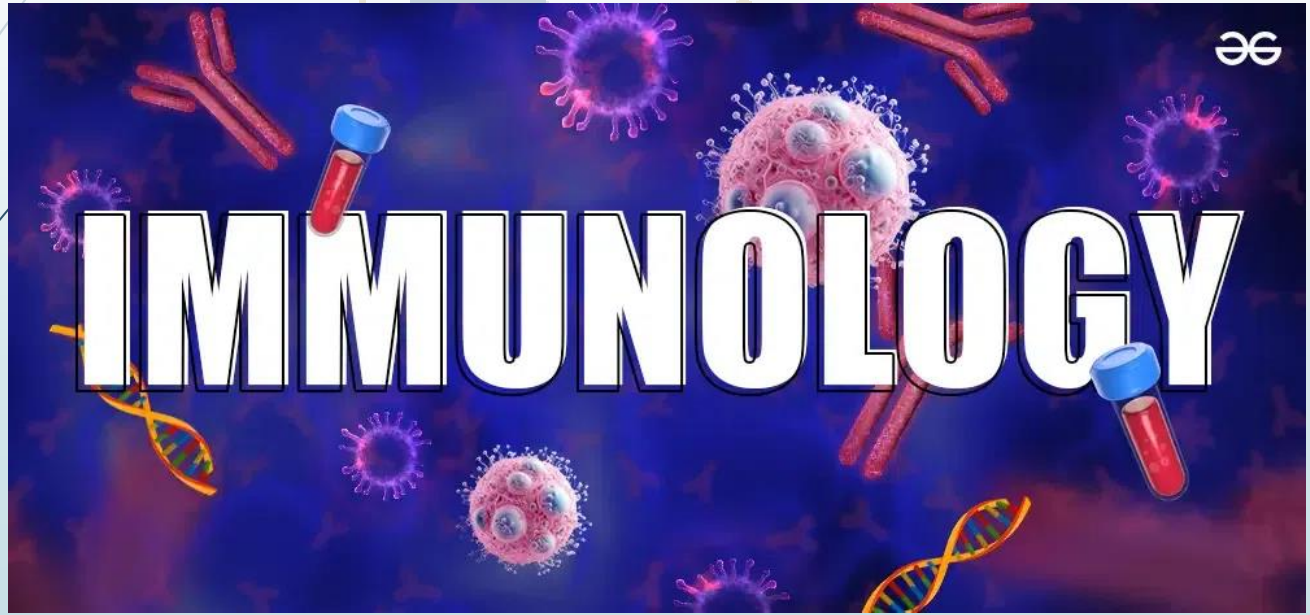
Part II

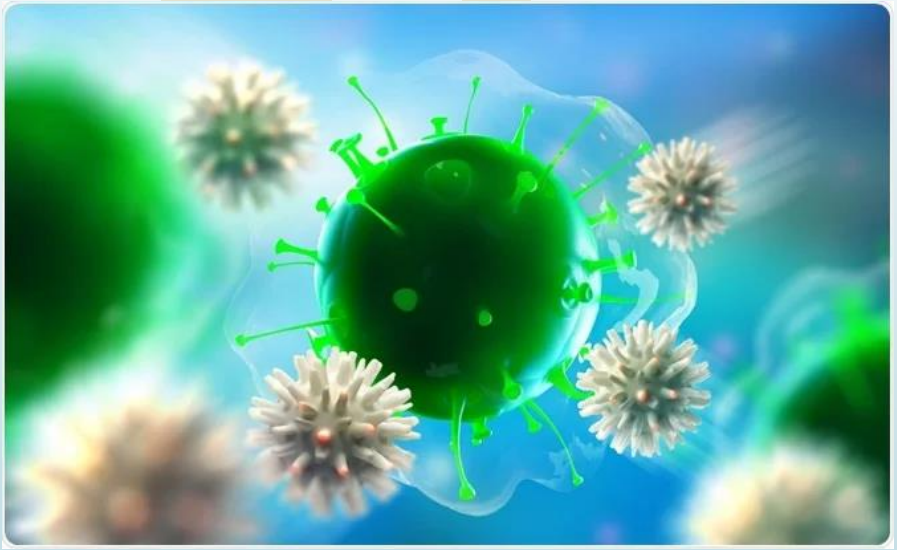


Chapter 7: The Immune Response

- Document 1: Non-specific Immune Response
- Document 2: Specific Immune Response
- Document 3: Induction of the Specific Immune Response
- Document 4: Role of TH in the Specific Immune Response
- Document 5: Specific Humoral Immune Response
- Document 6: Specific Cell-Mediated Immune Response
- Document 7: Immunological Memory
- Document8:Diagnostic Applications of Antibody Properties
- Selected Exercises of Official Exams

Document 1

Non-specific Immune Response



- **Immune response:** is the reaction done by the immune system against a non-self.

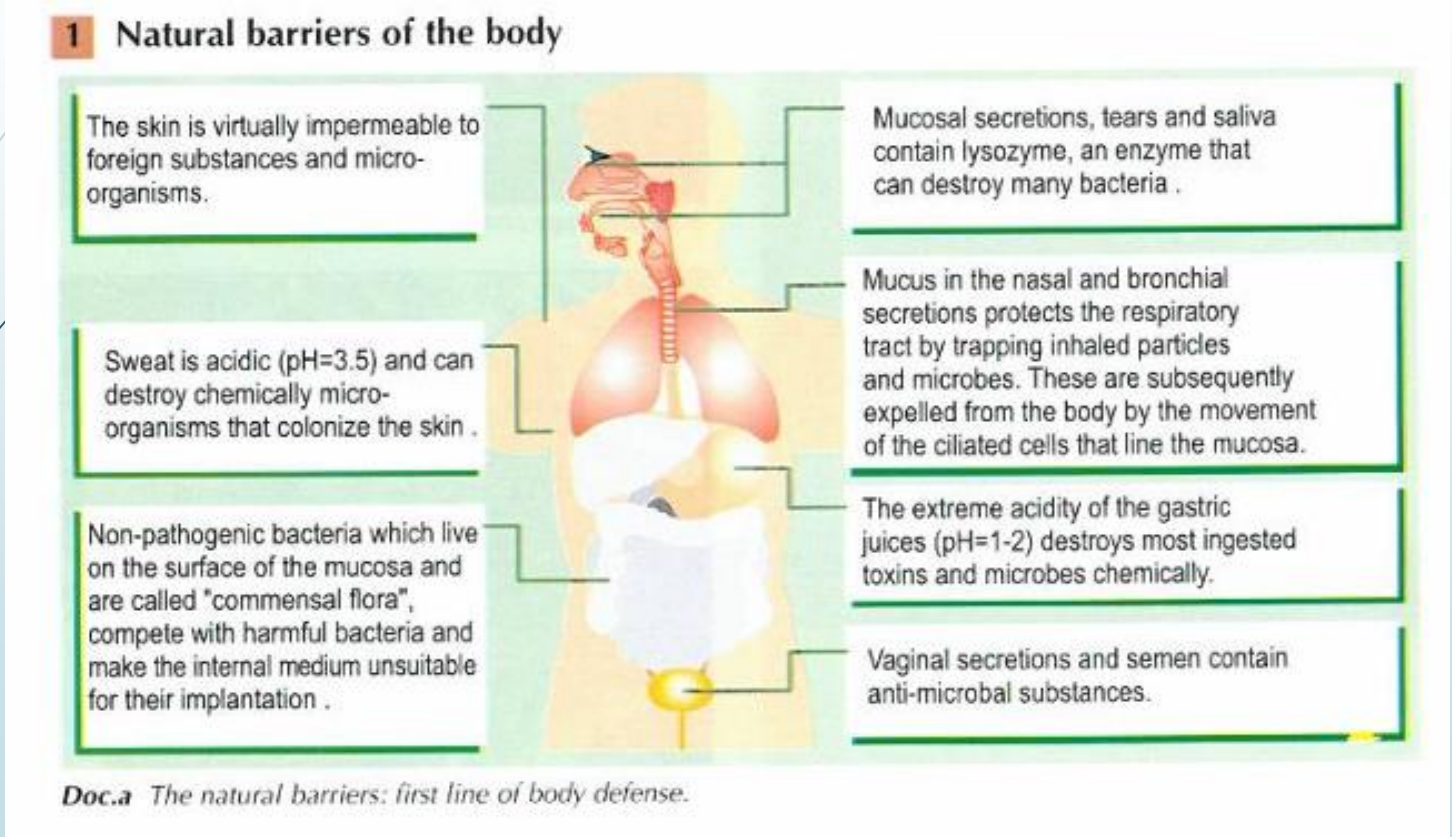
  - It may be specific or non-specific.

- **There are three lines of defense in the body:**

1- Natural barriers: First line of defense in the body.
2- Non-specific immune response: 2nd line of defense in the body.
3- Specific immune response: 3rd line of defense in the body.

I. Natural Barriers of the Body

- Study Doc.a, p.138.



Doc.a *The natural barriers: first line of body defense.*

I. Natural Barriers of the Body

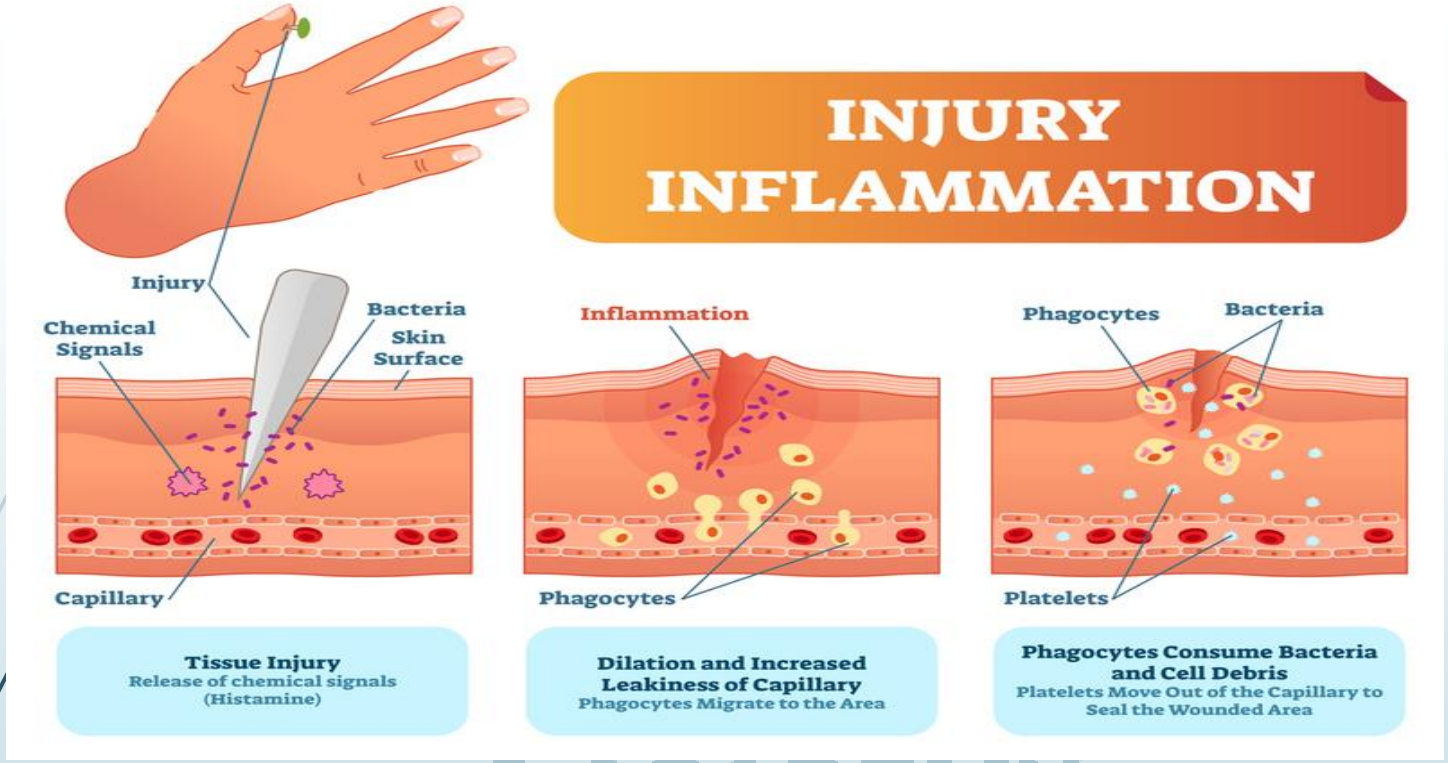
- They prevent the entrance of foreign antigens into the body.
- They can be classified into:
  - → Mechanical barriers: ex.skin.
  - → Chemical barriers: ex. acidity in stomach and sweat.
  - → Biological barriers:

Example: beneficial bacteria, non-pathogenic bacteria found in the small intestine.

II. Manifestations of a Non-specific Immune Response

- The non-specific immune response does not depend on the identity of the intruder. It attacks all the antigen in the same way.

- When there is a cut of the natural barriers, then the microbe will be able to cross this barrier and enter the body, where it will multiply and causes infection followed by inflammation.



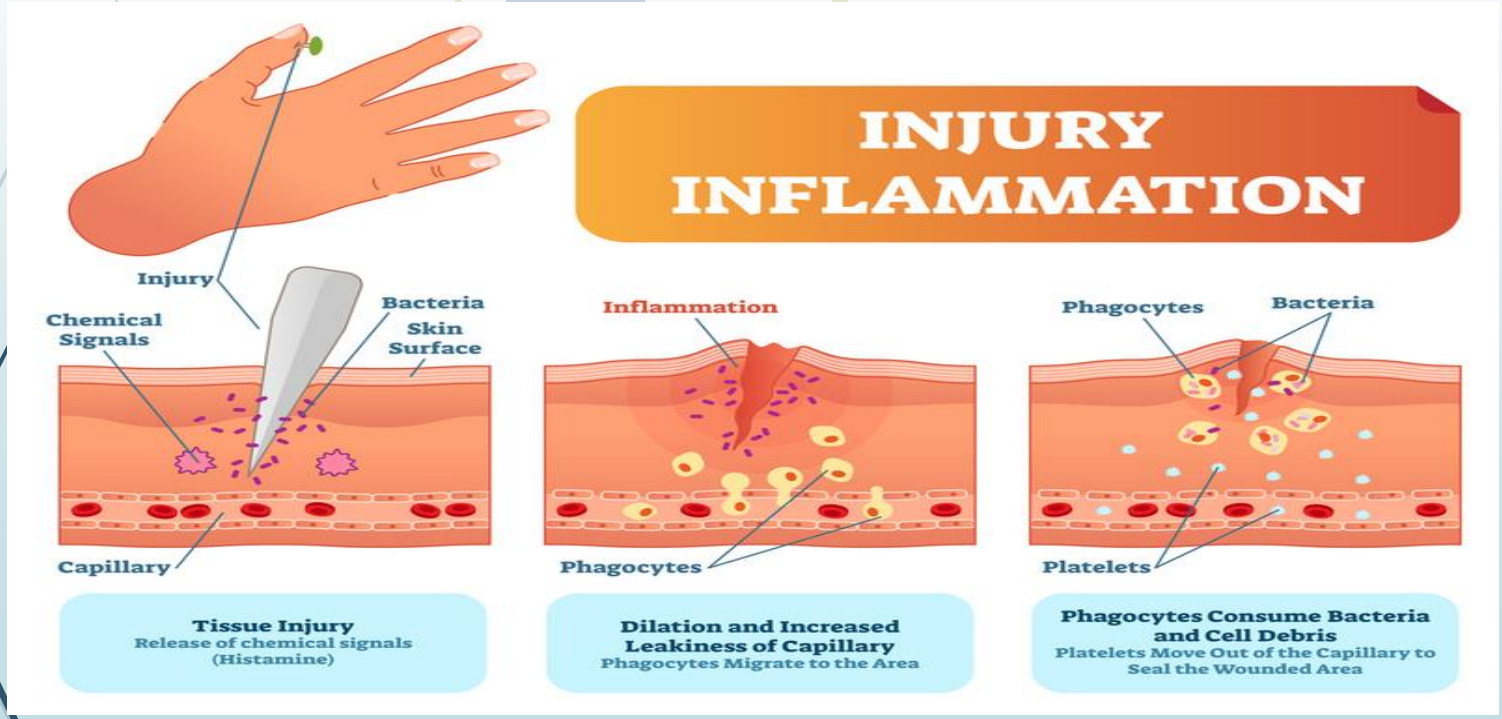
- **During inflammation:**

→ Infected cells will release chemical molecules into the blood called **cytokines.**

→ Release of cytokines into the blood causes: redness, heat, and swell (edema).

- **Signs of inflammation:**

1. **Pain:** due to the stimulation of nerves (nociceptors).
2. **Redness:** due to dilation of blood capillaries.
3. **Heat:** due to the increase in blood flow.
4. **Edema:** due to leak out of plasma to the inflamed area from the capillary.



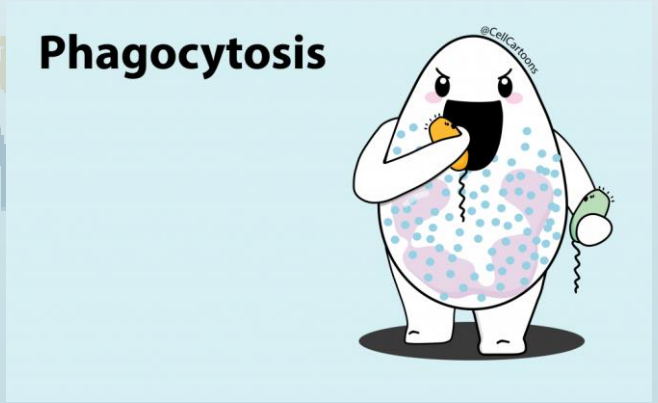
* Characteristics of Inflammatory Reaction:

→ Rapid

→ Local

→ Non-specific

***Effector cells:** granulocytes and macrophages.



- Doc.b, p.139 shows the steps taking place during an inflammatory reaction:

Doc.b *Inflammatory reaction.*

1. Release of cytokines by infected cells.
2. Diapedesis: is the cross of monocytes and granulocytes of the capillary wall (blood vessel) and their migration into the inflamed tissue.

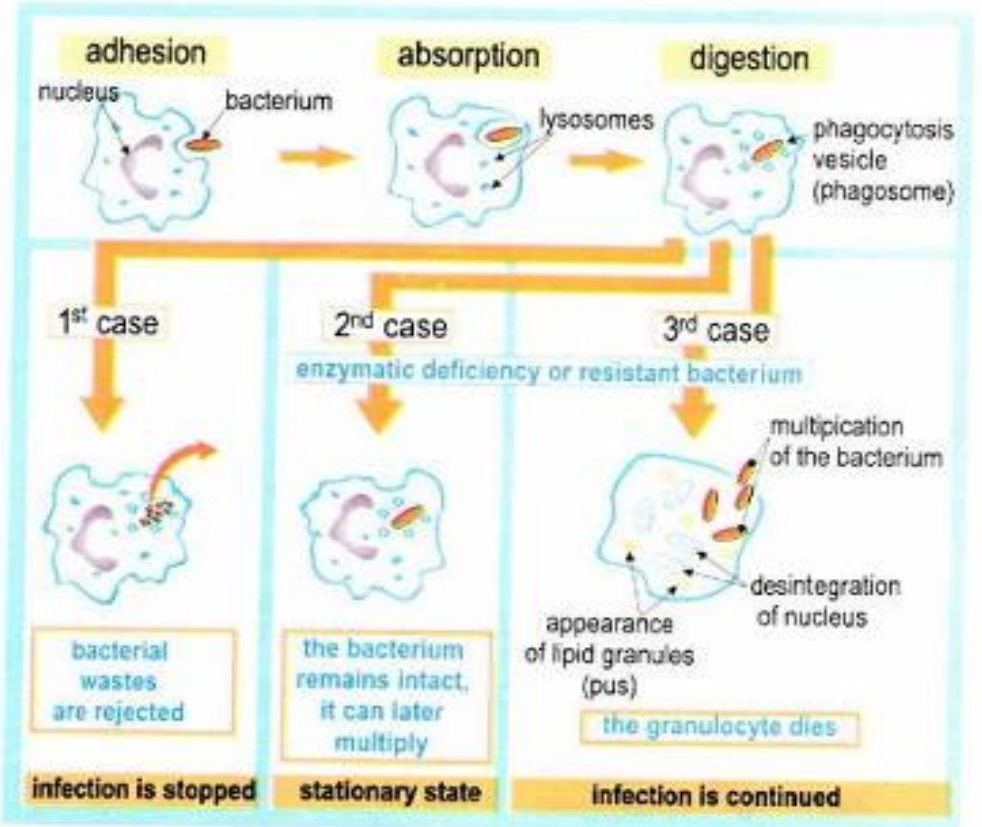
Chemotactic process: is a process by which cells are attracted chemically. ex: cytokines attract phagocytes to the inflamed area.

3. **Phagocytosis:** is a non-specific immune response by which phagocytes (macrophages and granulocytes) eliminate the intruder.

* Steps of Phagocytosis: Doc.c, p.139.

1) Attraction, approaching and adhesion.
2) Absorption (engulfing).
3) Digestion and hydrolysis of the microbe: a phagocytosis vesicle containing the bacterium is formed called phagosome, where the digestion of the bacteria occurs by enzymes called lysosomes.

-phagosome = bacteria + lysosomes.

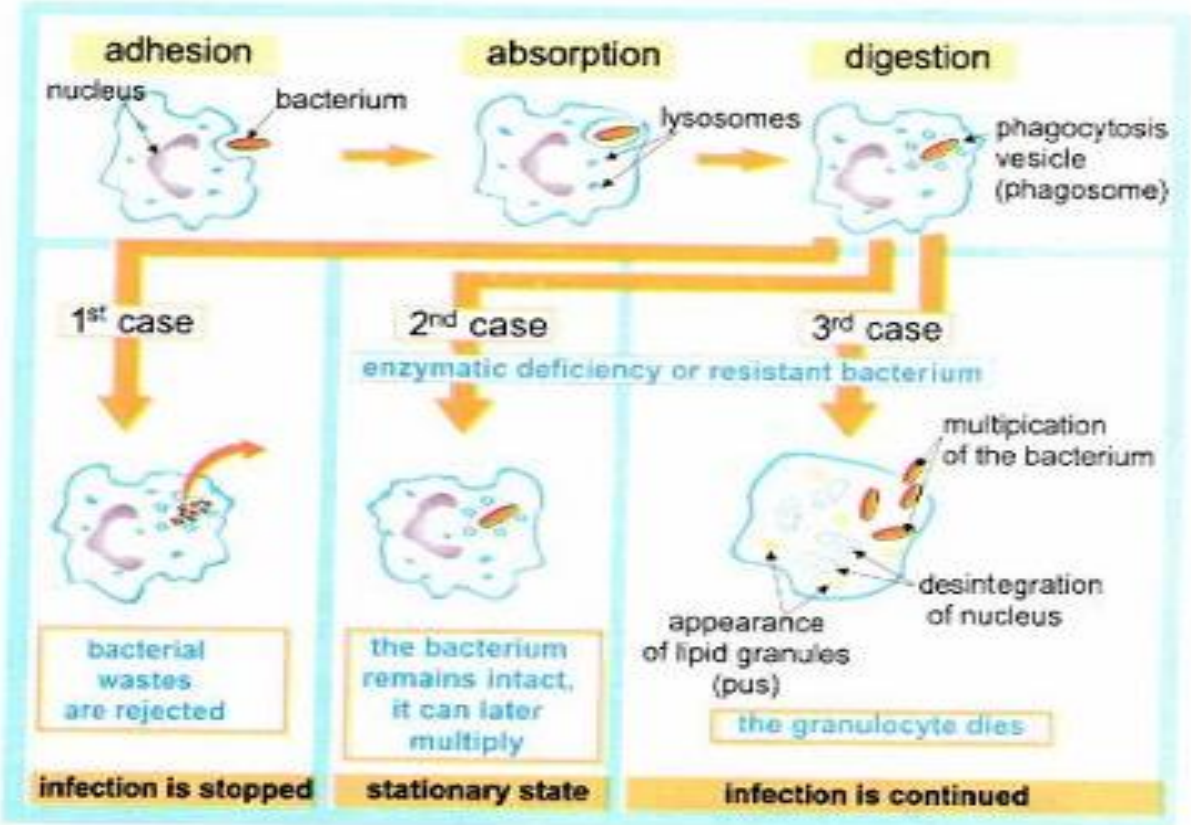


Doc.c *The steps of phagocytosis: adhesion, absorption, digestion.*

*Consequence of Phagocytosis: Doc.c (3 cases)

→ **1st case:**

- Infection is stopped.
- The bacteria are digested by lysosomes and destroyed, where bacterial wastes are released.



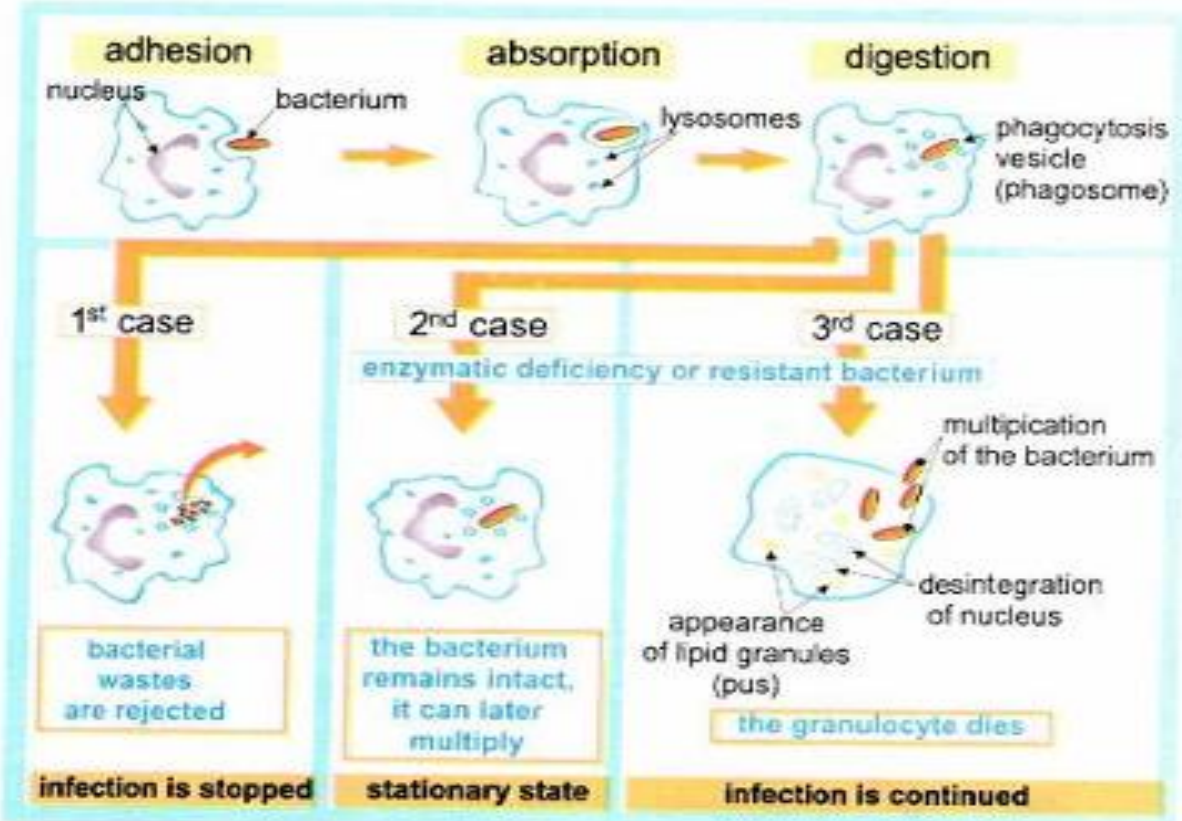
Doc.c *The steps of phagocytosis: adhesion, absorption, digestion.*

*Consequence of Phagocytosis: Doc.c (3 cases)

→ **2nd case:**

- Infection is in a stationary state.

- The bacteria remain intact and it is not destroyed by enzymes called lysosomes. It can multiply later.



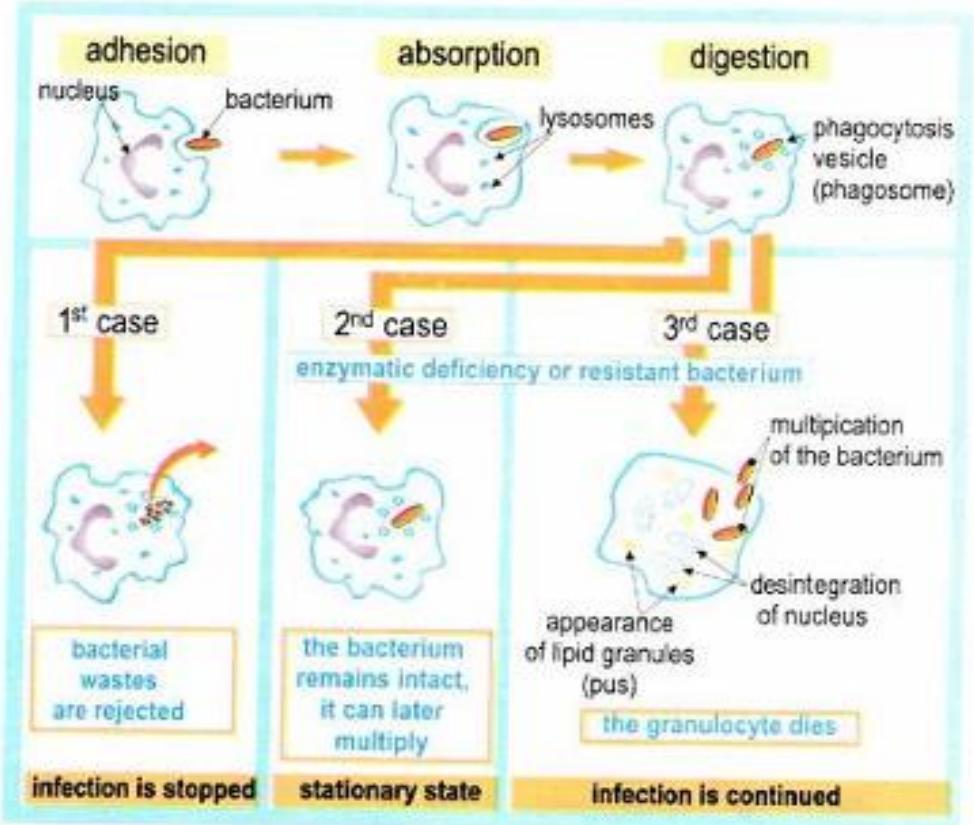
Doc.c *The steps of phagocytosis: adhesion, absorption, digestion.*

*Consequence of Phagocytosis: Doc.c (3 cases)

→ **3rd case:**

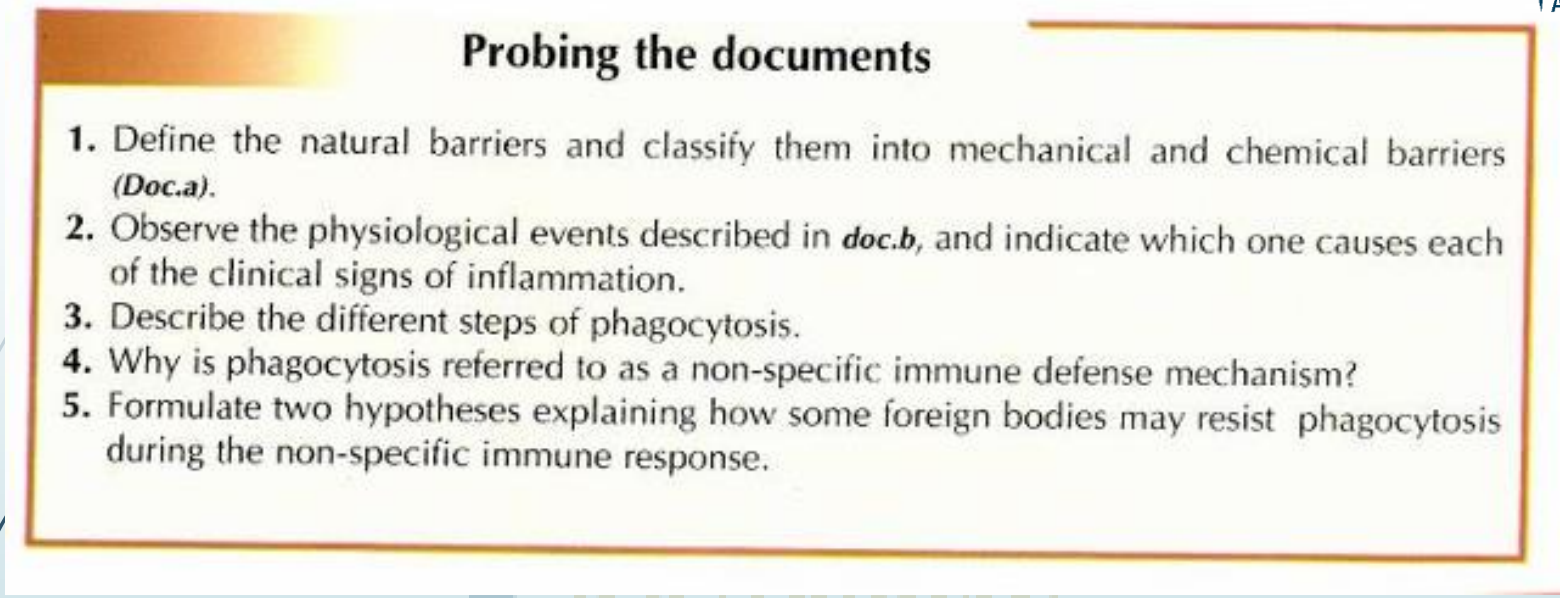
- Infection is continued.
- The bacteria multiply inside the phagocyte and destroy it. So, the phagocyte dies and this result in pus (dead white blood cells).

📌 ***2nd and 3rd cases may occur due to enzymatic deficiency in the lysosomes or due to resistant bacteria.***



Doc.c *The steps of phagocytosis: adhesion, absorption, digestion.*

- Probing the Documents: p.139



Probing the documents

1. Define the natural barriers and classify them into mechanical and chemical barriers *(Doc.a)*.
2. Observe the physiological events described in ***doc.b***, and indicate which one causes each of the clinical signs of inflammation.
3. Describe the different steps of phagocytosis.
4. Why is phagocytosis referred to as a non-specific immune defense mechanism?
5. Formulate two hypotheses explaining how some foreign bodies may resist phagocytosis during the non-specific immune response.

5- Hypothesis 1: Foreign bodies are resistance or virulent.

Hypothesis 2: There is deficiency in lysosomes of phagocytes.