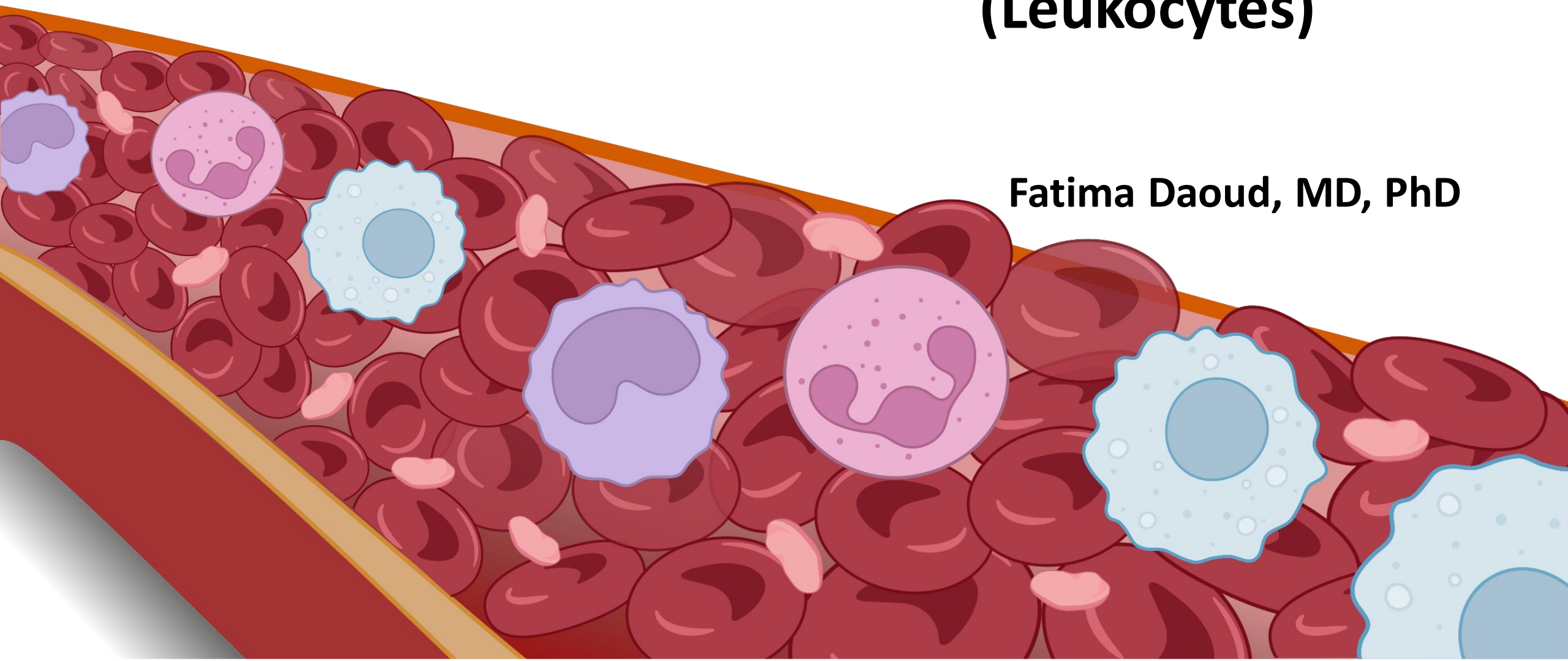
Hematology | Lymphocytes

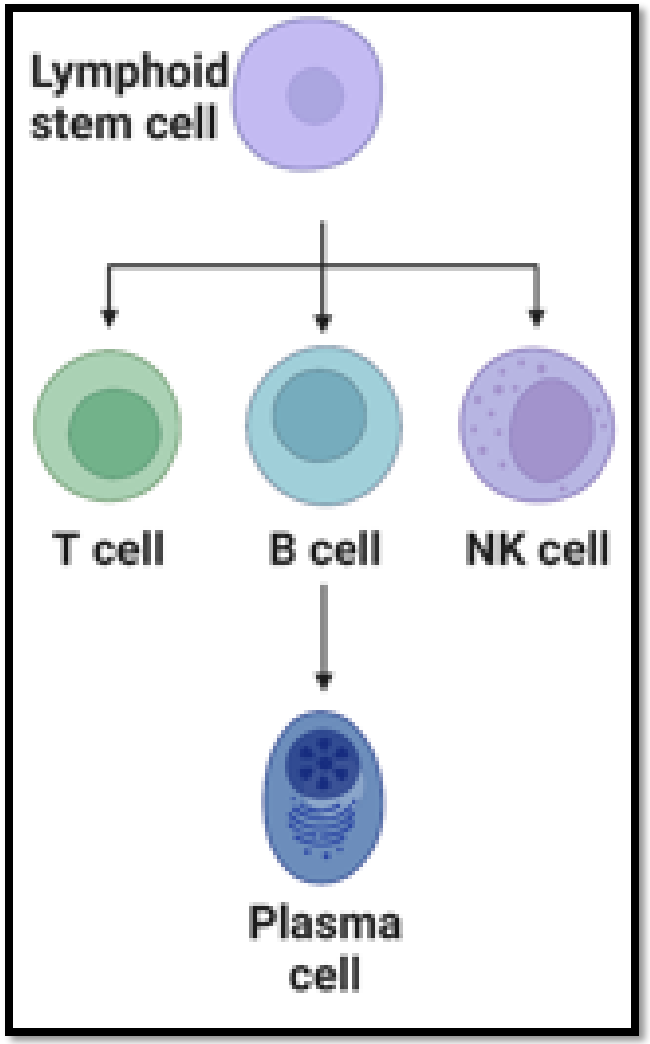
White Blood Cells (Leukocytes)

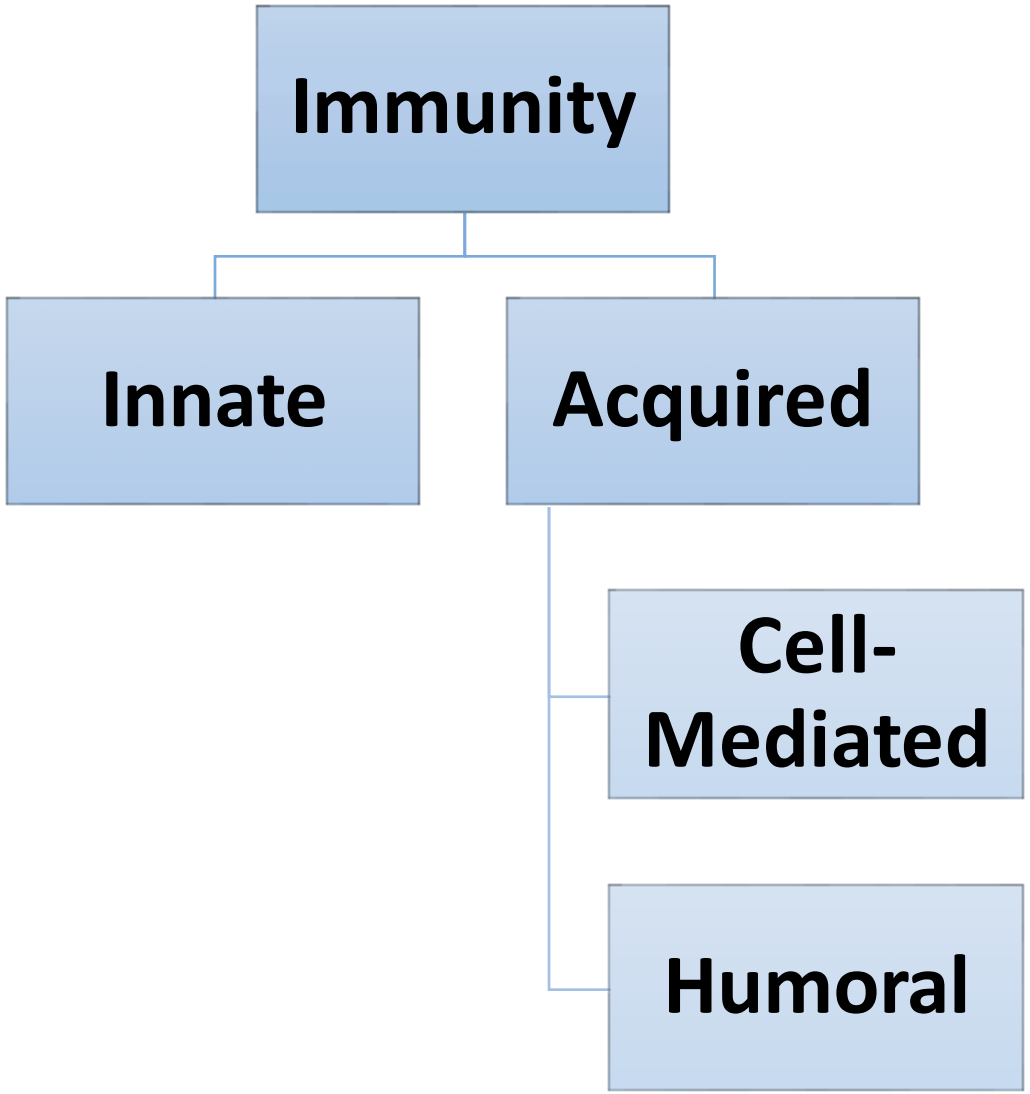
Fatima Daoud, MD, PhD



Hematology — Lymphocytes

- Lymphocytes are produced mainly in the various lymphogenous tissues.
- Some of the lymphocytes enter the circulatory system continually.
- Lymphocytes have life spans of weeks or months, depending on the body's need for these cells.




Immunity
Innate
Acquired
Cell-Mediated
Humoral

Innate Vs. Acquired (Adaptive)

- Results from general processes.

- Results from processes directed towards specific disease organisms.
- Does not develop until the body is first attacked by a bacterium, virus, or toxin, often requiring weeks or months to develop the immunity.

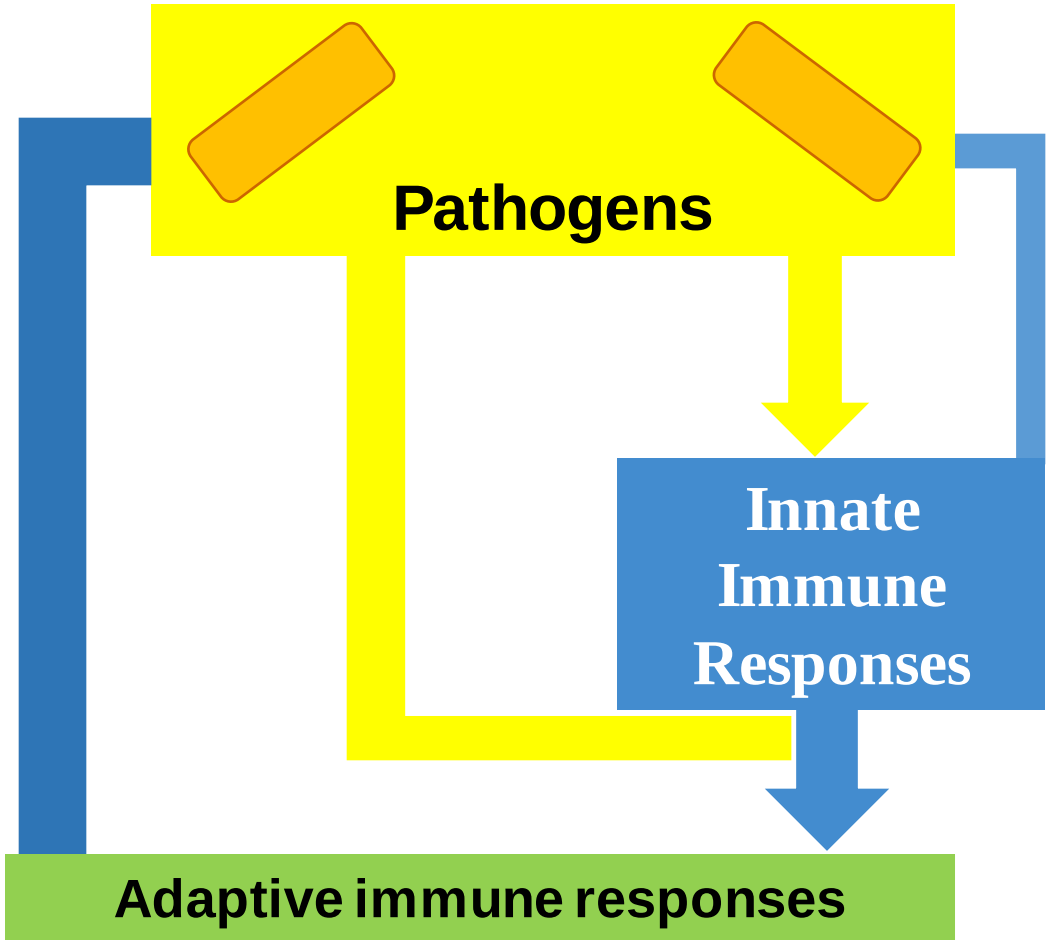
Innate Vs. Acquired (Adaptive)

- Phagocytosis
- Acid secretions of the stomach and the digestive enzymes.
- Skin (tight junctions).
- lysozyme
- Basic polypeptides
- Complement system
- Natural killer lymphocytes

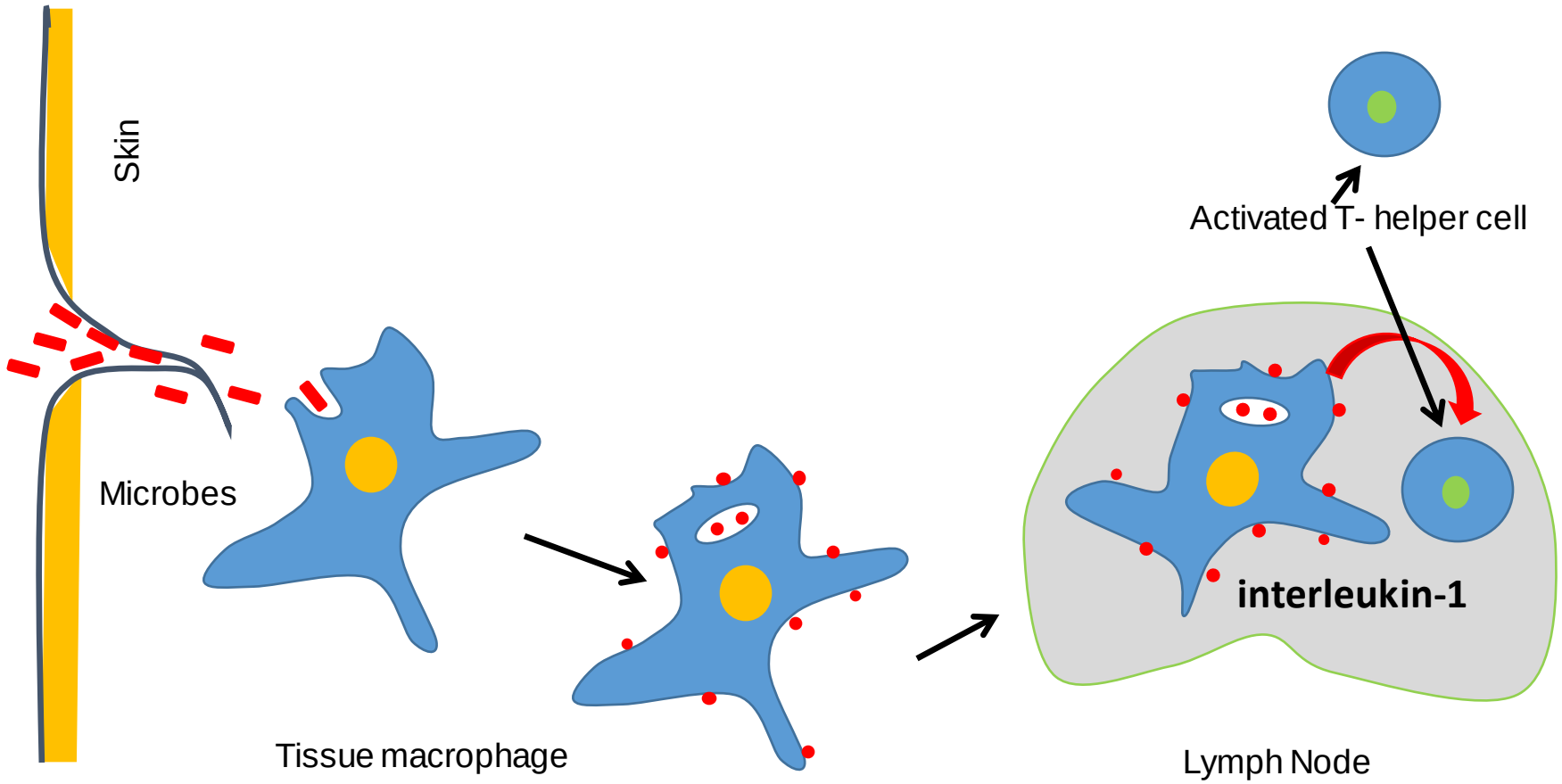
- Antibodies
- Activated lymphocytes

The innate immune system aims to :

- Prevent infection.
- Eliminate invader pathogens.
- Stimulate the acquired immune response.



Macrophage- activation of lymphocyte



Innate Immune Response

Adaptive Immune Response

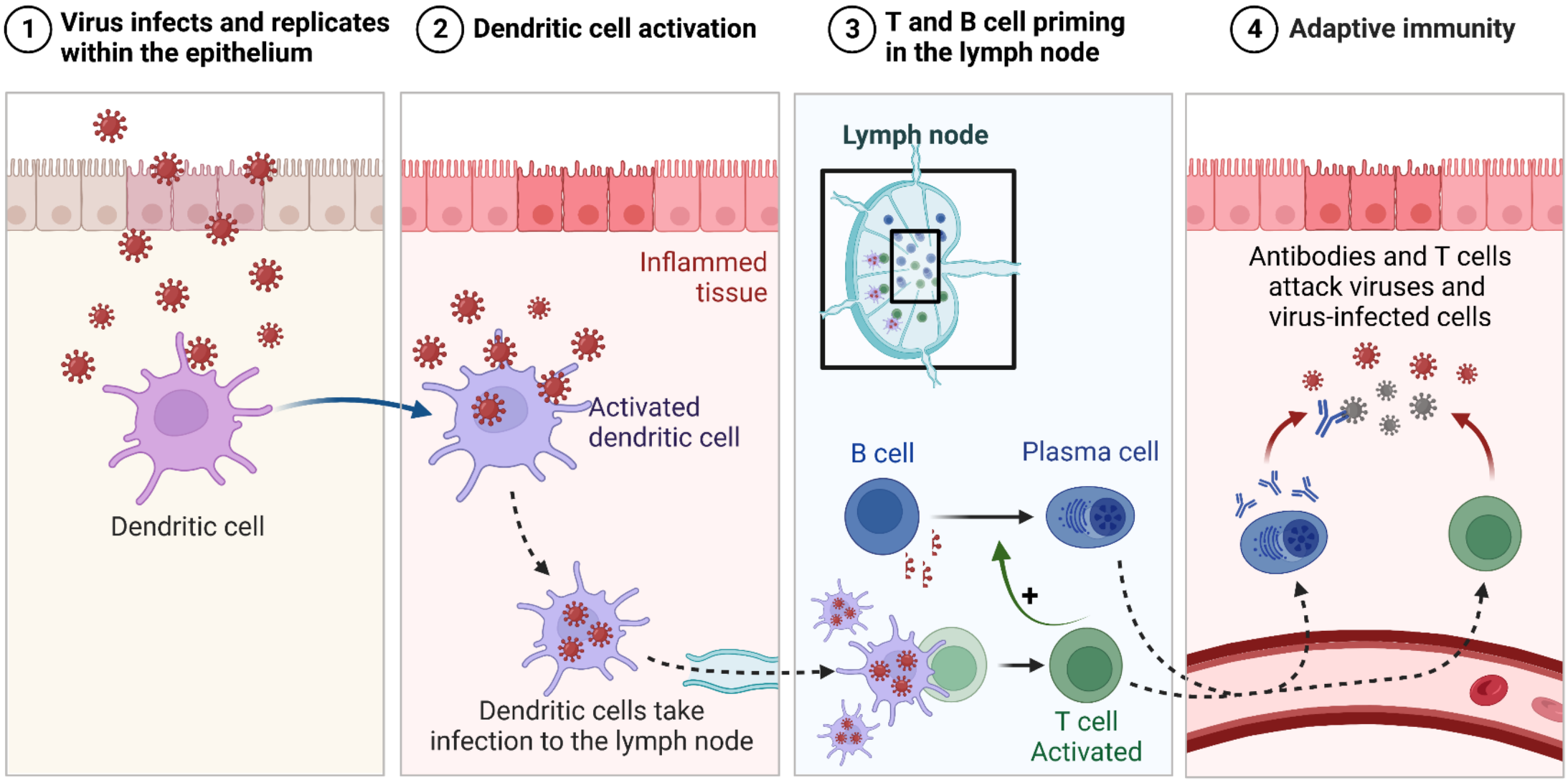
Basic Types of Acquired Immunity—Humoral and Cell-Mediated

- **Humoral (B-cell immunity)**
- Circulating antibodies, which are γ-globulin molecules in the plasma that are capable of attacking the invading agent.

- **Cell-Mediated (T-cell immunity)**
- Achieved through the formation of large numbers of activated T lymphocytes that are specifically crafted in the lymph nodes to destroy the foreign agent.

- (1) *helper T cells*
  (2) *cytotoxic T cells*
  (3) *suppressor T cells*

Adaptive Immunity



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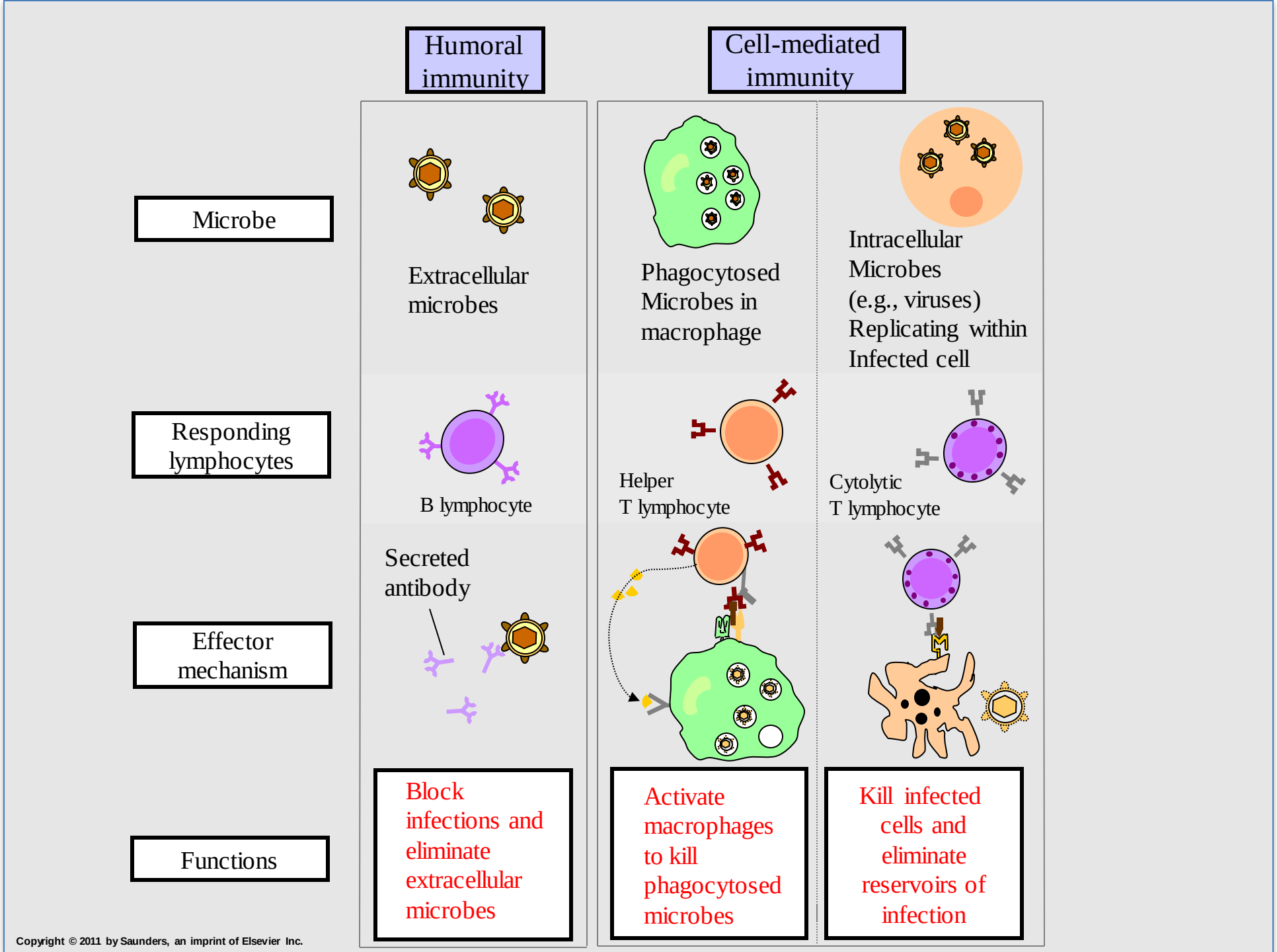
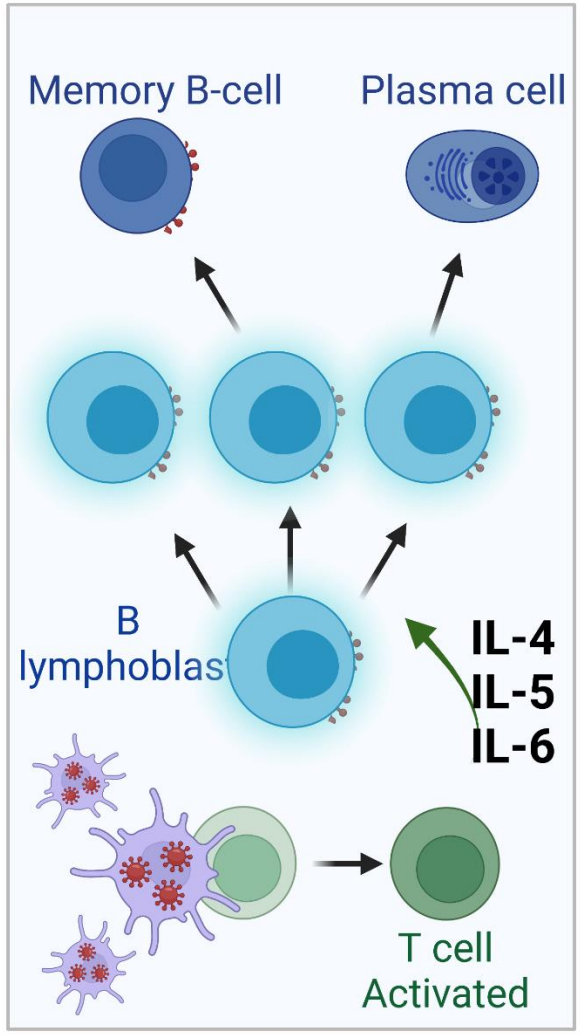


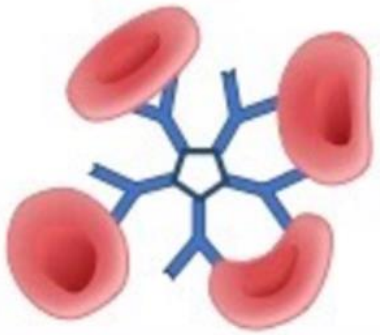
Formation of Memory cells (B-lymphocyte)

- Moderate numbers of new B lymphocytes similar to those of the original clone.
- They also circulate throughout the body to populate all the lymphoid tissue; immunologically, however, they remain dormant until activated once again by a new quantity of the same antigen



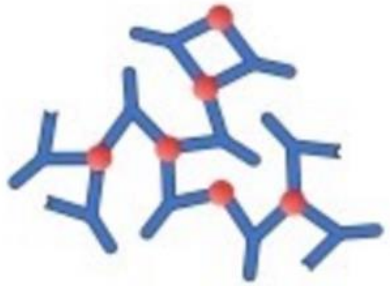
Mechanisms of Action of Antibodies

Agglutination



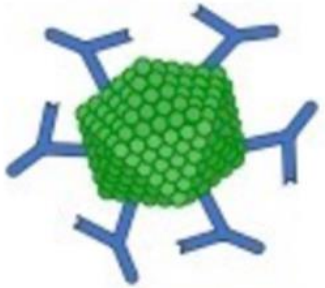
Links cell-bound antigens together, causing clumping

Precipitation



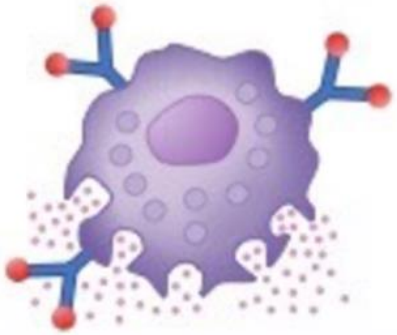
Makes soluble antigens insoluble, aiding elimination

Neutralisation



Masks dangerous parts of pathogen (e.g. exotoxins, etc.)

Lysis



Directly attacking membranes cause rupture

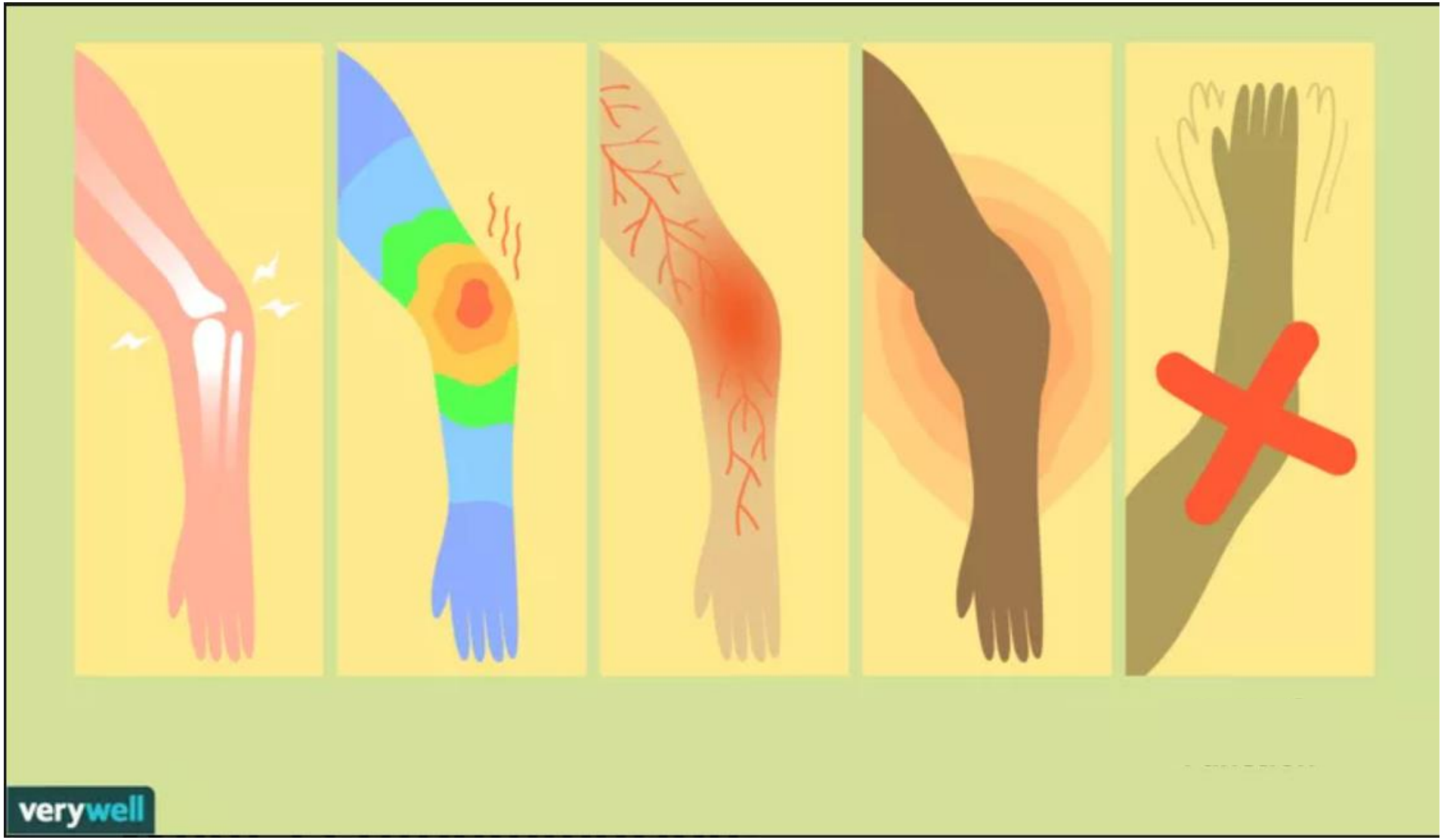
Inflammation

Inflammation

- The complex of changes that accompany tissue damage including vascular and cellular events that aim to clean up any cellular debris or pathogen and initiate repair.

Types/causes of Inflammation:

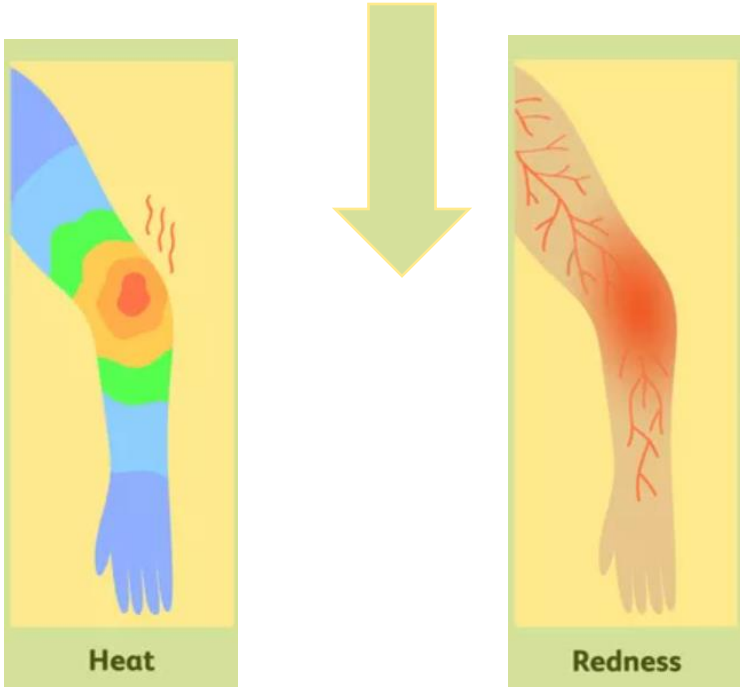
Signs of Inflammation

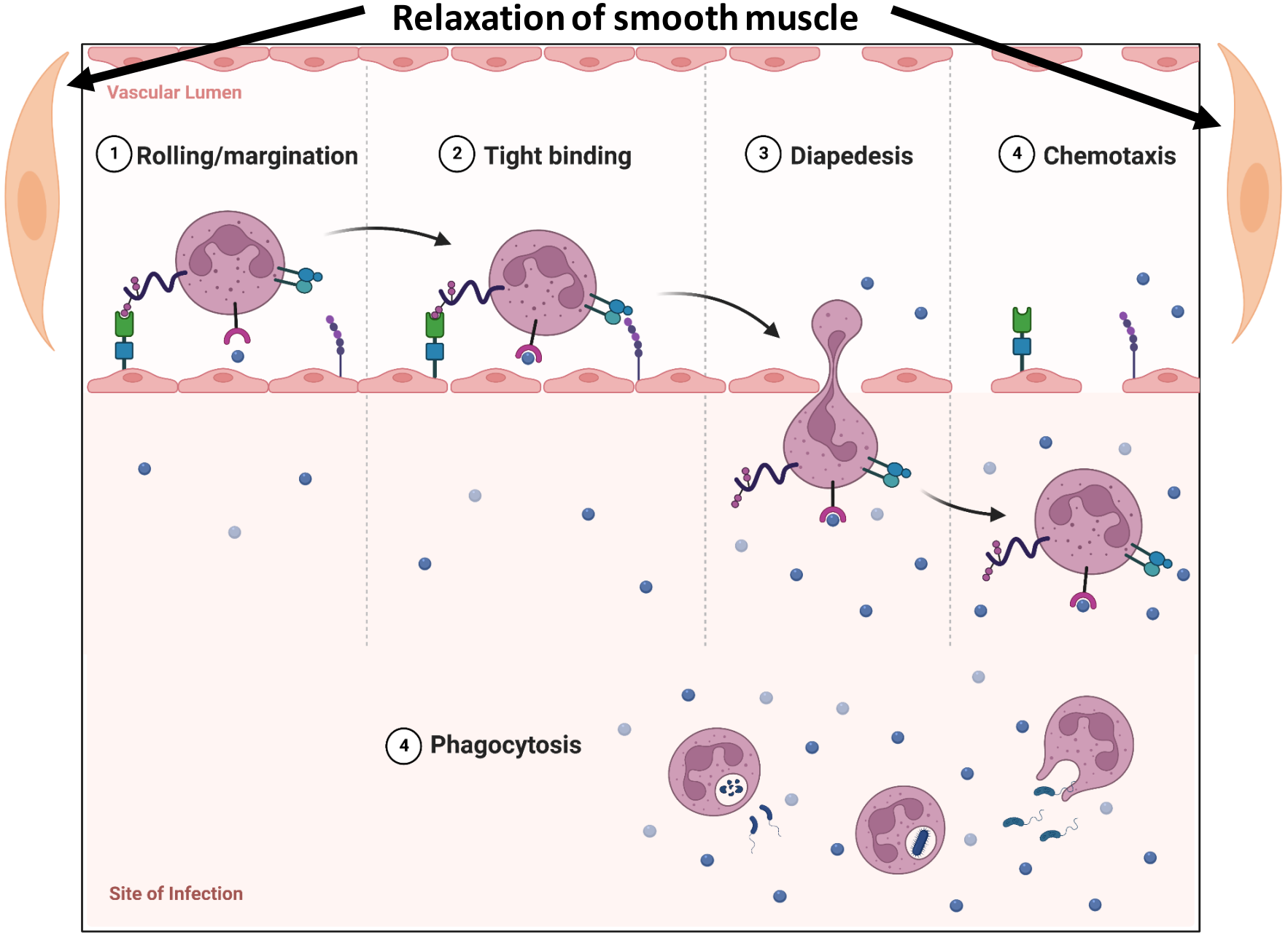


5 Signs of Inflammation: Pain, Heat, Redness, Swelling, and Loss of Function. By Lana Barhum

Inflammation is characterized by:

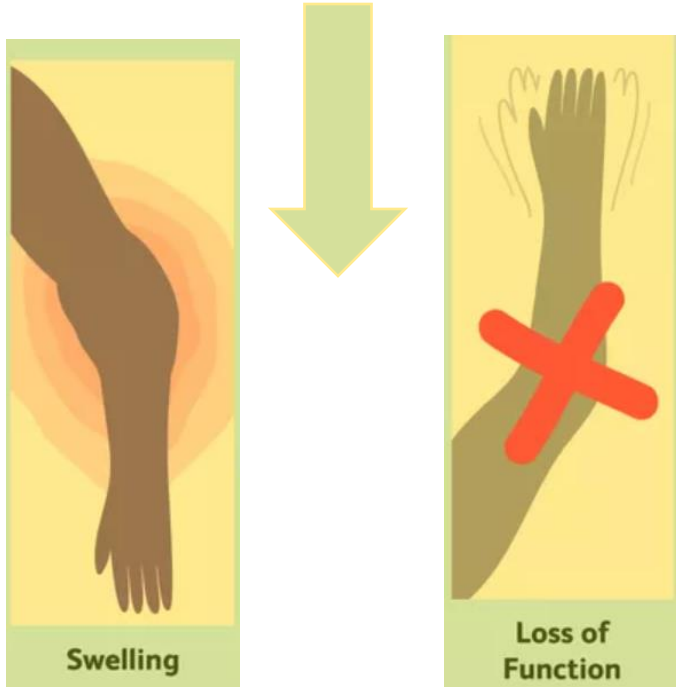
1. Vasodilation of the local blood vessels.

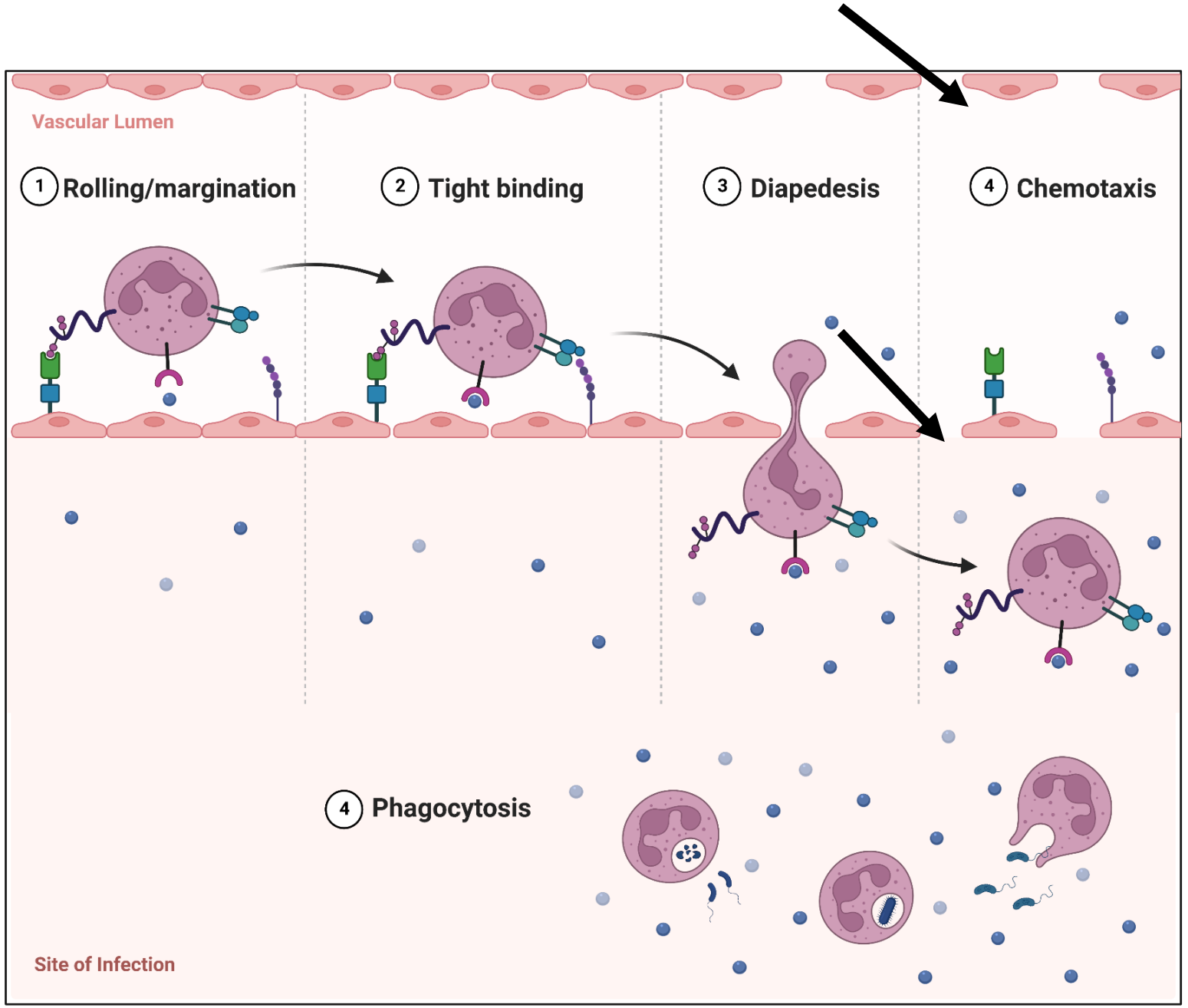




Inflammation is characterized by:

2. Increased permeability of the capillaries.





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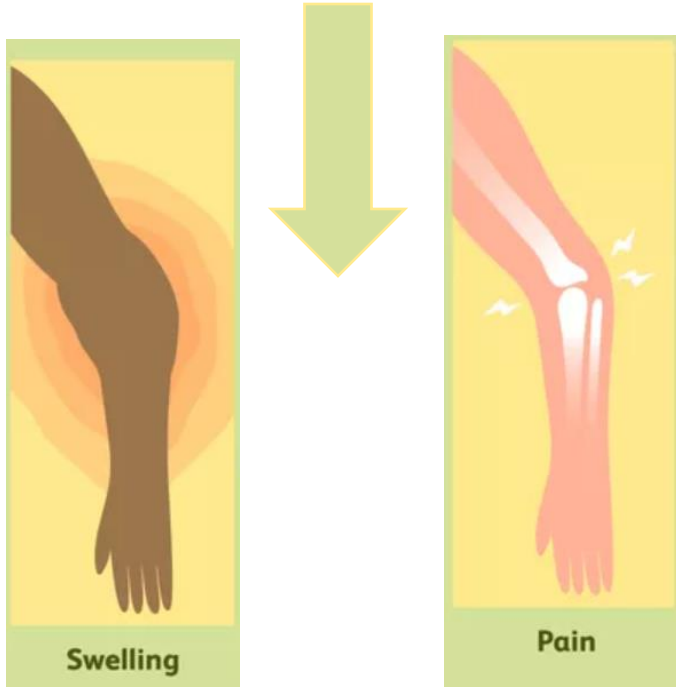
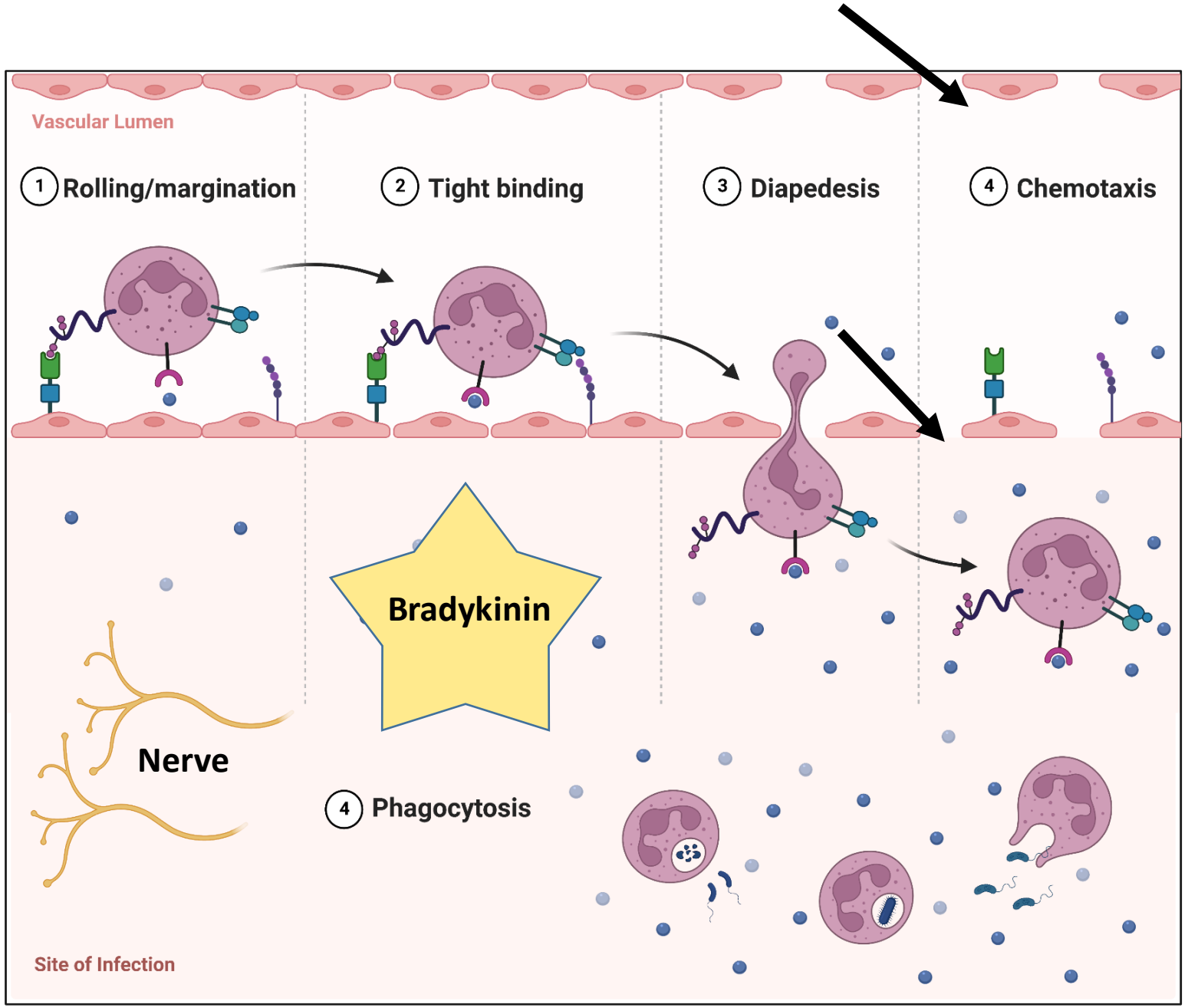
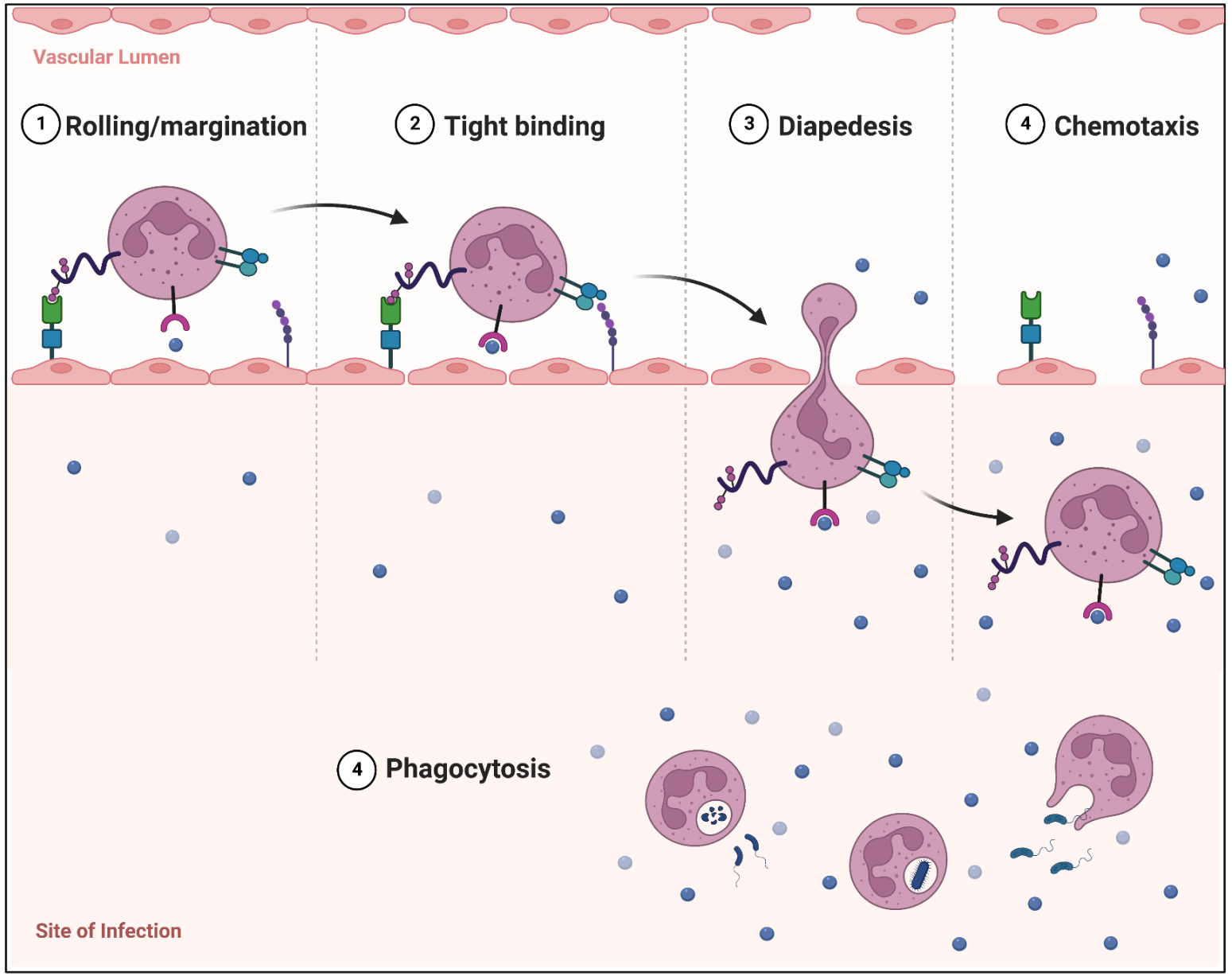




Inflammation is characterized by:

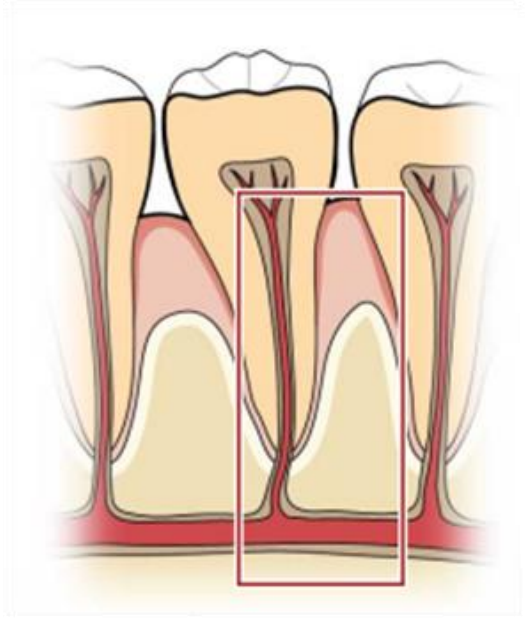
3. Migration of large numbers of granulocytes and monocytes into the tissue.

Leukocytosis

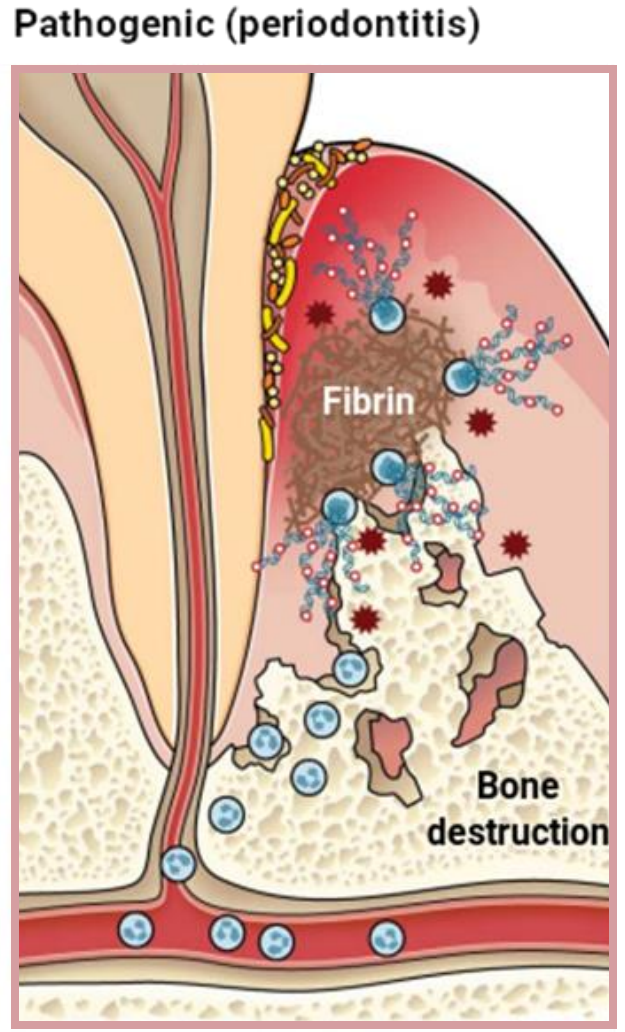


Inflammation is characterized by:

4. Increased amounts of fibrinogen and other proteins leaking from the capillaries.

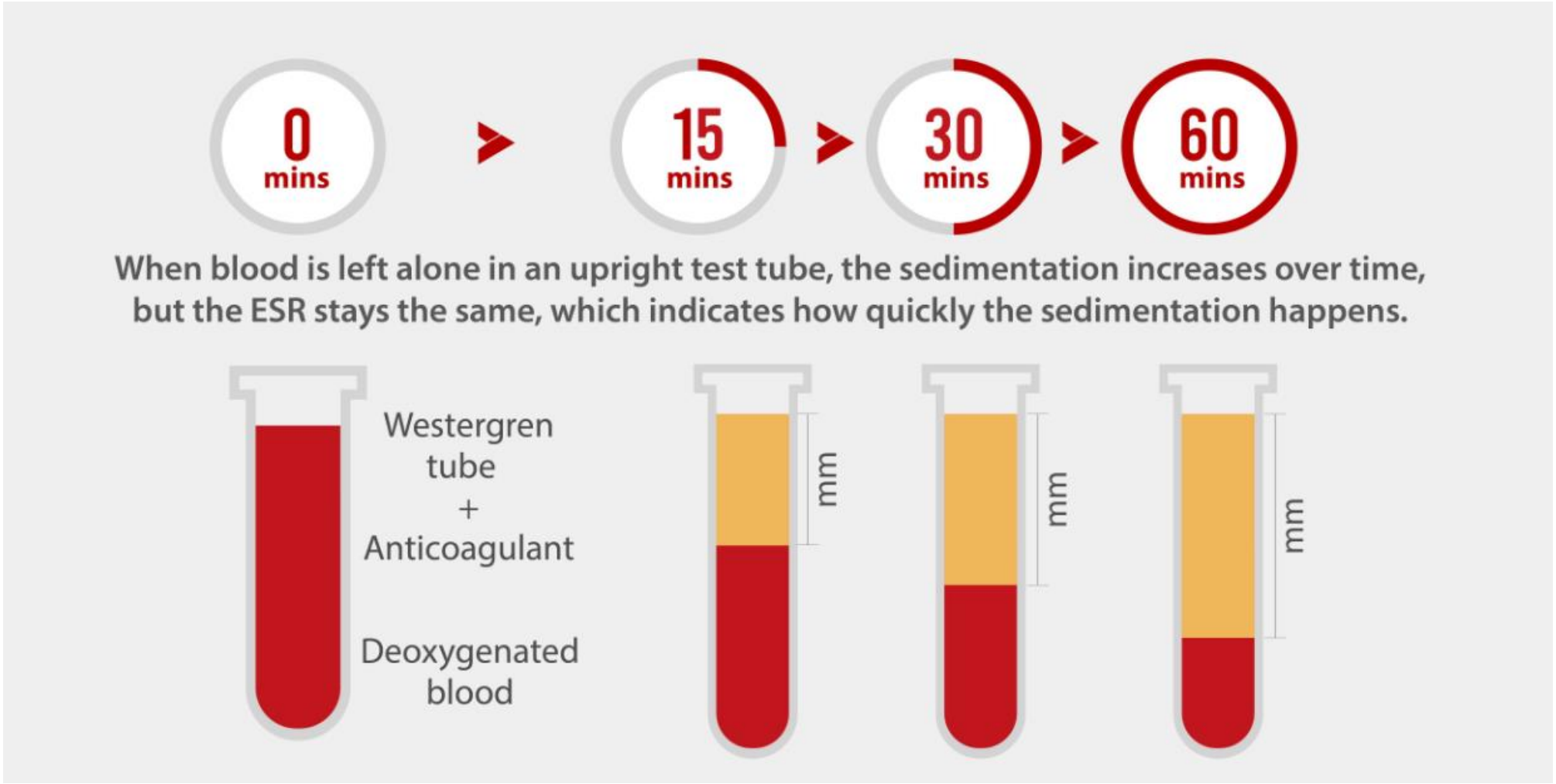


Walling-Off

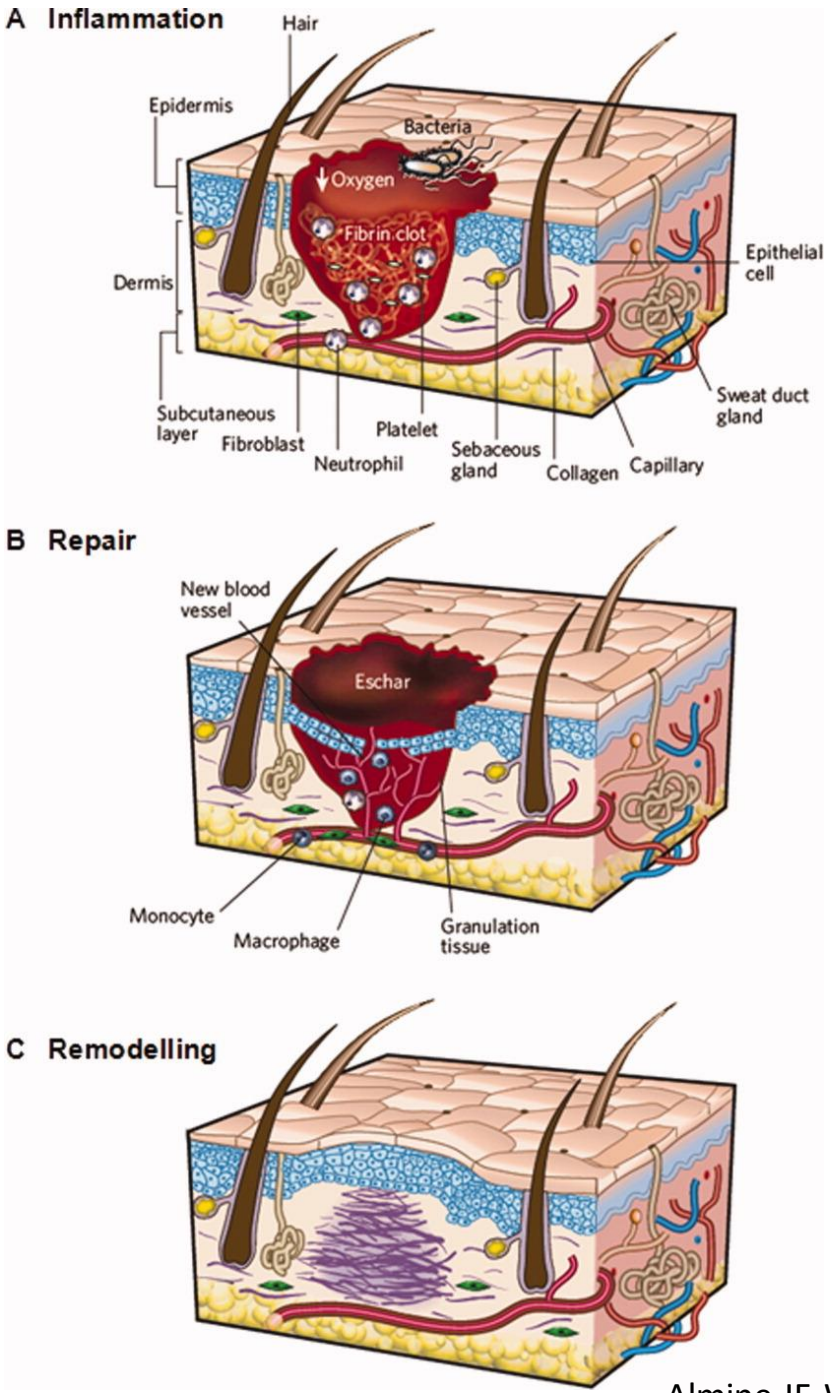


Fibrin sparks inflammation in the oral mucosa, Volume: 374, Issue: 6575, Pages: 1559-1560, DOI: (10.1126/science.abn0399)

Erythrocyte sedimentation rate (ESR)



Increase in plasma fibrinogen levels → Sedimentation↑ → ESR↑



- (A) A fibrin clot is formed and inflammatory cells enter the wound site.
- (B) Re-epithelialization
- (C) Remodeling is the final stage of wound healing. ECM remodeling factors modulate and revise the scar tissue.

Almine JF, Wise SG, Weiss AS. Elastin signaling in wound repair. Birth Defects Res C Embryo Today. 2012 Sep;96(3):248-57