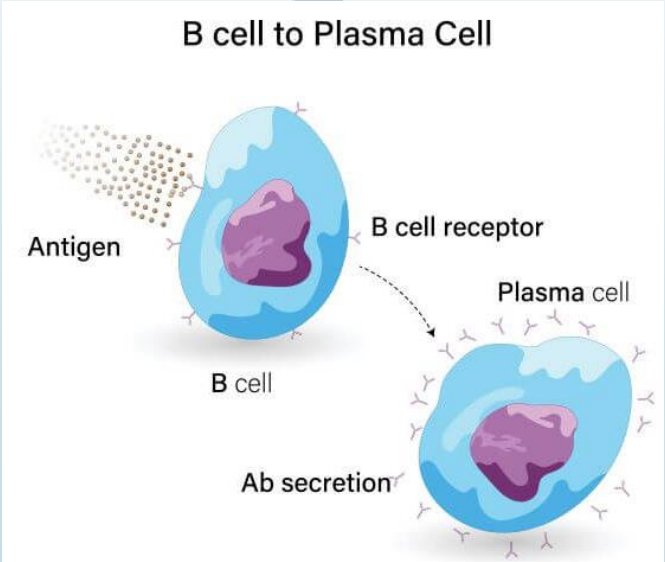
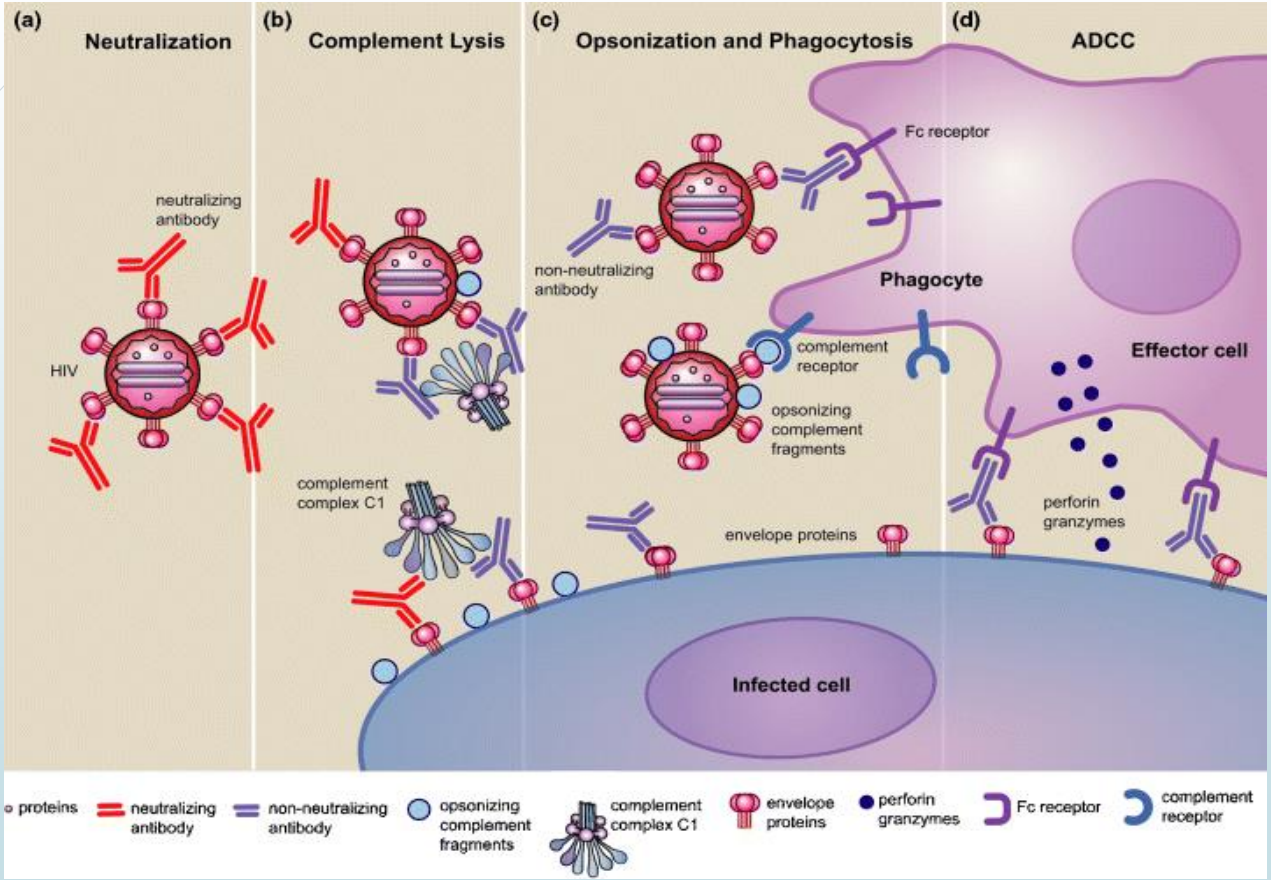
Document 5

Specific Humoral Immune Response

- The specific humoral immune response involves the action of antibodies against antigens.
- **Effector molecules:** Antibodies (produced by plasma cells)
- **Effector cells:** plasma cells



- **Mode of Action of Antibodies (secreted to blood) Against Pathogens:**

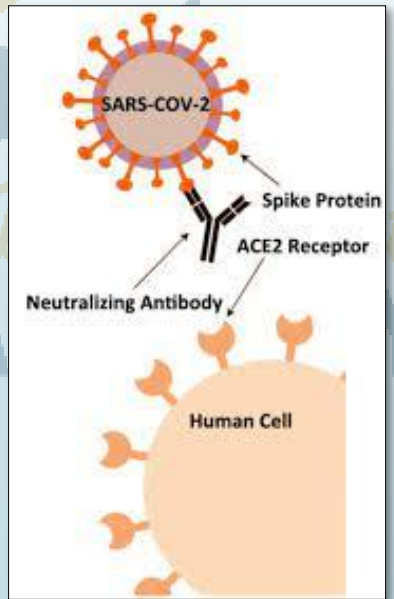


I. Neutralization (Doc.a and b, p.146):

• A variety of toxins that threaten human health can be found in nature, such as toxins of snake venom, those of poisonous mushrooms and microbial toxins. Antibodies are very efficient against circulating toxins:

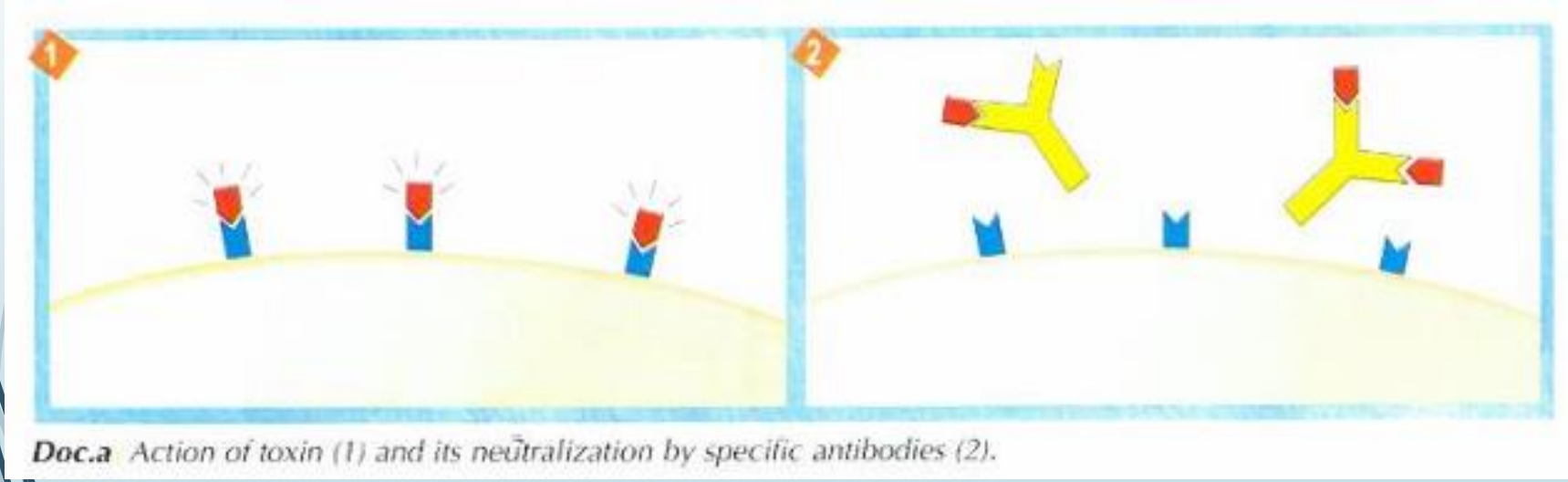
Toxins that enter the body attach to target cells, through membrane receptors, and alter their functions, each in a different way ***(Doc.a1).***

Antibodies that are specific for a given toxin bind to it and cover its attachment site for the target cell, thus preventing its action. They are said to neutralize the toxin ***(Doc.a2).***



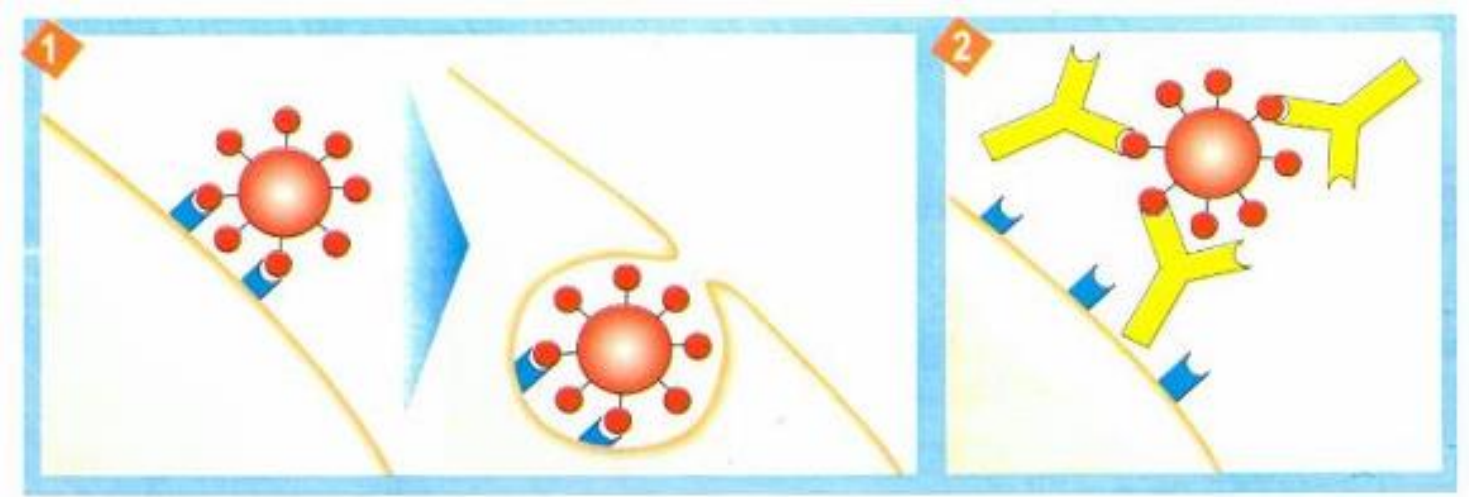
I. Neutralization (Doc.a and b, p.146):

- In this case, the antigen is neutralized but not eliminated. The antibodies bind to a specific toxin (doc a), thus preventing it from penetrating into the target cell. So the action of the antigen is stopped or neutralized.



Doc.a *Action of toxin (1) and its neutralization by specific antibodies (2).*

- In this case, the antigen is neutralized but not eliminated. The antibodies bind to an intracellular virus (doc b), thus preventing it from penetrating into the target cell. So the action of the antigen is stopped or neutralized.

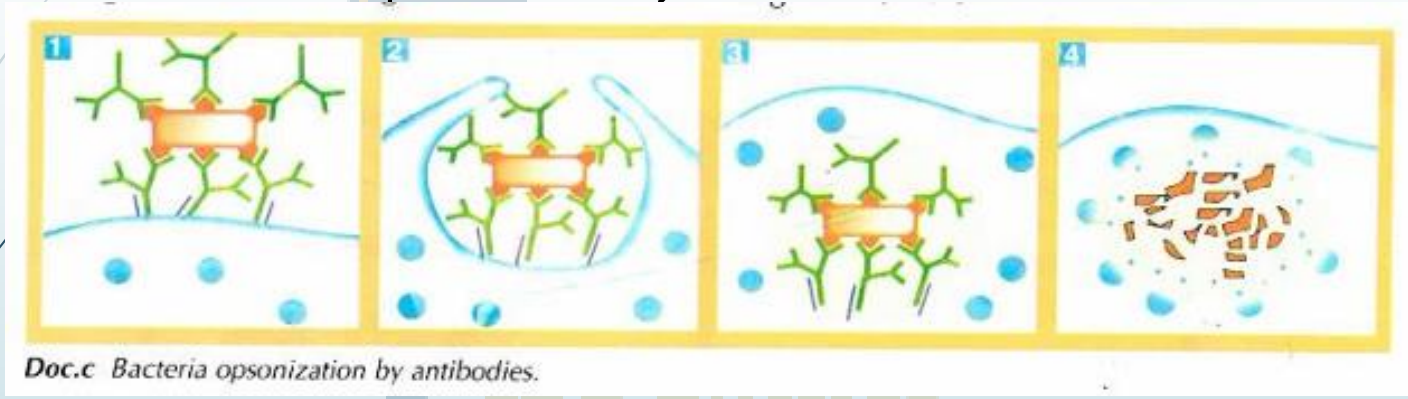


Doc.b *Inhibition of a virus attachment to a target cell.*

II. Elimination of Intruder (destruction):

1) Opsonization (doc c p:147):

- Doc.c shows bacteria opsonization by antibodies.

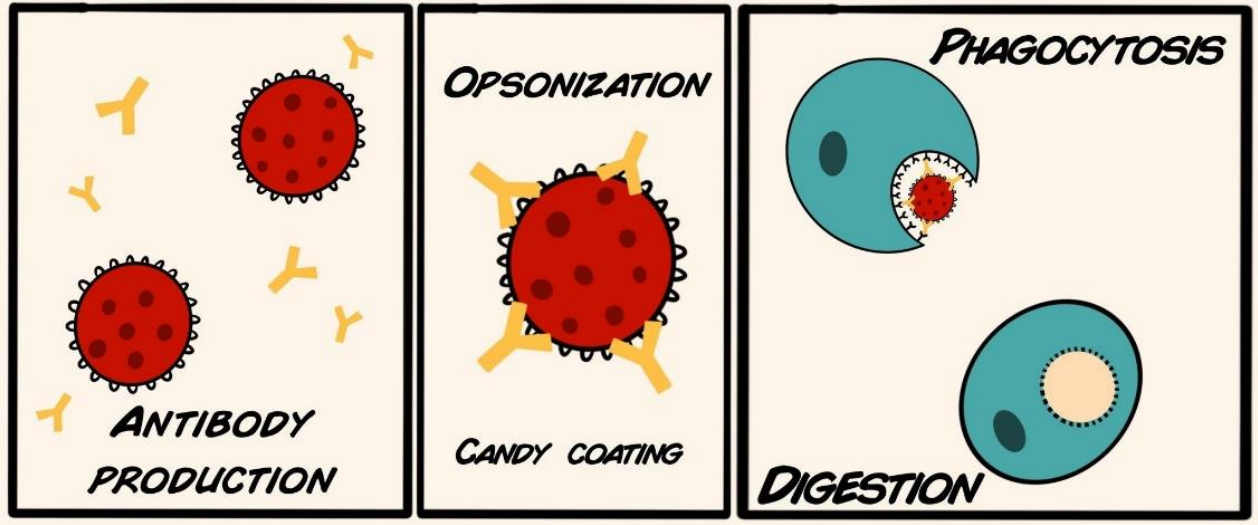


Doc.c *Bacteria opsonization by antibodies.*

- When the antibody binds to its specific antigen, it forms an antibody antigen complex. Then, it binds on specific receptor on the surface of macrophage or phagocyte, through their constant region.

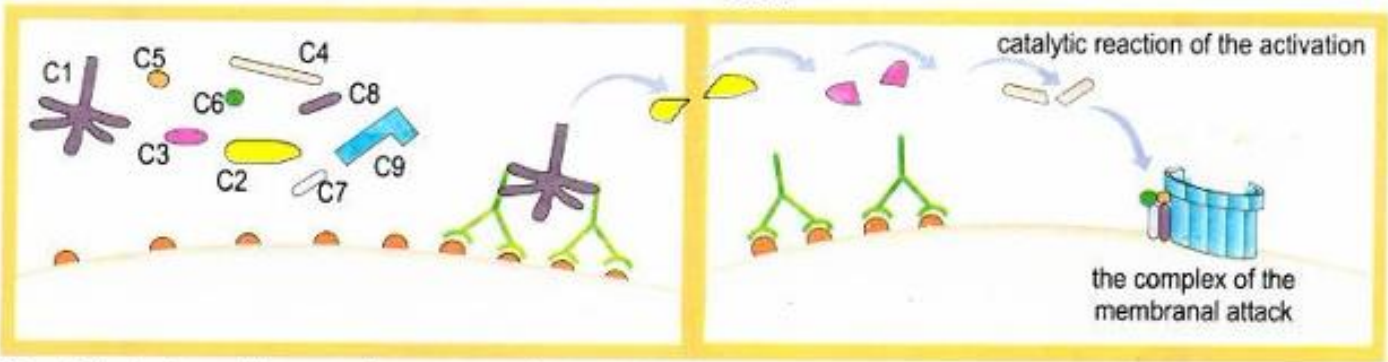
→As a result, the phagocyte will engulf the antibody antigen complex and eliminate it.

*In this case, there is cooperation between nonspecific and specific immunity, and there is shift from specific to non-specific immunity.



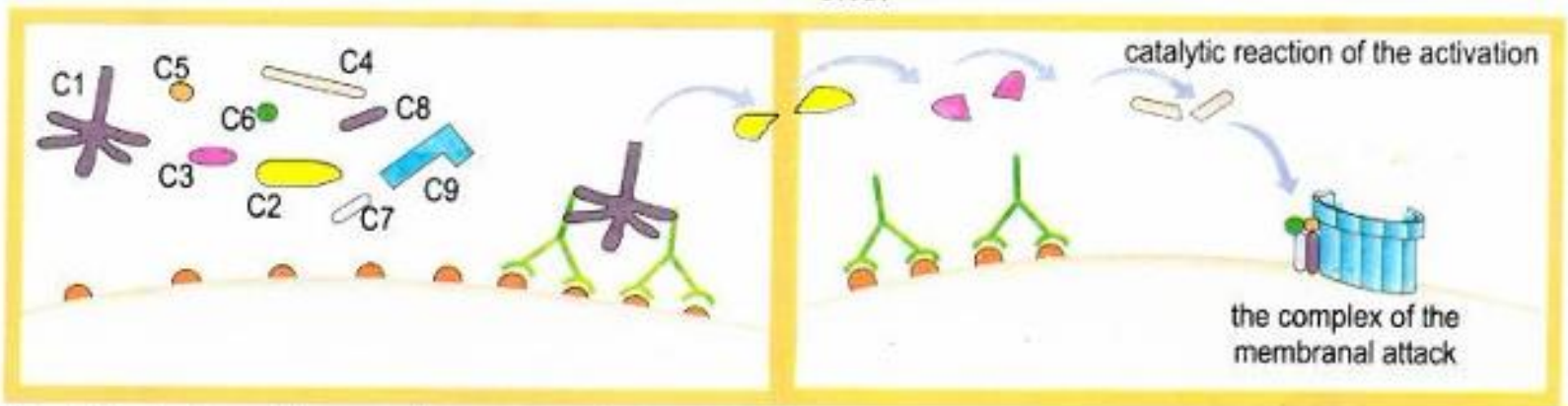
2) Complement system activation or complement cascade.

- Doc d p:147



Doc.d *Activation of the complement cascade by antibodies.*

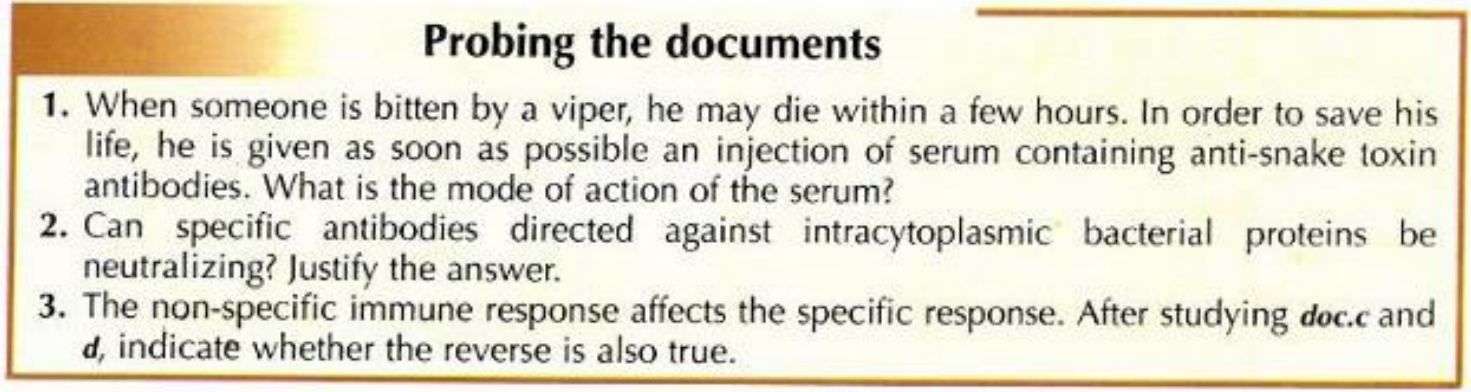
- The complement system is a set of plasma proteins from C1 to C9 that activate each other.
- This system is activated when antibodies with bound antigens on the surface of the target cell, bind by their constant region to the complements C1, which in turns activates other complements by cascade reaction (C1 activates C2 which activates C3….C9)



Doc.d *Activation of the complement cascade by antibodies.*

- This cascade leads to the formation of a membrane attack complex that perforates the antibody bound target cell, causing its death.
- Complement C5 is a chemotactic factor that attracts phagocytes to the site of inflammation and induces inflammation.

- **Probing the documents: p.147**



Probing the documents

1. When someone is bitten by a viper, he may die within a few hours. In order to save his life, he is given as soon as possible an injection of serum containing anti-snake toxin antibodies. What is the mode of action of the serum?
2. Can specific antibodies directed against intracytoplasmic bacterial proteins be neutralizing? Justify the answer.
3. The non-specific immune response affects the specific response. After studying ***doc.c*** and ***d***, indicate whether the reverse is also true.

1. To neutralize the snake venom antigens.

This process of administration of specific antibodies is called serotherapy.

3. Yes, in doc c **specific antibody** bound to bacteria can bind to macrophages through their constant region and cause phagocytosis which is **non specific.**