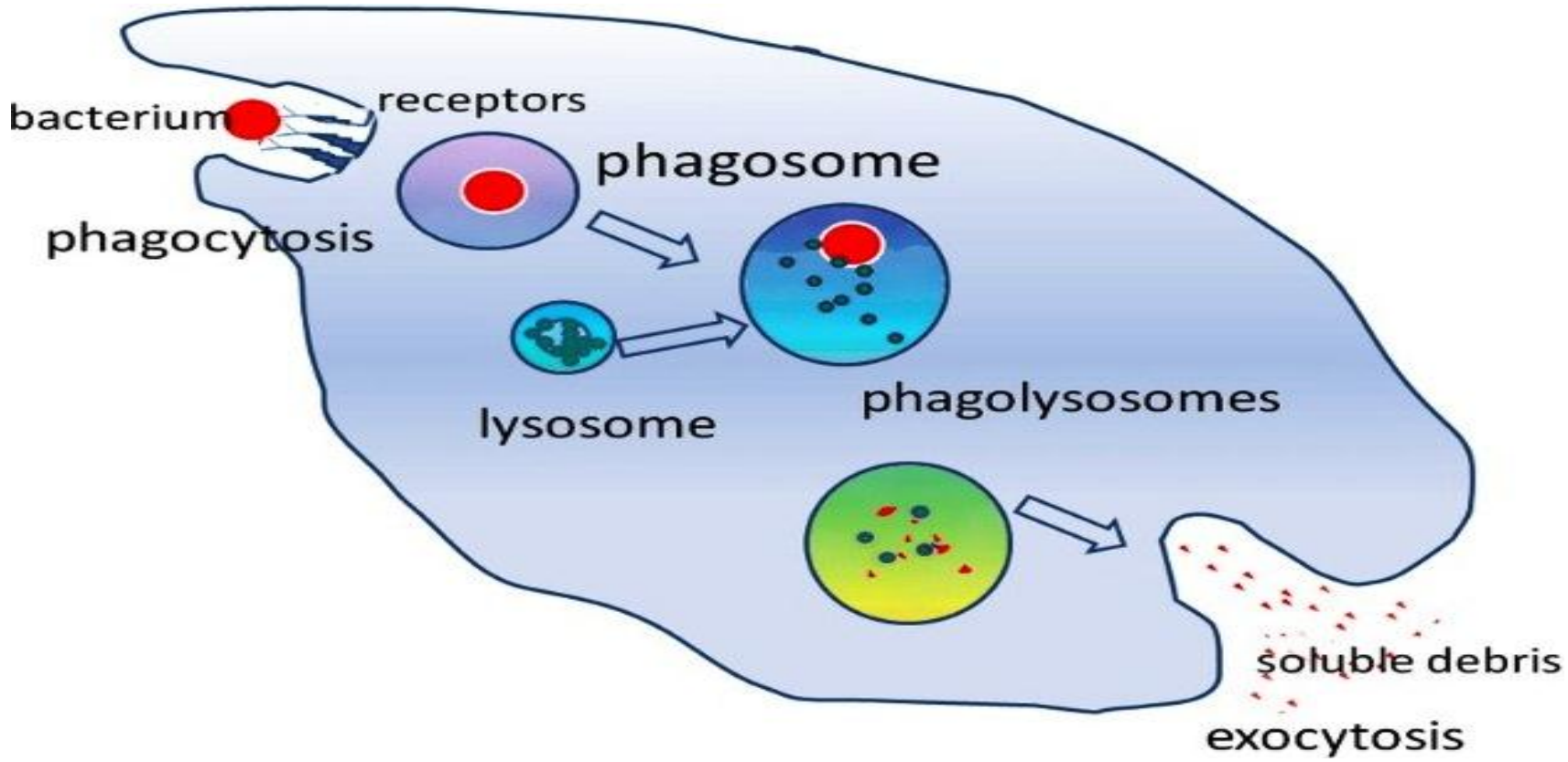
Inflammation and repair-2



Objectives

1. Describe the mechanism of **leukocyte exudation .**
2. Describe the process of **phagocytosis.**
3. Know the **chemical mediators** of inflammation.
4. Describe the **course of acute inflammation**.

cellular responses

Consists of 2 processes:

I- Exudation of leucocytes.

II- Phagocytosis.

I-Exudation Of Leucocytes

The escape of leucocytes from blood to the interstitial tissue passes through the following steps:

1.Margination:

Due to stasis, leukocytes leave the axial zone and adhere to the inner endothelial wall.

2. Rolling:

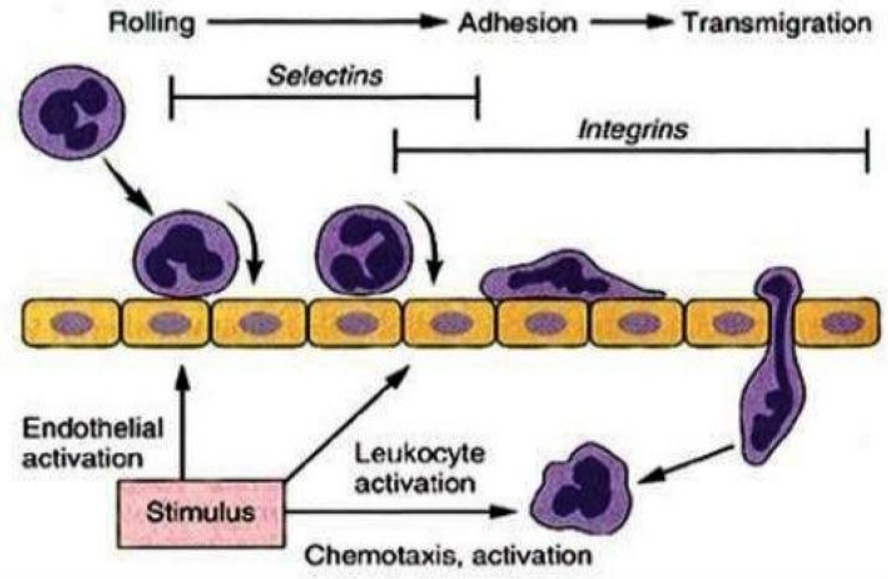
- Leucocytes transiently stick along the endothelial cells.
- This is mediated by the leucocytes surface adhesion molecules

called **P-selectin and E-selectin.**

3. Adhesion:

leucocytes firmly stick to endothelial cells by the help of adhésion molecules as **integrins**, Inter-Cellular Adhesion Molecule-1(**ICAM-1**).

derived free radicals.



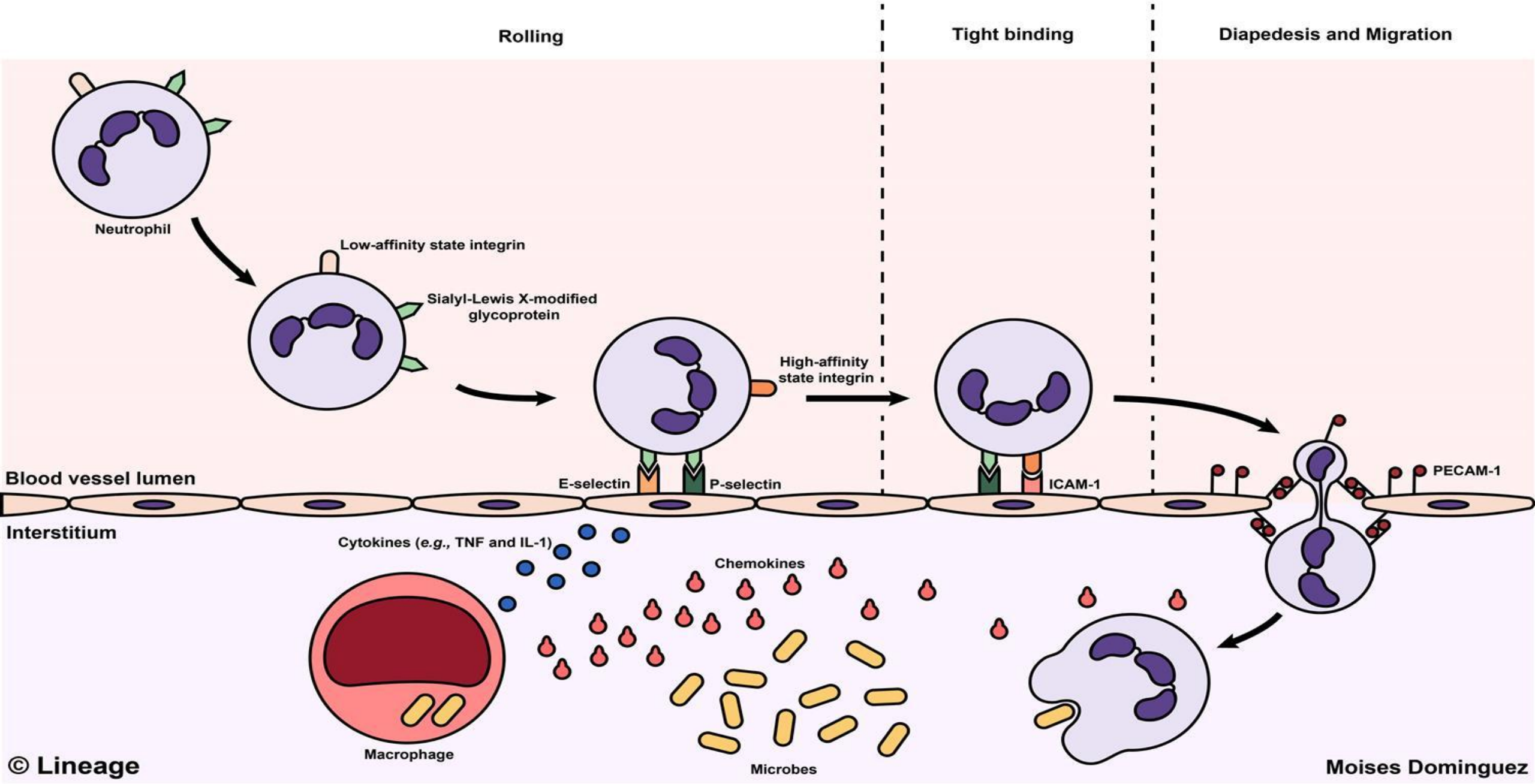
4. Emigration:

The passage of white blood cells through wide capillary pores by means of pseudopodia and *pass outside the capillaries* by ameboid movement.

5. Chemotaxis:

- Means *attraction of leucocytes towards the site of injury.*
- By chemotactic substances.es: bacterial products, cytokines and components of complement system, Leukotriene B4 (LTB4).

Leukocyte Extravasation



Moises Dominguez

II- phagocytosis

Definition:

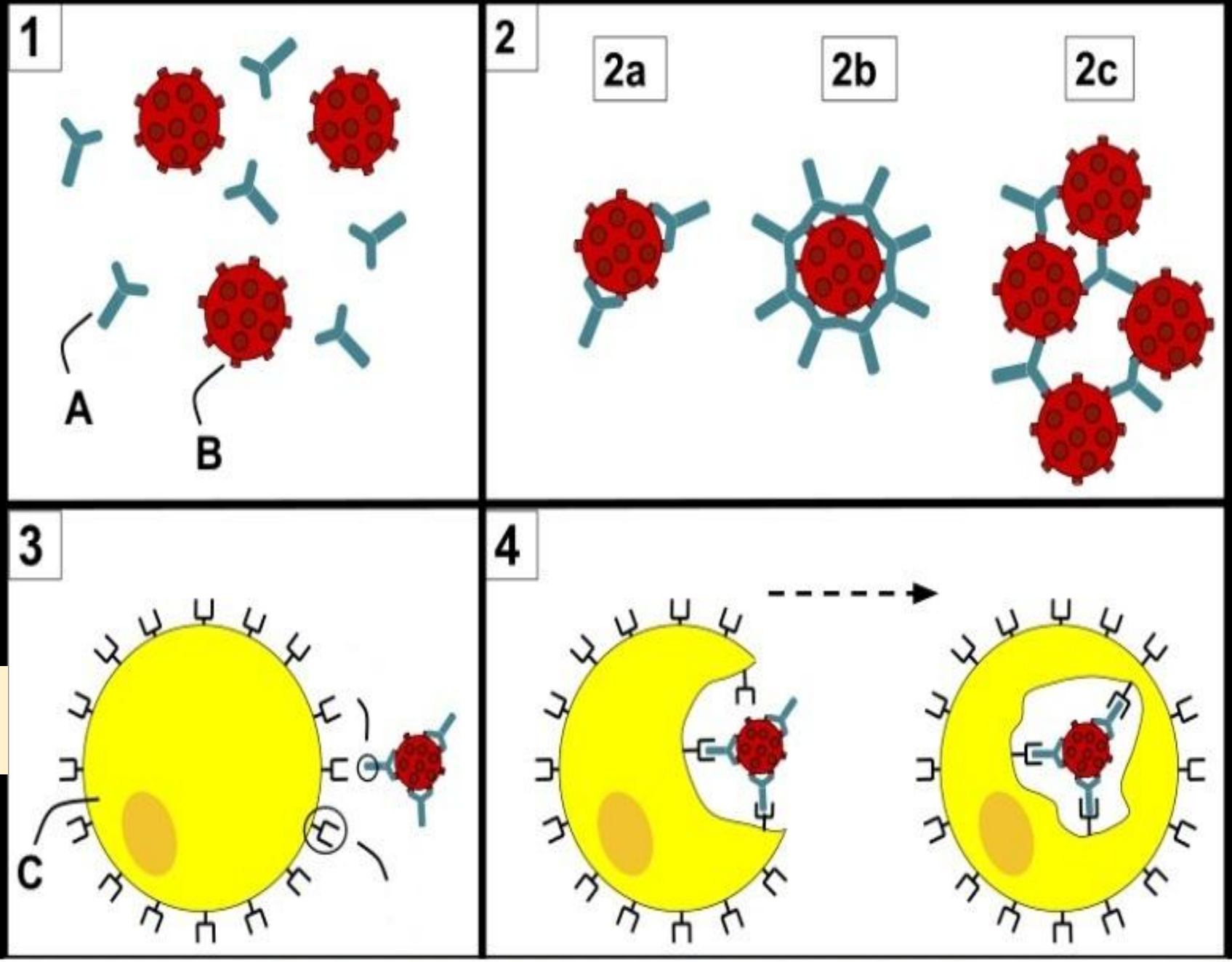
The process of engulfment and destruction of bacteria and necrotic tissue by the phagocytic cells.

Phagocytosis involves the following 3 steps:

1. Recognition and Attachment:

- **Leucocytes** have **cell surface receptors** **that are able to recognize and attach bacteria** with the help of specific antibodies (**opsonins**), The process is called **opsonization** (meaning preparing for eating).
- The two major opsonins are IgG and C3b.

Opsonization



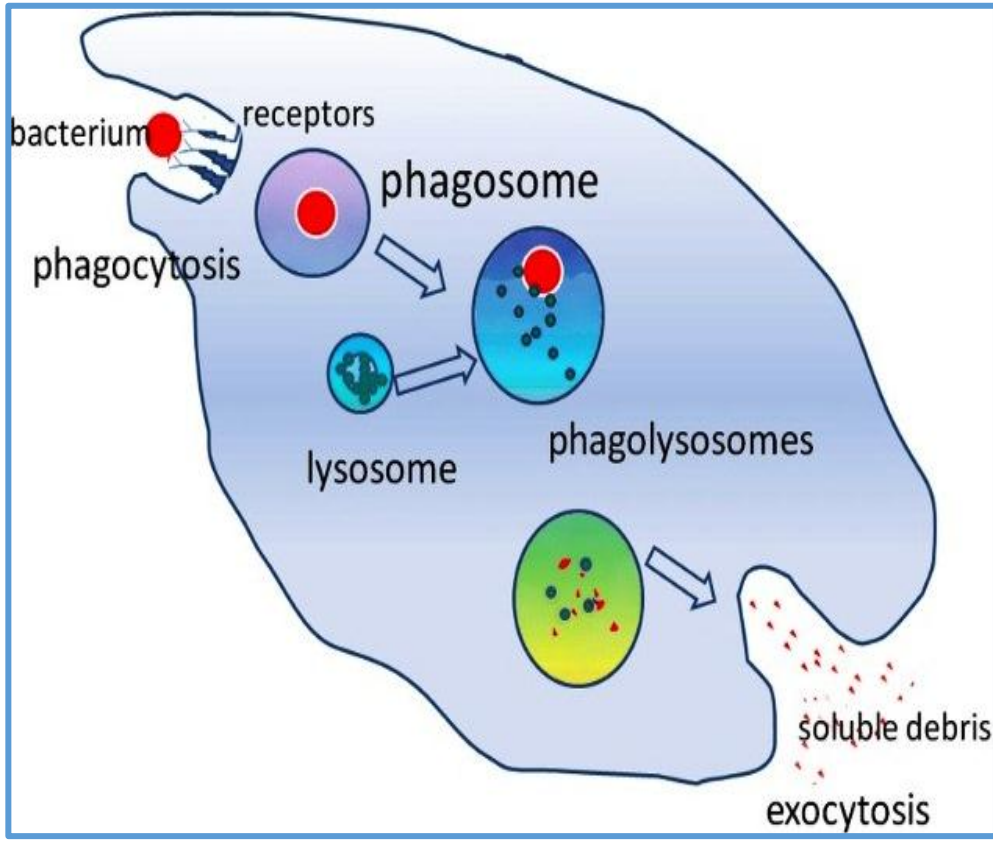
1) Antibodies (A) and pathogens (B)

2) The antibodies bind to pathogens with complementary antigen sequences, engaging in opsonization

3) A phagocyte (C)

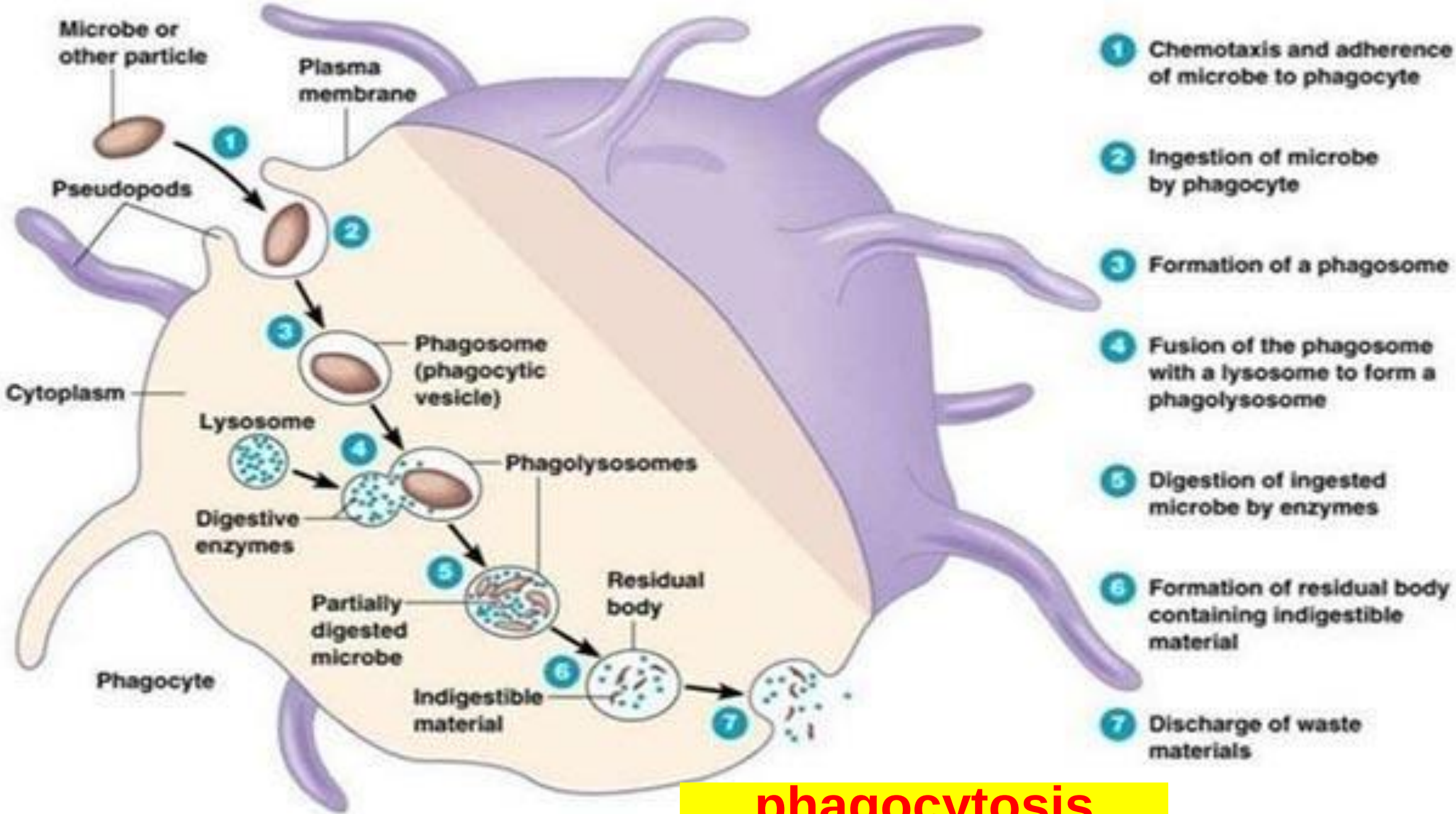
2. Engulfment:

- The phagocytic cells form cytoplasmic **pseudopods** around the bacteria due to activation of actin filaments beneath cell wall, enveloping it in a phagocytic vacuole (**phagosome**).
- The membrane of the phagosome then fuses with the membrane of the lysosomes resulting in release of lysosomal granules (phagolysosome).



3. Killing and Degradation:

through release of lysosomal enzymes *or* oxygen derived free radicals.



phagocytosis

(B) systemic reactions

A- Changes in blood cells:

-Leucocytosis: Increased number of the leukocytes (N: 4000-10.000/cm)

* Neutrophils increase in pyogenic infections.

* Eosinophils increase in parasitic infestation and allergic lesions.

* Lymphocytes increase in chronic infections and viral inflammation.

* Monocytes increase in typhoid fever and malaria.

- Leucopenia: Decrease in the number of leukocytes as in typhoid fever and viral infections.

- Anemia: Decrease red blood cells due to:

* Toxic depression of the bone marrow.

* Hemolysis of RBC's as in Malaria & hemolytic strept. infections

B-Acute phase reaction:

- Fever: due to the action of cytokines IL1, IL6 and TNF on the thermoregulatory center of the hypothalamus.
- Constitutional symptoms: (loss of appetite, anorexia, malaise &drowsiness).
- Increase C-reactive protein (CRP).

C- Changes in organs:

* Reactive hyperplasia of the draining lymph nodes.
* Degenerative changes in parenchymatous organs due to toxemia.
* Septicemia due to multiplication of virulent organisms in blood.

Chemical mediators of inflammation:

A- Cell derived:

-Histamine: released from basophils and mast cells.

Action: vasodilatation and increase vascular permeability.

-Serotonin: released from platelets.

Action: vasodilatation and increase vascular permeability.

-Prostaglandins: released from mast cells and leucocytes.

Action: vasodilatation, pain, fever.

-Leukotrienes: released from and mast cells and leucocytes .

Action: increase vascular permeability, chemotaxis and leucocytes activation.

-Cytokines (IL1,TNF): released from and macrophages, endothelial cells and mast cells.

Action: endothelial activation, fever, pain, hypotension.

B- Plasma derived:

Kinins: produced in liver and released to plasma.

Action: vasodilatation, increase vascular permeability, smooth muscle Contraction.

Complement products: produced in liver and released to plasma.

Action:

C3a increased vascular permeability.

C5a increased vascular permeability & chemotactic activity.

C3b important opsonin that help phagocytosis.

COURSE OF ACUTE INFLAMMATION

1- Resolution:

- Means complete restoration of the inflamed area to the normal state.
- This occurs when the irritant is mild and tissue damage is minimal.

2- Progression and spread:

When the irritant is severe and tissue damage is extensive.

3- Healing by fibrosis (Organization):

The destroyed tissue is replaced by fibrous tissue.

4- Chronicity:

The irritant remains for long time and inflammation is changed from acute to chronic.

Media

- https://www.youtube.com/watch?v=XS30Rnpka8M
- https://www.youtube.com/watch?v=1SvEdg94qUA
- https://www.youtube.com/watch?v=8YoWd9-OVCA

Thank you