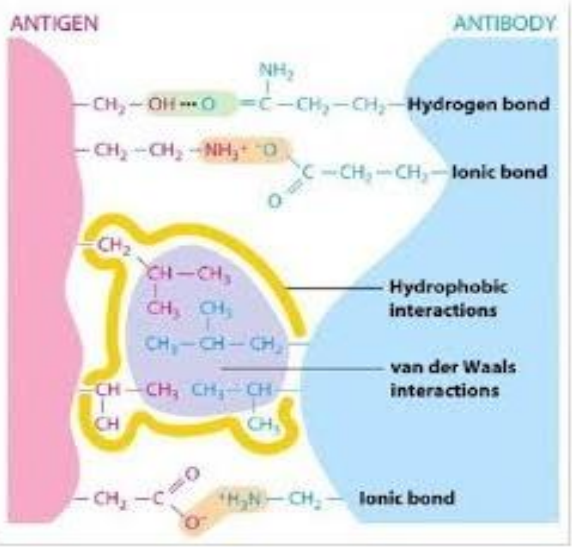
Non-Covalent Interactions

Epitopes: Antigen Regions that Interact with Antibodies



Strength of Antigen – Antibody reaction:

•The non – covalent interaction that form the basis of antigen – antibody binding include hydrogen bond, ionic bond, hydrophobic interaction and Van der Waals interaction.



Binding Force of Antigen – Antibody Reaction:

• The binding between antigen and antibody in ag – ab reaction is due to three factors namely:

- Closeness between antigen and antibody.
- Non – covalent bonds or Intermolecular forces .
- Affinity of antibody.

Properties of Ag-Ab Reaction

Properties of Ag –Ab can be explained with the help of 3 points they are

1. **Antibody Affinity**
2. **Antibody Avidity**
3. **Cross reaction**

Strength of Antigen – Antibody reaction:

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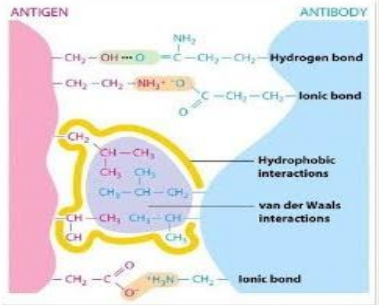
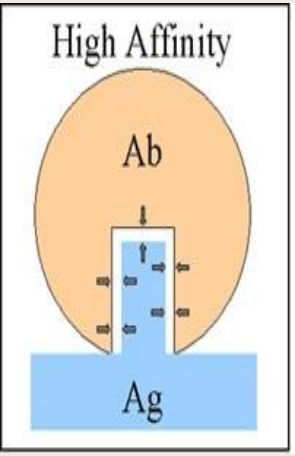
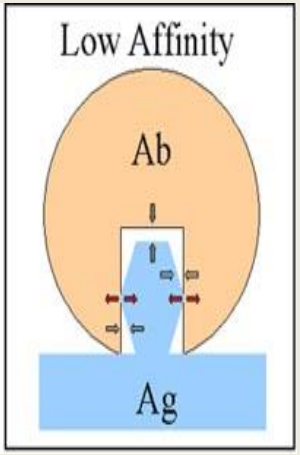






Closeness between antigen and antibody: When antigen and antibody are closely fit, the strength of binding is great. When they are apart binding strength low.

Non – Covalent Bonds: The bonds that hold the antigen to the antibody combining site are all non-covalent in nature. These include hydrogen bonds, electrostatic bonds, Van der Waals forces and hydrophobic bonds.

Affinity of antibody: Antibody affinity is the strength of the reaction between a single antigenic determinant and a single combining site on the antibody.

Antibody Affinity

Antibody Avidity

- It is the strength of the bond after the formation of Ag-Ab complexes
- It is used to denote the overall capacity of antibodies to combine with the multivalent antigen
- A multivalent antigen many types of antigenic determinants or epitopes
- When injected into the blood, each antigenic determinant stimulates the production of a particular antibody
- Various antibodies produced by single antigen combines with the different antigenic determinants of the antigen.
- The cumulative strength of the multivalent interactions between a multivalent antibody and antigen called avidity

Cross-reaction

When an antibody elicited by one antigen, reacts with an unrelated antigen, it is called cross –reaction.

Cross –reactions occurs when two unrelated antigens have an identical epitope

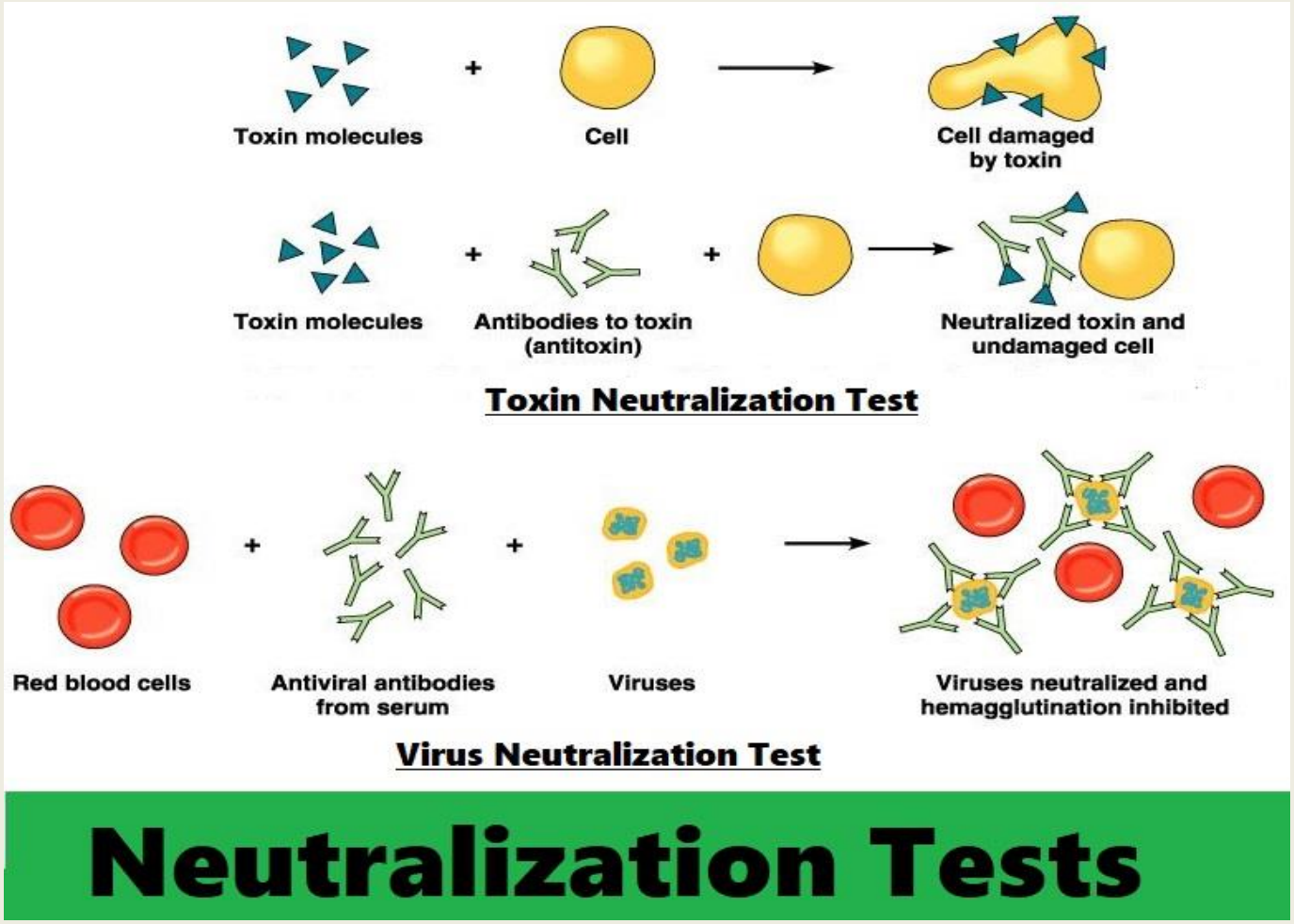
Eg: 1.ABO blood group antigens present an excellent example of cross-reactivity.

2. A number of viruses and bacteria have epitopes identical or very similar to normal host cell components.

Ag-Ab Interactions (In vivo)

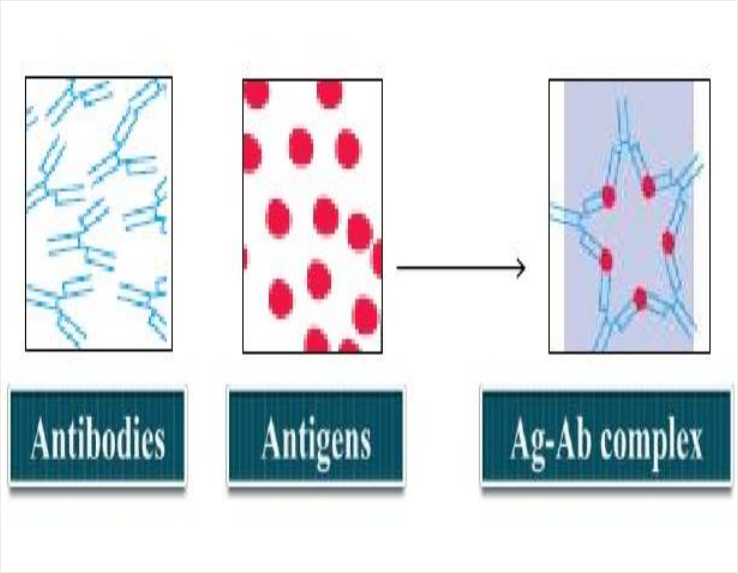
1. Neutralization
2. Precipitation
3. Agglutination(Blood Grouping)
4. Opsonisation
5. Compliment Fixation

Neutralization



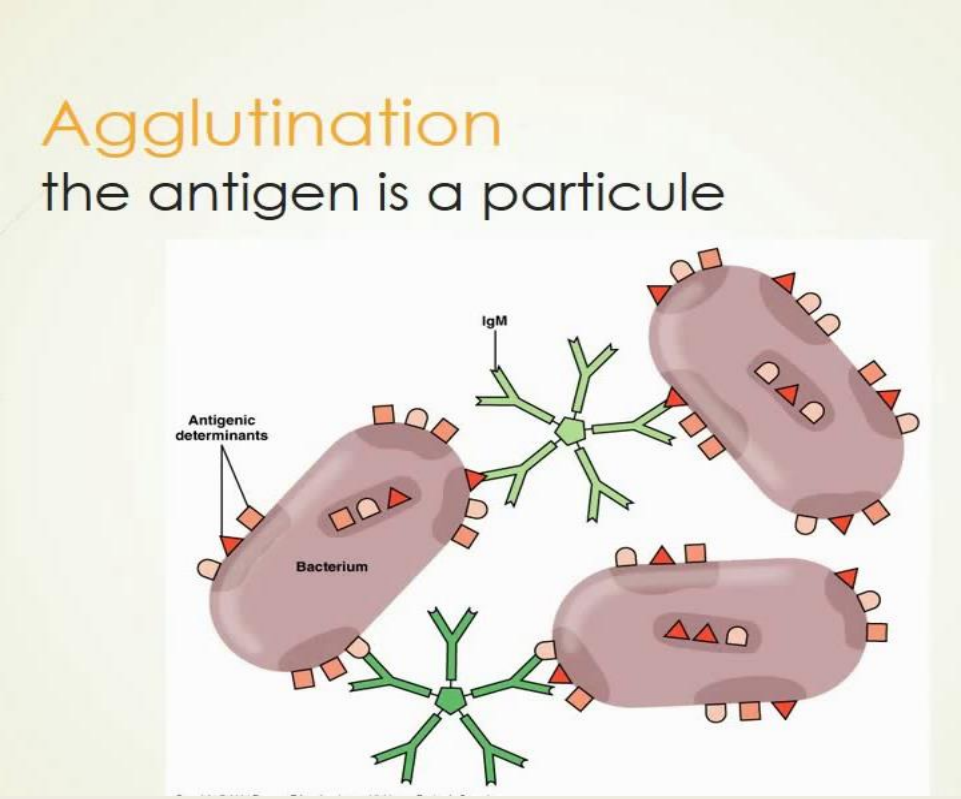
Precipitation

- **Soluble antigens combine with soluble antibodies in presence of an electrolyte at suitable temperature and pH to form insoluble visible complex. This is called a precipitation reaction.**
- **It is used for qualitative and quantitative determination of both antigen and antibody.**
- **It involves the reaction of soluble antigen with soluble antibodies to form large interlocking aggravated called lattice.**

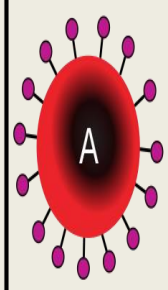
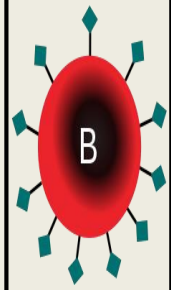
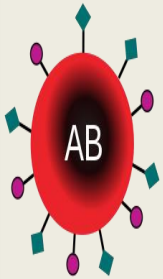
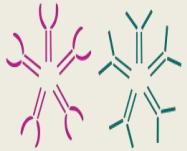


Agglutination

It acts on antigen-antibody reaction in wich the antibodies cross-link particulate antigens (Surface -bound antigens) resulting in the visible clumping of the particle

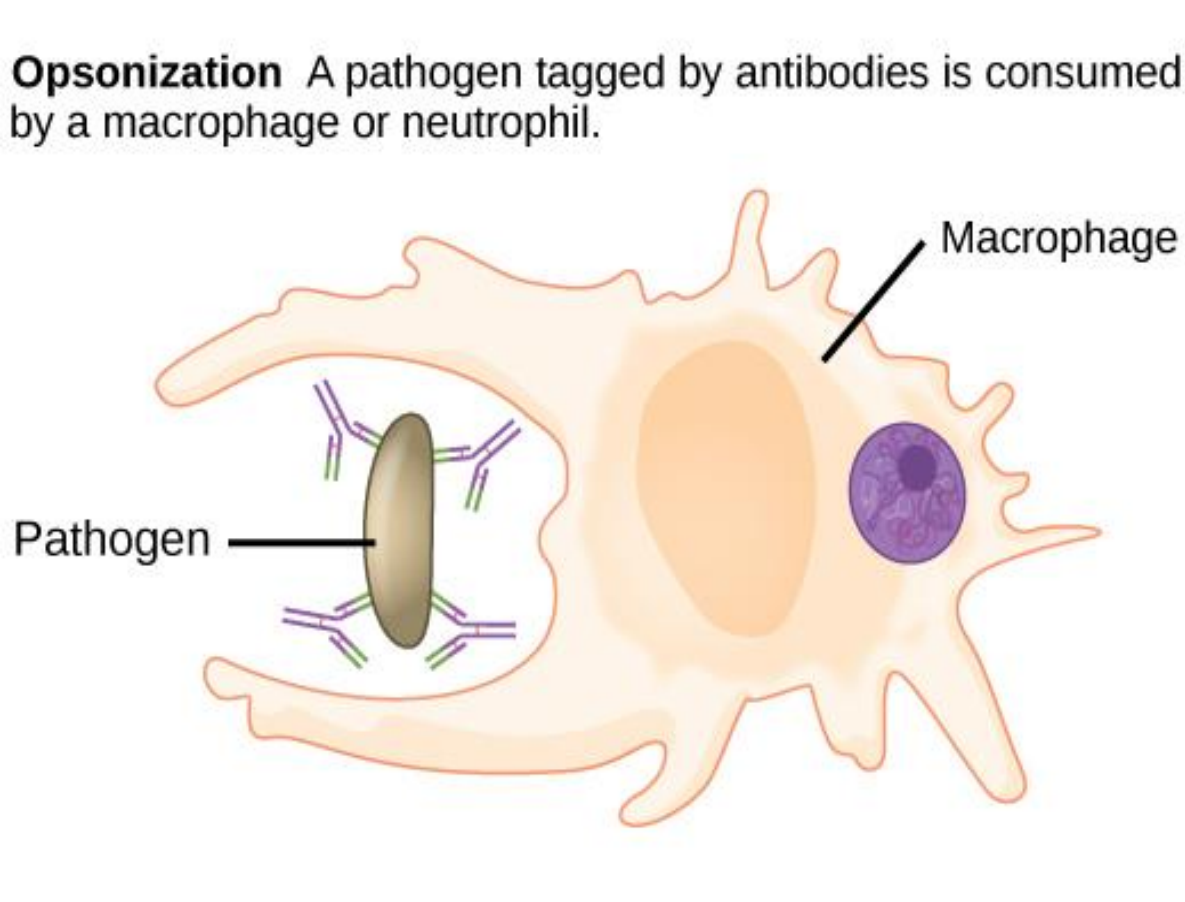


Agglutination: Blood Grouping

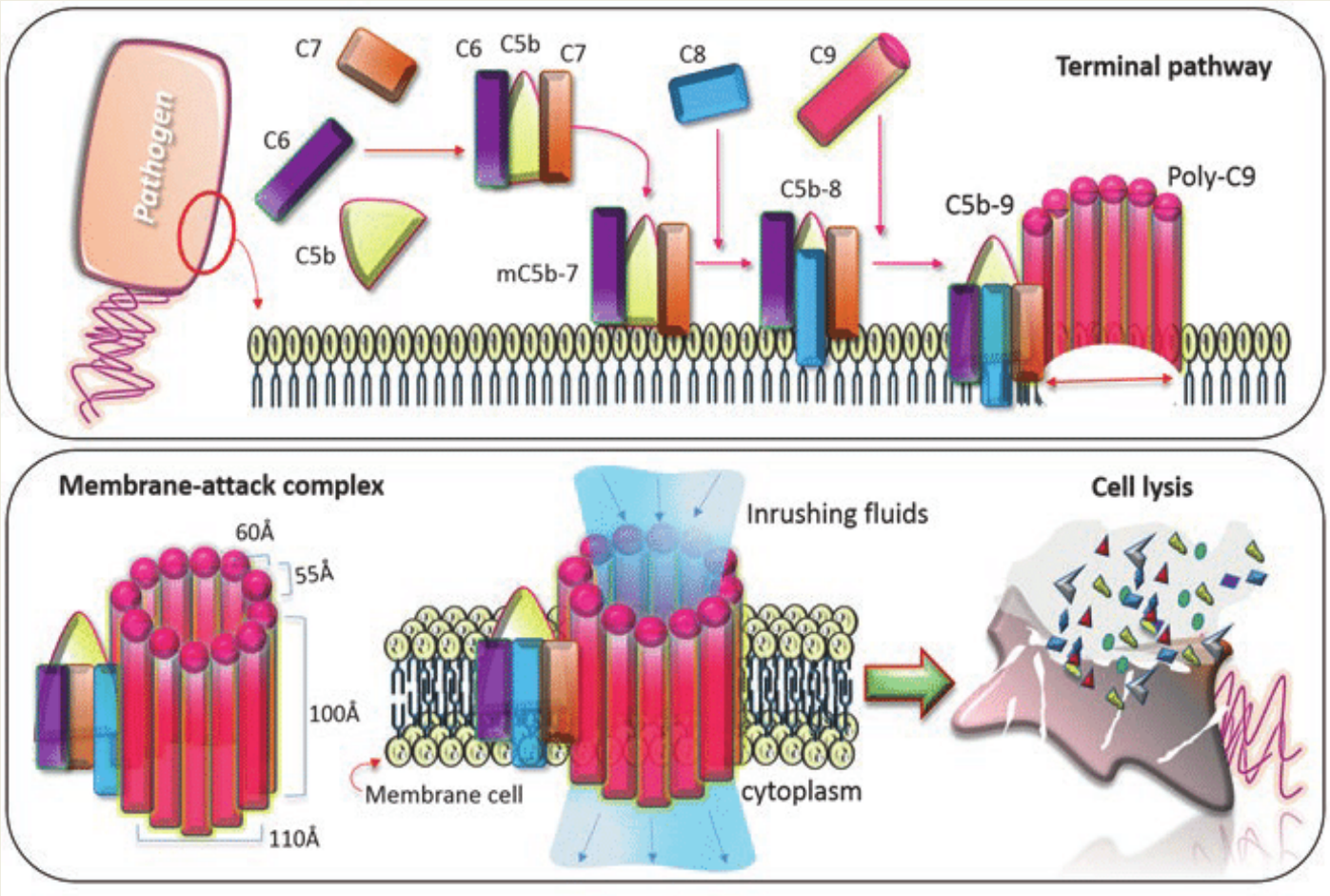
	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies in plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in red blood cell	 A antigen	 B antigen	 A and B antigens	None

Blood group	Red blood cells with protein	Antibody present in plasma
A	A	Anti-B
B	B	Anti-A
AB	AB	Neither
O	neither	Anti-A and Anti-B

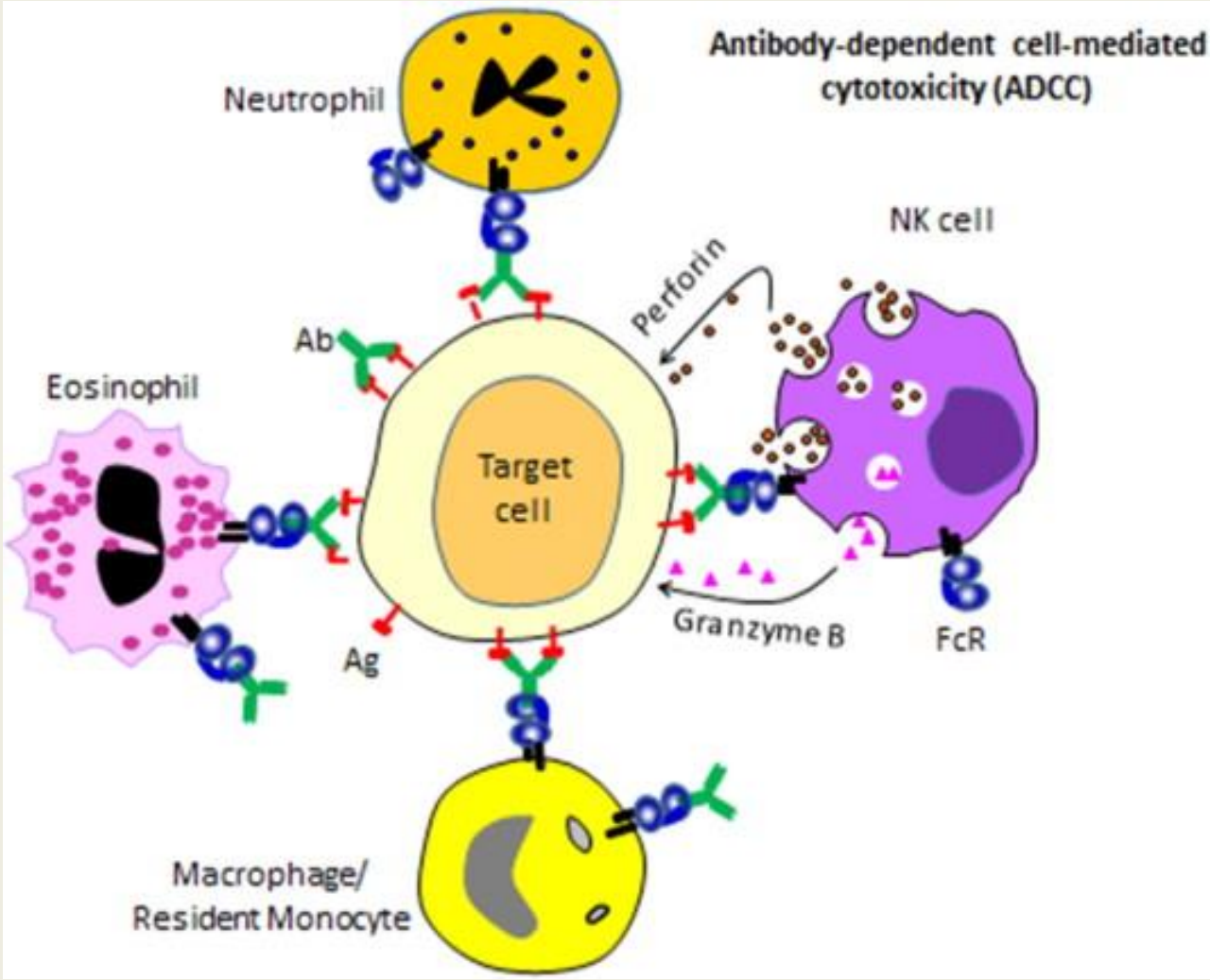
Opsonisation

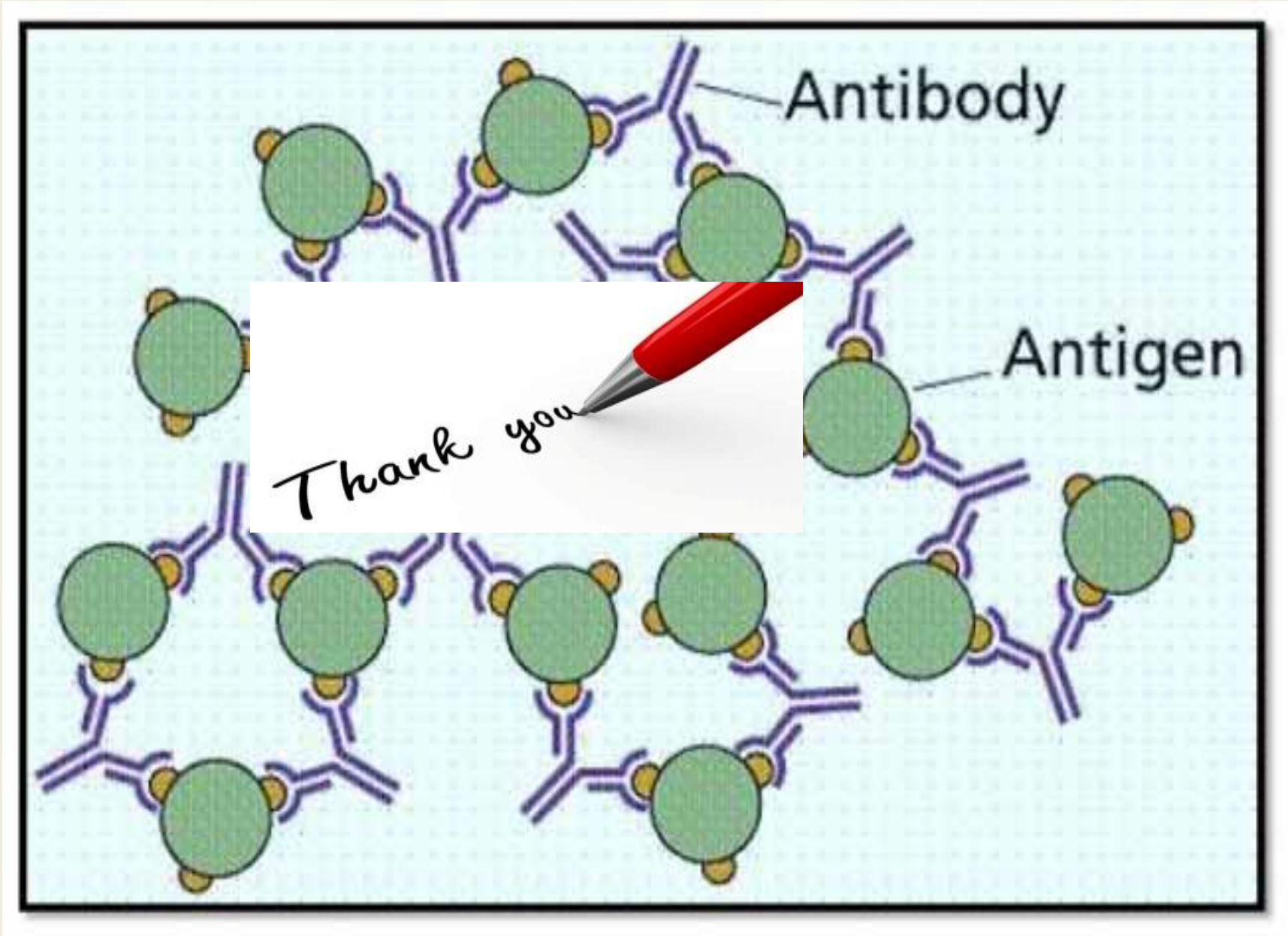


Compliment Fixation



ADCC


Antibody-dependent cell-mediated cytotoxicity (ADCC)
Neutrophil
NK cell
Perforin
Ab
Eosinophil
Target cell
Granzyme B
FcR
Ag
Macrophage/
Resident Monocyte


Antibody
Antigen
Thank you