A study material for M.Sc. Biochemistry (Semester: III) Students
on the topic (CC-12; Unit II)

Antibody Mediated Effector Functions

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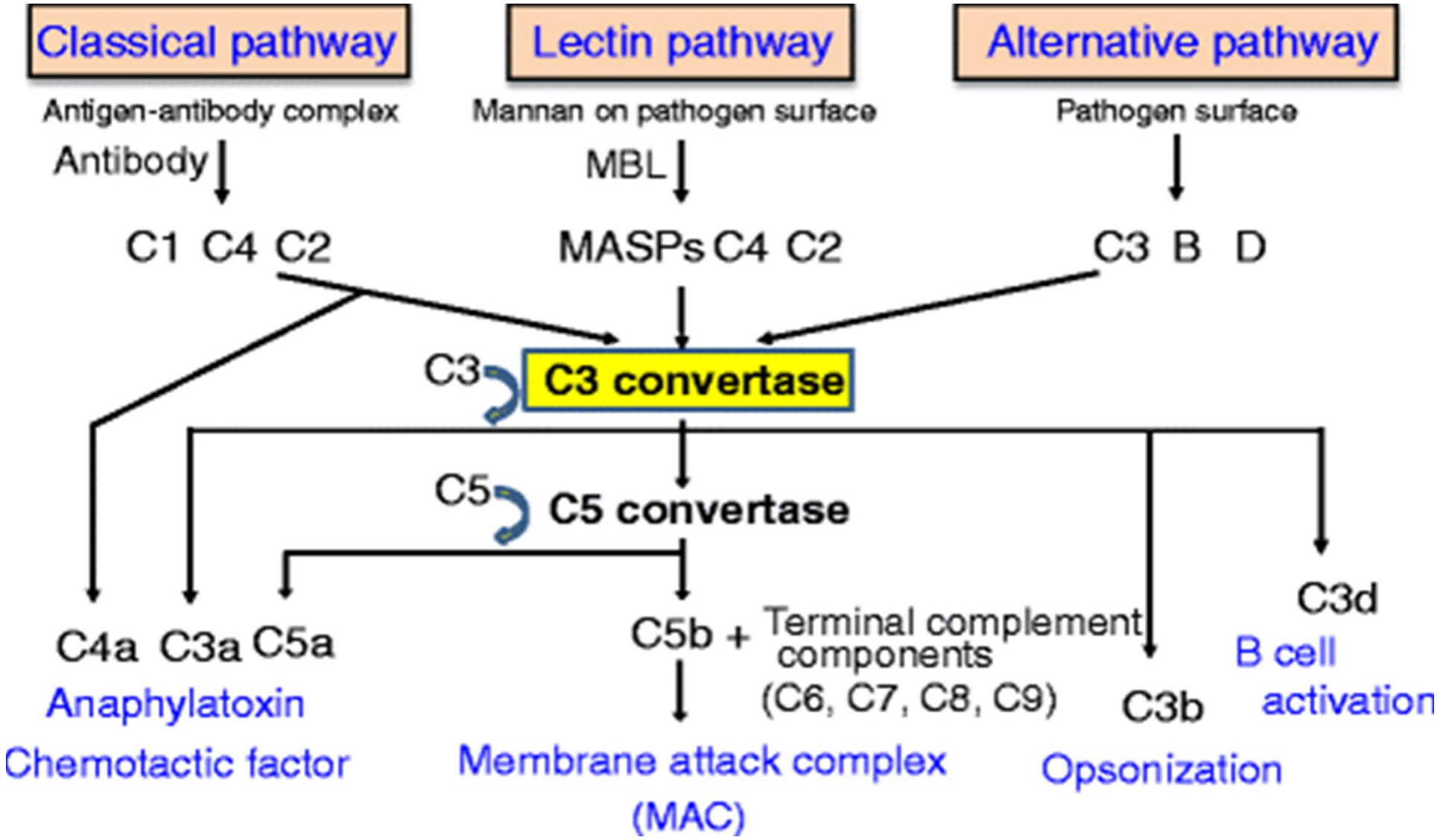
Complement Activation

There are three pathways of activation of Complement system, in which the Classical Pathway is based on Antibody

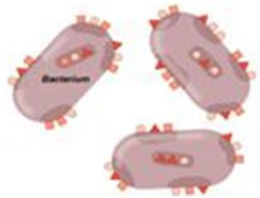


Membrane attack complex

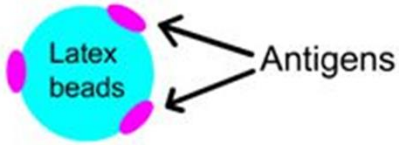
- Cleavage of C5 into C5a and C5b.
- C5 (structurally homologous to C3 and C4, lacks internal thioester bond)
- C5b initiates formation of MAC (complex of C5b, C6, C7, C8 and multiple C9 molecules) binds to C6, and C7 , recruits C8 and complex penetrates more deeply into the membrane.
- C9, a pore-forming molecule with homology to perforin. The complex of C5b678 forms a nidus for C9 binding and polymerization
- Penetrates membrane bilayers to form pores
- Disrupt the osmotic barrier, leading to swelling and lysis of susceptible cells.

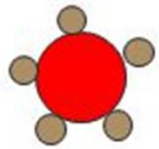
Agglutination

- The interaction between antibody and a particulate antigen results in visible clumping called agglutination
- Particulate antigen include:
  - bacteria,
  - white blood cells,
  - red blood cells,
  - latex particles
- Antibodies that produce such reactions are called agglutinins
- If an agglutination reaction involves red blood cells, then it is called hemagglutination



Antigens (Bacteria)



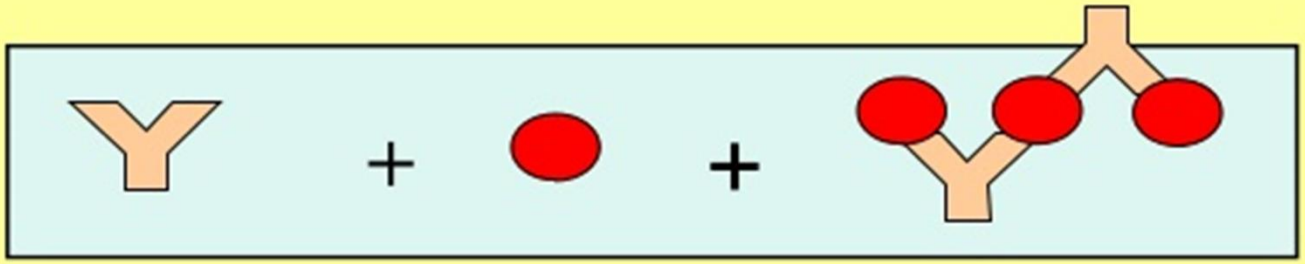


RBCs Antigens

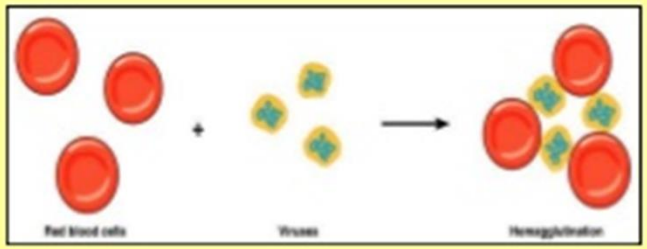
Hemagglutination test

– **Agglutination reactions using red blood cells.**

Qualitative agglutination test - Antigen or Antibody.

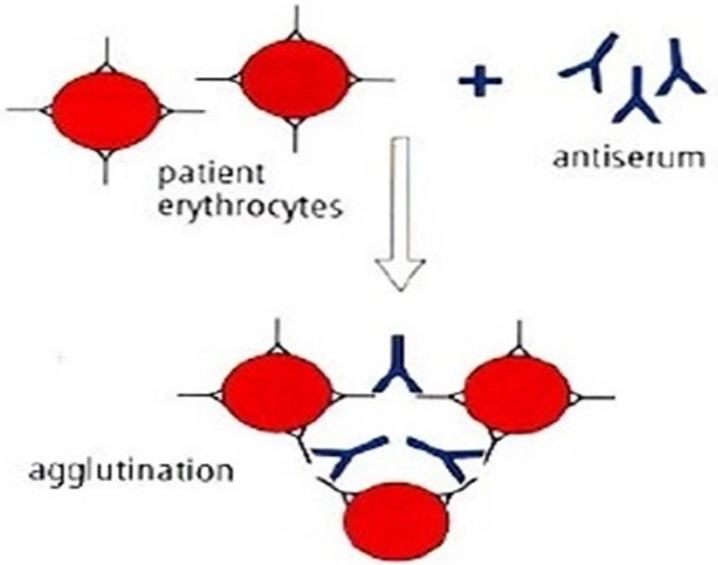


- Applications
  - – Blood group typing
  - – The identification of viruses.
  - – The diagnosis of certain diseases (Bacterial infection)



- Practical considerations
  - – Easy & Semi-quantitative test

- **Agglutination** occurs i.e. clumping together of RBCs (due the reaction of antibodies with antigens → special proteins found on the surface of the RBCs)
- Blocks up small blood vessels
- Prevents the flow of blood
- May result in death



	Components	Interaction	Microtiter Results
A	RBCs		No Reaction
B	Virus + RBCs		Hemagglutination
C	Virus + Antibody + RBCs		Hemagglutination Inhibition

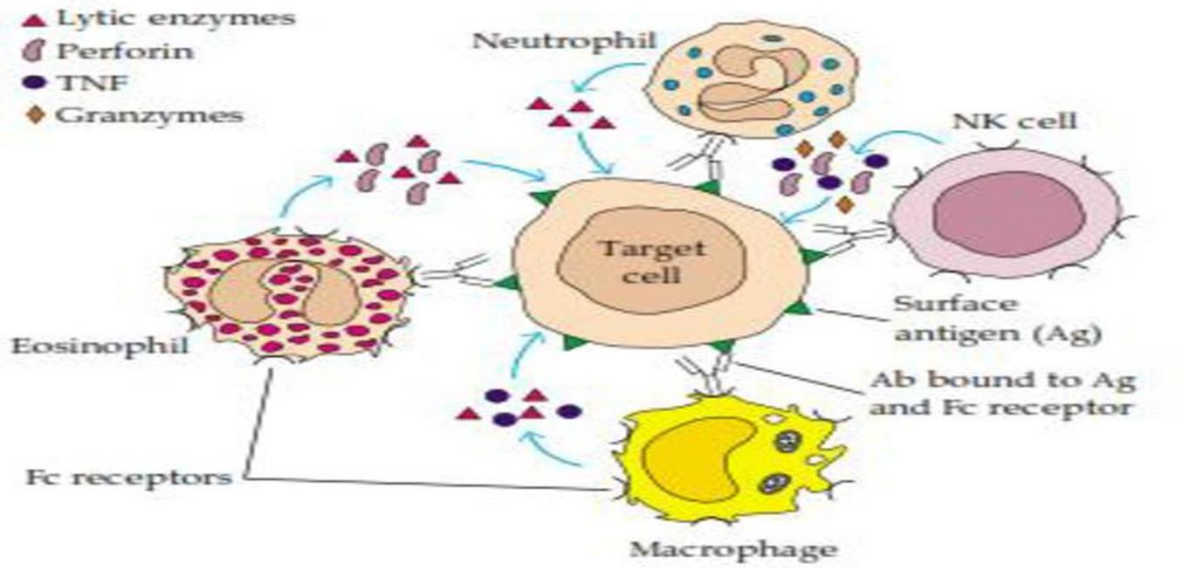
Antibody – Dependent Cell - Mediated Cytotoxicity (ADCC)

- Certain types of cells : Neutrophils, Eosinophils, NK cells macrophages have the ability to lyse target cells express membra receptors for Fc region of antibody molecule

- These cells are not specific against this antigen (Virus or parasit

- ADCC does not involve complement - mediated lysis but appea to involve a number of different cytotoxic mechanisms similar to th performed by cytotoxic T - cells including release of lytic enzyme perforin , TNF - α & granzymes

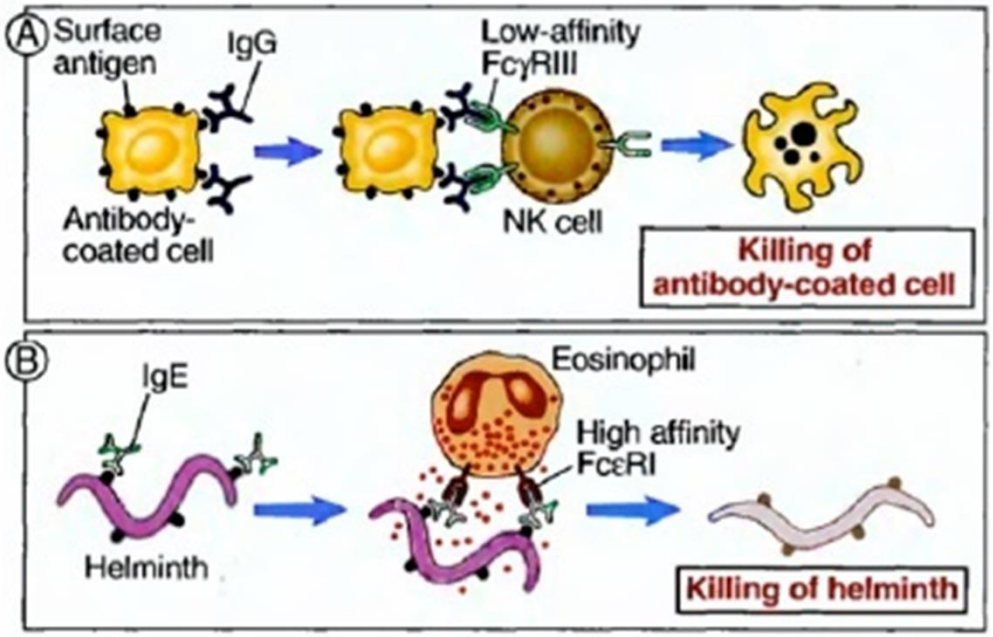
ANTIBODY DEPENDENT CELL MEDIATED CYTOTOXICITY (ADCC)

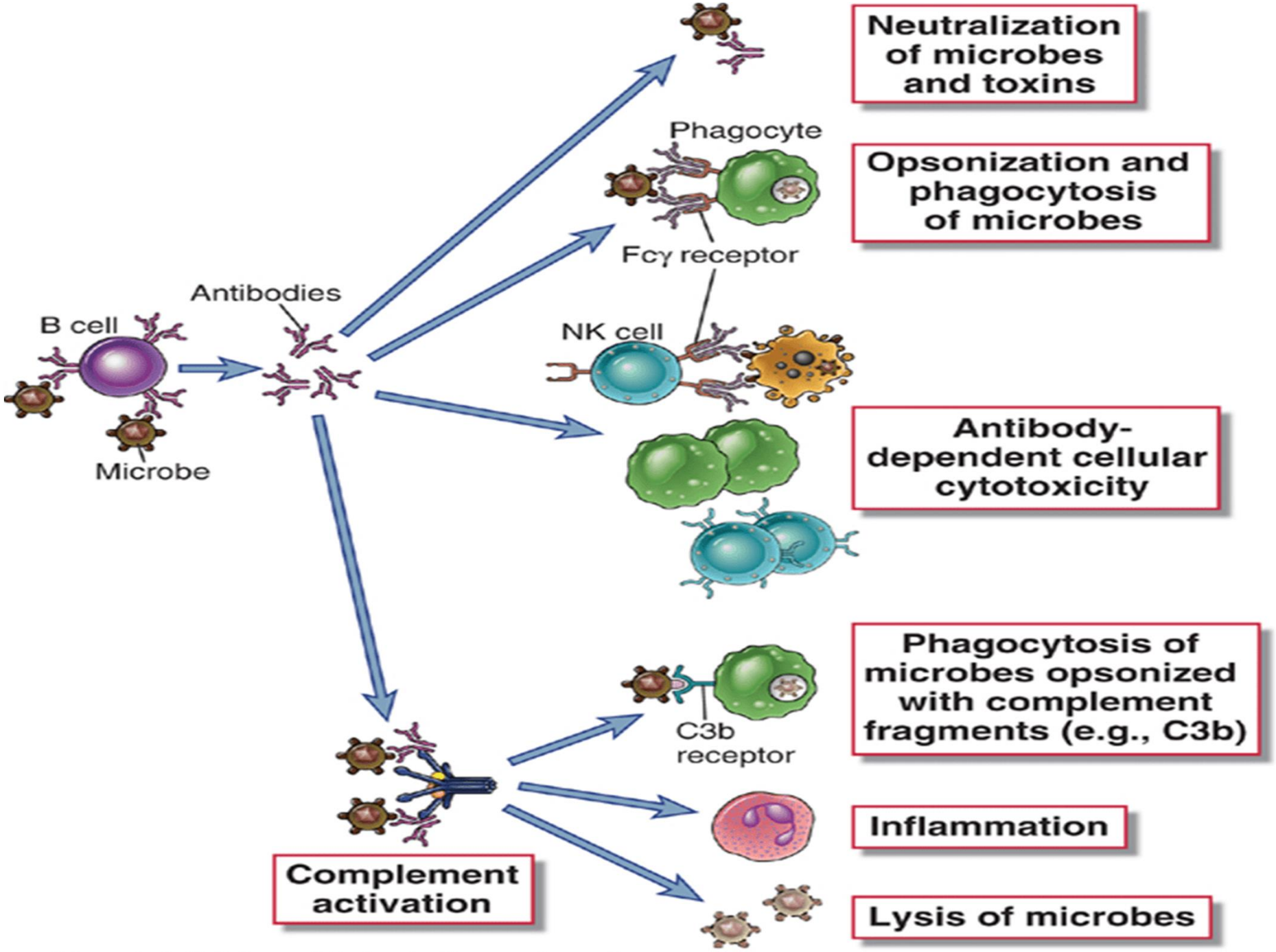


- Mediated by leucocytes like monocytes, neutrophils, eosinophils & NK cells.
- Antibodies involved - mostly IgG
- The cellular injury occurs by lysis of antibody-coated target cells through Fc receptors on leucocytes.
- The *examples* of target cells killed by this mechanism are tumour cells, parasites etc.

ANTIBODY-DEPENDENT CELLULAR CYTOTOXICITY (ADCC)

- natural killer cells (NK) and other leukocytes may bind to antibody-coated cells and destroy these cells
- important in helminth infections
    - helminths are too large to be phagocytosed
    - thick teguments resistant to substances released by phagocytes (neutrophils and macrophages
    - ***<u>IgE and eosinophil tandem</u>***





Acknowledgement and Suggested Readings:

1. Kuby Immunology; Sixth Edition; Kindt, Goldsby and Osborne; W. H. Freeman and Company
2. Fundamental Immunology; 5th edition; William E., Md. Paul (Editor) ; Lippincott Williams & Wilkins Publishers
3. Roitt's Essential Immunology; Tenth Edition; Roitt and Delves; Blackwell Science
4. Cellular and Molecular Immunology; 6th Edition; Abbas, Lichtman and Pillai; Saunders Elsevier

Thanks