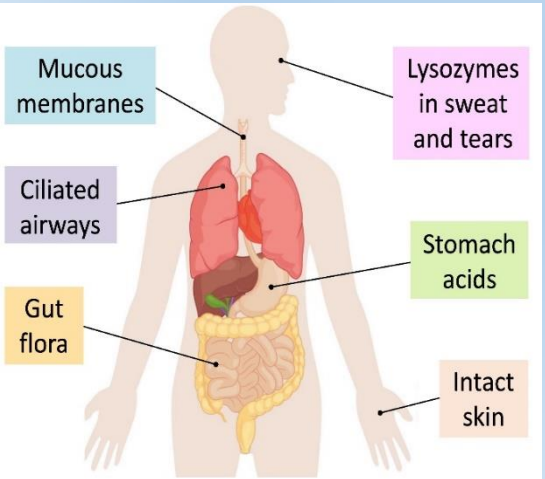
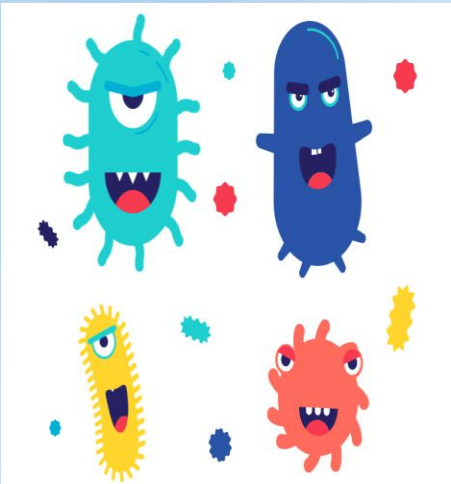

# Biology Grade 8

## Chapter 1: The Immune Response

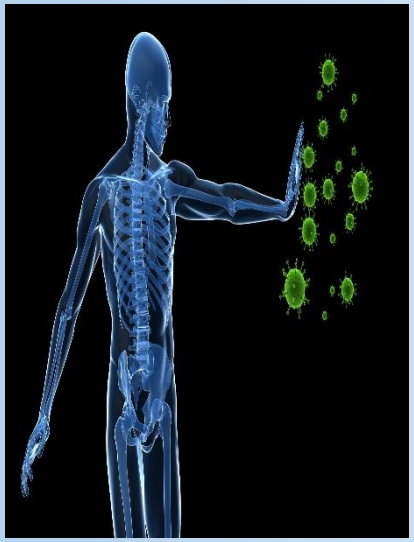
### Activity 3: Non-specific immune response




## Instructor: Suhaib Audi



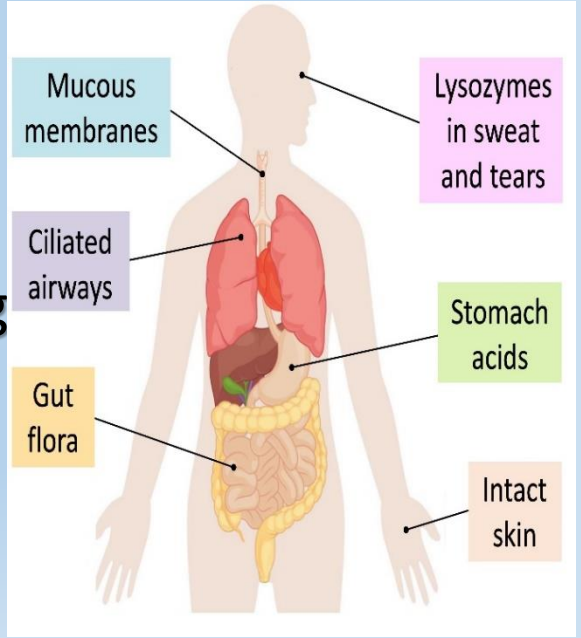
# Activity 3: Non-specific immune response



## ❖ Natural barriers:

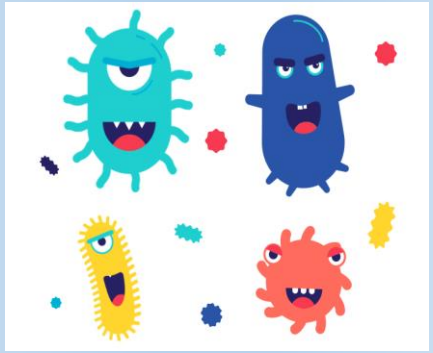
- ✓ They are the first line of Defense against the invasion of pathogenic microorganisms.
- ✓ They protect the Body by **preventing the intruder from entering the body** by different ways.
- ✓ Examples: skin, ear wax, mucus in the nasal secretion, mucus in the trachea, mucus in the stomach, saliva, gastric juice, tears and urinary streams

- **Tears:** Wash the eyes from foreign particles.
- **Mucus in nasal secretions:** Traps inhaled particles and microbes.
- **Urinary stream:** washes the urinary tract, removing potential pathog
- **Gastric juice:** Destroys most ingested bacteria and pathogens.
- **Skin:** Acts as a barrier to microbes.



## ❖ Non-specific immune response

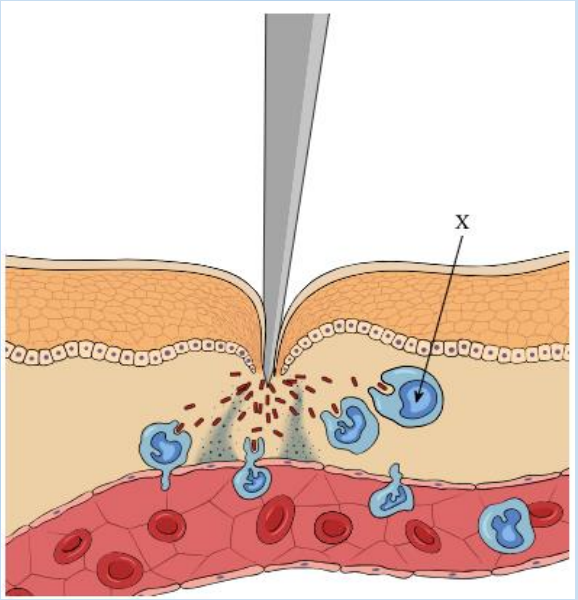
- It is a immune response triggered against any foreign body that invades the organism **regardless of its identity**.
- The actor cells of non-specific immune response are the **phagocytes**: the **granulocytes and the monocytes**.

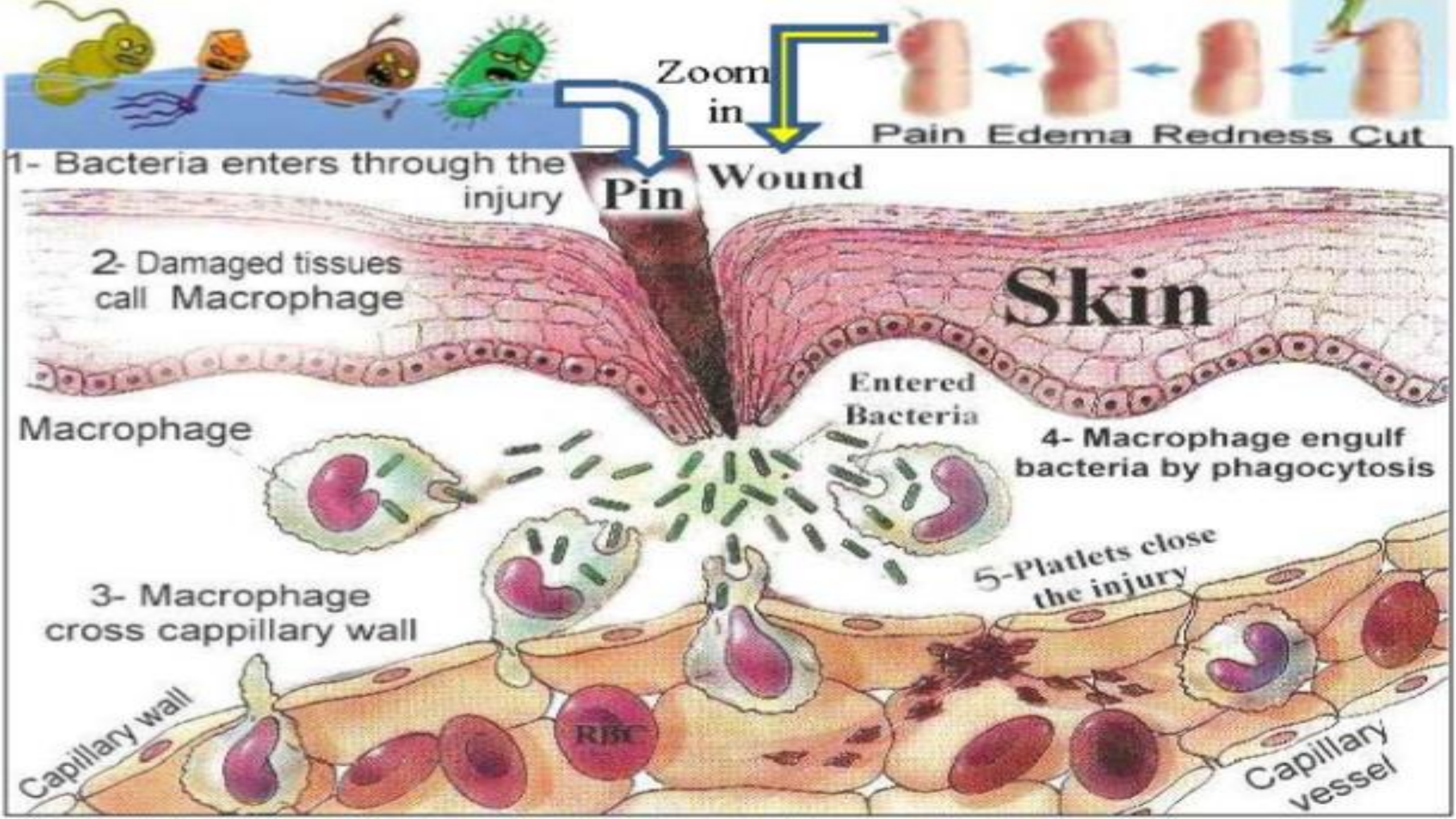


Nonspecific immune response is characterized by an **inflammatory reaction (inflammation).**

### ❑ Inflammatory reaction:

- Is the second line of Defense in the body after the natural barriers.
- It aims to **prevent and eliminate the microbe from spreading into the whole body.**




Zoom in
Pain Edema Redness Cut
1- Bacteria enters through the injury
Pin
Wound
2- Damaged tissues call Macrophage
Skin
Entered Bacteria
Macrophage
4- Macrophage engulf bacteria by phagocytosis
5-Platlets close the injury
3- Macrophage cross cappillary wall
Capillary wall
RBC
Capillary vessel

## ❖ Steps of an inflammatory reaction

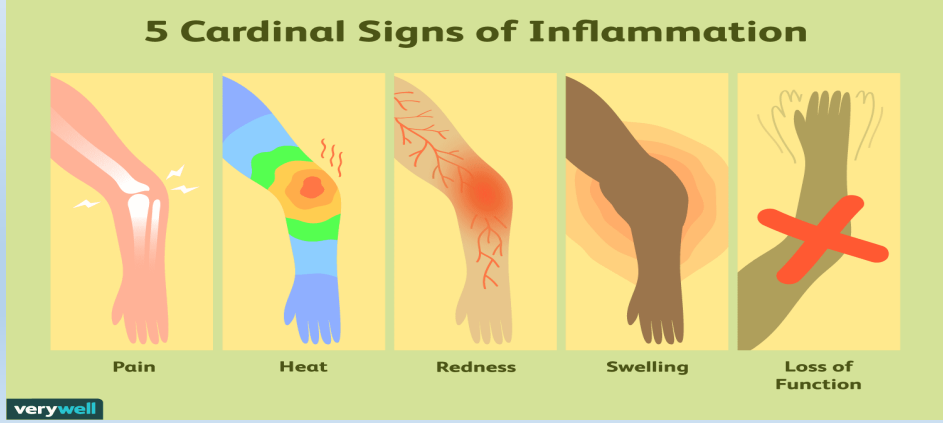
1. The microbe and the infected tissue release chemical signals (such as cytokines) to alert the immune system.
2. **Phagocytes** are attracted to the site by these chemical signals (**chemotaxis** = Cell movement in response to a chemical signal, often used by immune cells to locate infections.).
3. **Monocytes** in the blood differentiate into **macrophages**, and along with **granulocytes**, they cross the **dilated capillary walls** and move toward the site of infection.
4. **Phagocytes** kill the microbes by **phagocytosis**, and the damaged tissue begins to heal.

## ❖ Symptoms (clinical signs of inflammatory reaction)

- Pain is due to the stimulation of nerves found under the skin.
- Redness and heat it due to the increase of the blood at the side of infection.
- 3. Edema (swelling under the skin) and due to the massive leakage of a Plasma into the site of infection.

## ❖ Characteristics of the inflammatory reaction

- It is rapid.
- It is local take a place at the site of infection only .
- It is the protective.



## ❖ Phagocytosis


It is **non-specific immune response** made by **Macrophages and Granulocytes.**

**They attack all microbes equally regardless to their nature.**

### ➢ Steps of phagocytosis:

1. **Attraction:** the phagocytes are attracted to the microbes.


2. **Adhesion:** the phagocytes adhere (bind) to the membrane of the microbe.

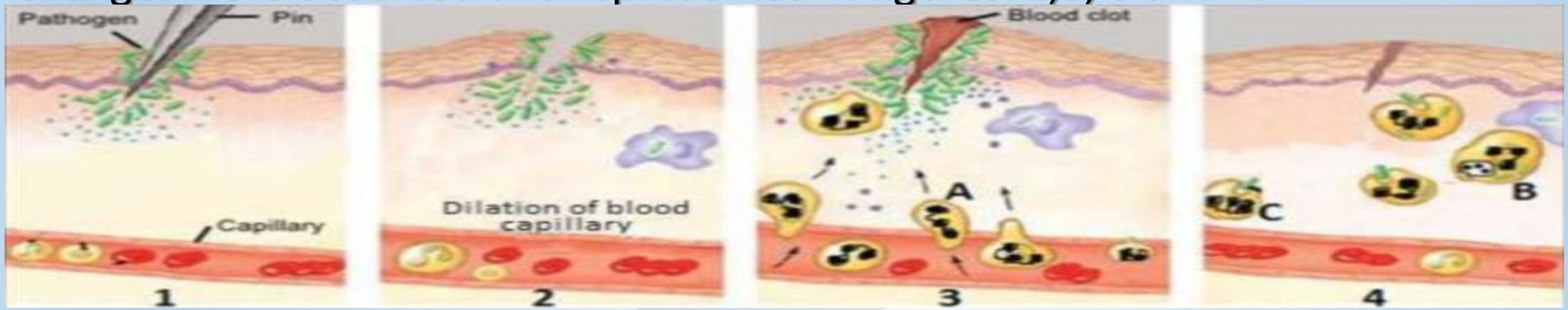
3. **Engulfment:** the phagocytes extend cytoplasmic extensions and surround the bacterium.

4. **Digestion:** the phagocytes digest (breakdown) the bacterium and transform it into waste products .

5. **Excretion:** the phagocytes excrete (release out) the waste products.

## Exercise 1:

A skin was attacked by a pin and causes a wound. At the site of the wound, several changes were observed and represented in figures: 1,2, 3 and 4.




1- Name the immune reaction represented by these figures.

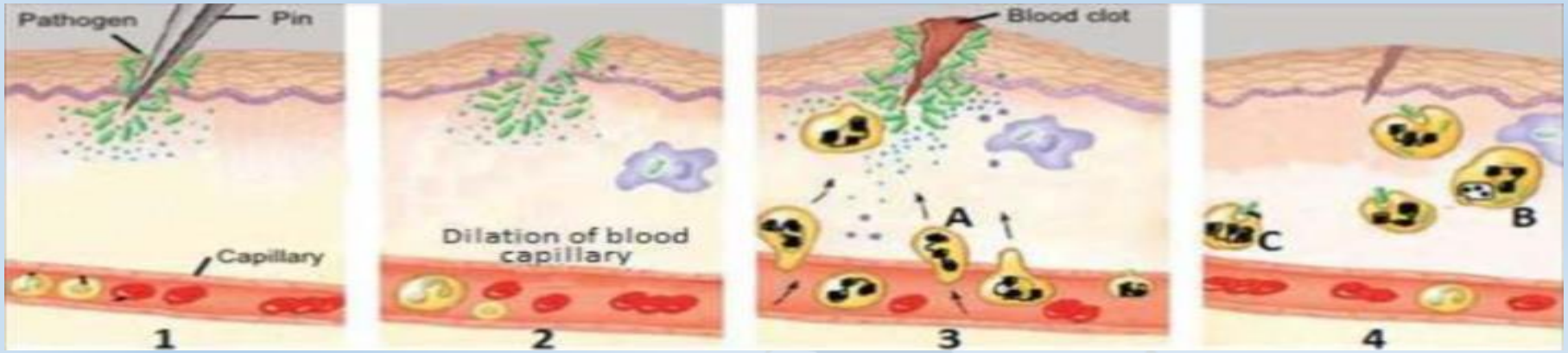
Inflammatory reaction.

2- Derive the sign of this immune reaction.

Pain, edema, redness and heat .

3- Indicate the reason of the decrease of the reaction observed in the figure 4.

The granulocyte breakdown the bacteria by phagocytosis.




During this reaction, the white blood cells make an important process called phagocytosis.

4- Name the steps A, B and C of phagocytosis shown by these figures.

Step (A) attraction is the movement of phagocyte to the attacked site.

step (B) digestion break down.

step (C) is engulfment.

5- Arrange the steps A, B and C in order. Justify.

The phagocyte moves from the capillary to reach the non- self, it engulfs it and then it breaks it down.

then the order is: A-C-B.

# Exercise 2: NATURAL BARRIERS AND INFLAMMATORY REACTION

Our bodies are equipped by different strategies of defense against viruses and bacteria, in the field of studying the **role of skin in this issue**, we realize the following experiments:

| Mouse | State | Treatment | Observation |
|---|---|---|---|
| A | Intact skin | Placing a layer of bacteria on its skin | it remained healthy |
| B | Injured skin | Placing a layer of bacteria on its skin | it became sick |
| C | Intact skin | Introduce bacteria with the food to the mouse | it remained healthy |


Note: Intact = Healthy = not injured.

a- Indicate the objective of these experiments.

To study the role of skin in the defense against viruses and bacteria

b- Analyze experiments done on mice A and B.

When a layer of bacteria was placed on the intact skin of mouse A, it remained healthy.
Whereas, when this layer is placed on the injured skin of mouse B, it became sick

c- Conclude concerning the role of the skin.

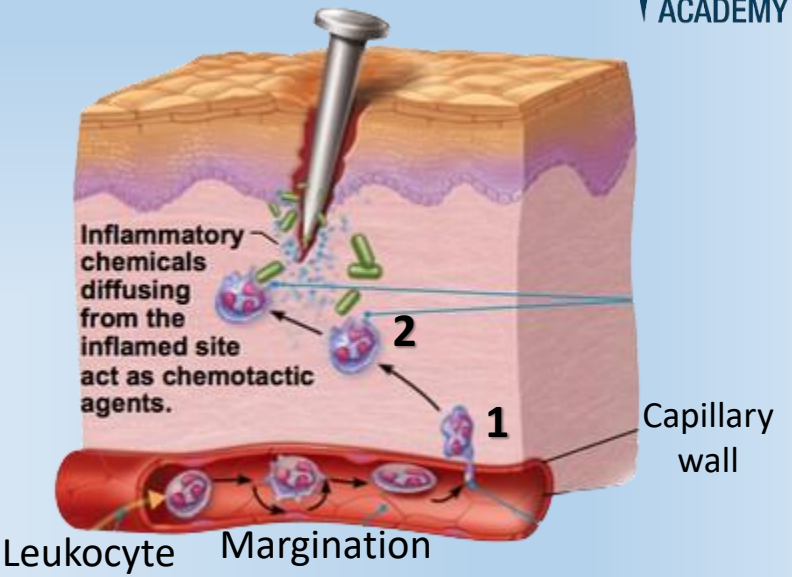
It acts as a natural barrier.

d- Using your knowledge, explain the observation in mouse C.

The bacteria found in food were destroyed by the gastric juice of the stomach.

The next figure shows the injured skin of mouse of experiment B.

**Note: Chemotactic factor is a factor that attracts the WBC to the infected tissue or the bacteria.**




e- Identify the leukocyte involved in the figure.

Since it has a multi-lobed nucleus, so it is a granulocyte.

f- Name stage 1and 2.

1: Cross capillary wall

2: Phagocytosis

g- Pick out the factor that attracts leukocytes toward the bacteria.

Chemotactic agents

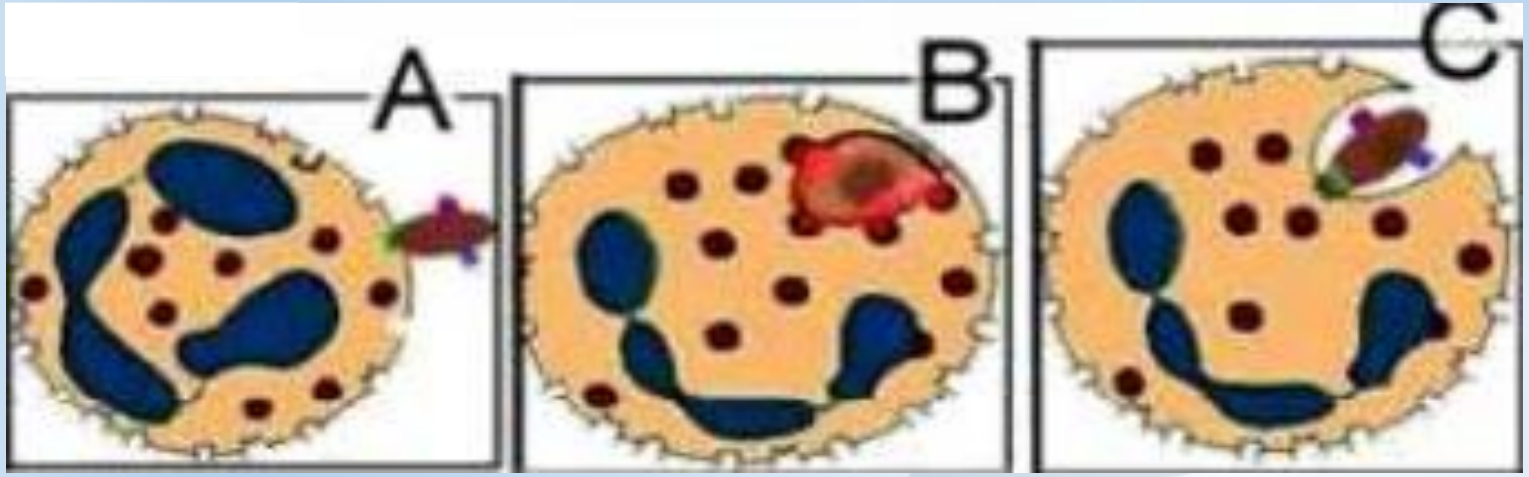
h- Conclude the name of this reaction.

Inflammation reaction

i- Identify if this response is specific one or not.

Since granulocytes engulf bacteria without recognizing and binding to their antigens, then it is not specific.

Detailed study showed that leukocyte has to add some enzymes over the bacteria in order to digest it. The figure beside shows 3 stages: A, B and C of stage number 2 in the random order.




J-Give a title for each stage, then list them in the correct order.

A: Adhesion

B: Break Down

C: Engulfment

Correct order: A→C→B

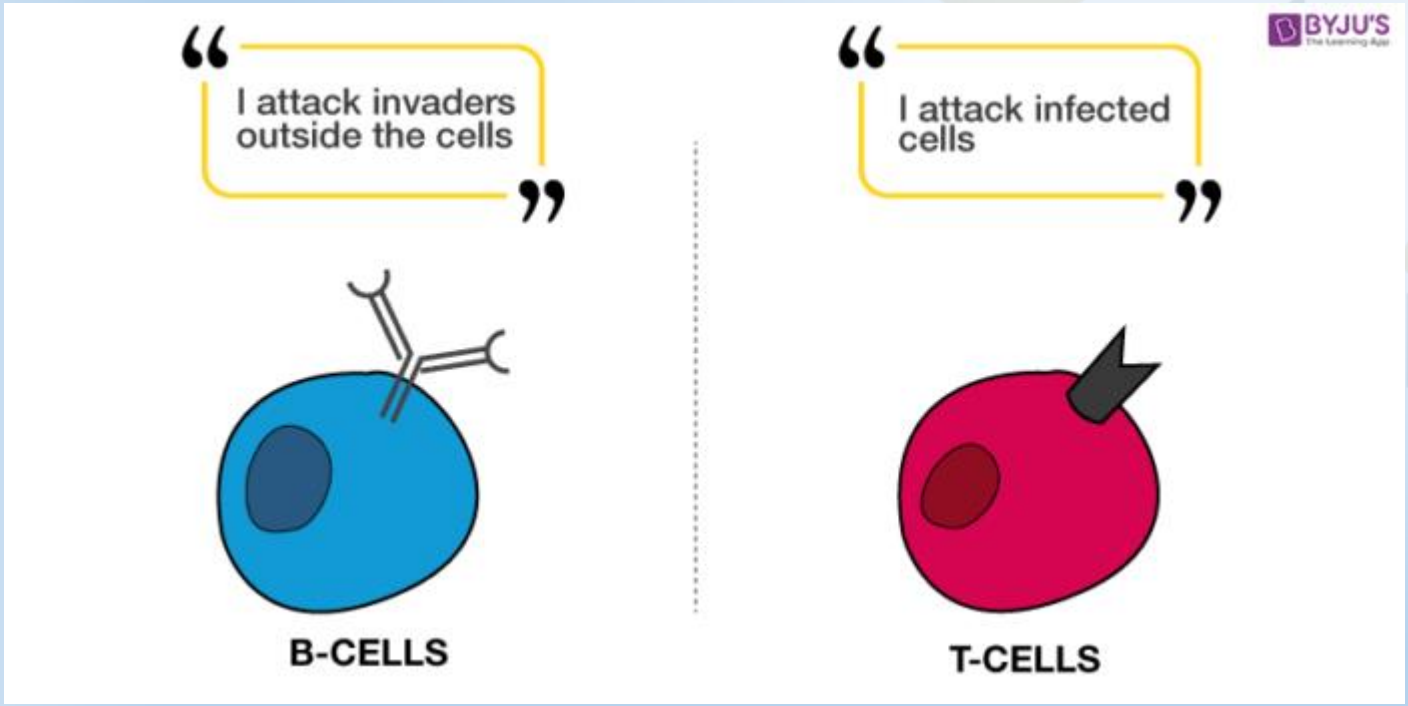
K- In some rare times, process 2 fails; formulate two hypothesis concerning the origin of this failure.

Hypothesis 1:Enzymes necessary for digestion are absent.

Hypothesis 2: Bacteria become resistant to the enzymes.

L- Predict in this case, the cells that will interfere to save the body.

B and T Lymphocytes.




Specific Immune Response

Activity 4