Inflammation •
Lec.2 •

ILO: K19
Objectives of lecture

1- third component of acute inflammation (cellular event) •

2- outcome of acute inflammation •

3- chronic inflammation definition •

4- causes of chronic inflammation

5- cells of chronic inflammation

Cellular Events:

(Leukocyte Recruitment and Activation)

- an important function of the inflammatory response is to deliver leukocytes to the site of injury and to activate them. Leukocytes ingest offending agents, kill bacteria and other microbes, and eliminate necrotic tissue and foreign substances. A price that is paid for the defensive potency of leukocytes is that, once activated, they may induce tissue damage and prolong inflammation, since the leukocyte products that destroy microbes can also injure normal host tissues. Therefore, key to the normal function of leukocytes in host defense is to ensure that they are recruited and activated only when needed (i.e., in response to foreign invaders and dead tissue)

- *Leukocyte Recruitment*

The sequence of events in the recruitment of leukocytes from the vascular lumen to the extravascular space consists of

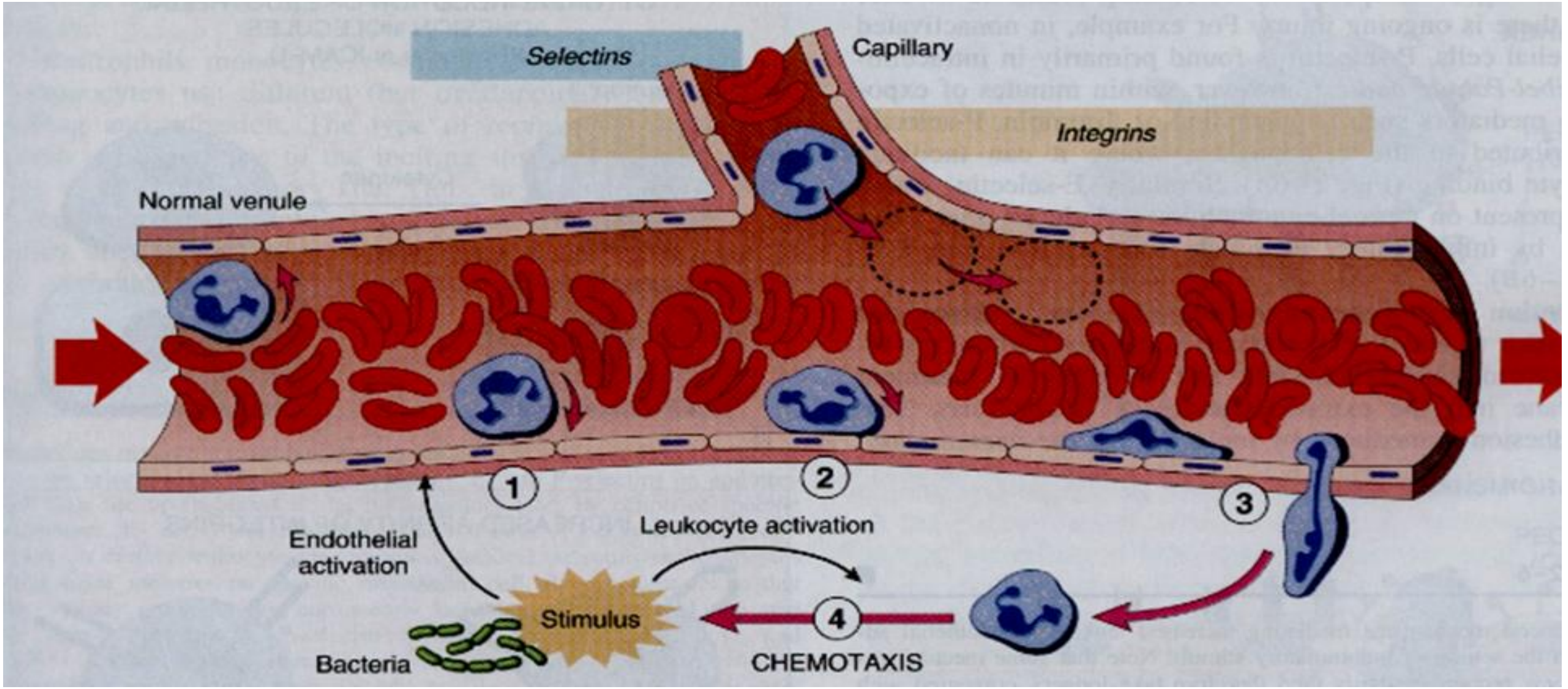
(1)margination, adhesion to endothelium, and rolling along the vessel wall.

(2)firm adhesion to the endothelium;

(3) transmigration between endothelial cells; and

(4) migration in interstitial tissues toward a chemotactic stimulus .

Rolling, adhesion, and transmigration are mediated by the binding of • complementary adhesion molecules on leukocytes and endothelial surfaces from the vascular lumen to the extravascular space consists of



Sequence of events in leukocytes emigration in inflammation: •

1. Margination 2. rolling 3. adhesion 4. transmigration and movement •

toward injurious agent (stimulus) •

Outcome of acute inflammation

1.Resolution.

When the injury is limited or short-lived, when there has been no or minimal tissue damage, and when the tissue is capable of replacing any irreversibly injured cells, the usual outcome is restoration to histologic and functional normalcy.

2.Progression to chronic inflammation

may follow acute inflammation if the offending agent is not removed. In some instances, signs of chronic inflammation may be present at the onset of injury (e.g., in viral infections or immune responses to self-antigens). Depending on the extent of the initial and continuing tissue injury, as well as the capacity of the affected tissues to regrow, chronic inflammation may be followed by restoration of normal structure and function or may lead to scarring.

3. Scarring or *fibrosis*

results after substantial tissue destruction or when inflammation occurs in tissues that do not regenerate. In addition, extensive fibrinous exudates (due to increased vascular permeability) may not be completely absorbed and are *organized* by ingrowth of connective tissue, with resultant fibrosis.

4. Abscesses

may form in the setting of extensive neutrophilic infiltrates or in certain bacterial or fungal infections (these organisms are then said to be *pyogenic,* or "pus forming"). Because of the underlying tissue destruction (including damage to the ECM), the *usual outcome of abscess formation is scarring.*

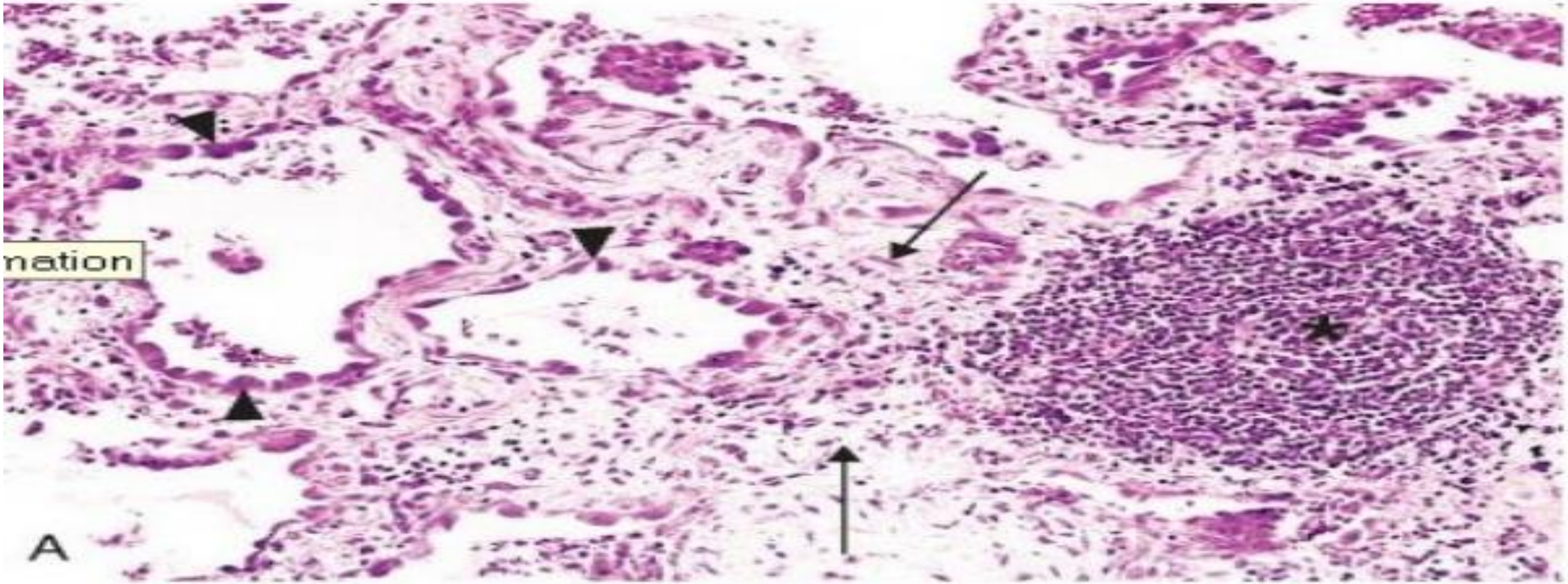
CHRONIC INFLAMMATION

Chronic inflammation is inflammation of prolonged duration (weeks to months to years) in which active inflammation, tissue injury, and healing proceed simultaneously, in contrast to acute inflammation, which is distinguished by vascular changes, edema, and a predominantly neutrophilic infiltrate, chronic inflammation is characterized by:

1. Infiltration with mononuclear cells, including macrophages, lymphocytes, and plasma cells
2. Tissue destruction, largely induced by the products of the inflammatory cells

Repair, involving new vessel proliferation (angiogenesis) and fibrosis

acute inflammation may progress to chronic inflammation. This
- transition occurs when the acute response cannot be resolved, either because of the persistence of the injurious agent or because of interference with the normal process of healing. For example, a peptic ulcer of the duodenum initially shows acute inflammation followed by the beginning stages of resolution, alternatively, some forms of injury (e.g., viral infections) engender a response that involves chronic inflammation from the onset.



A, Chronic inflammation in the lung, showing all three characteristic histologic features: (1) collection of chronic inflammatory cells (*), (2) destruction of parenchyma (normal alveoli are replaced by spaces lined by cuboidal epithelium, *arrowheads*), and (3) replacement by connective tissue (fibrosis, *arrows*).

Causes of chronic inflammation:

1. Persistent infections :

by microbes that are difficult to eradicate. These include mycobacteria, Treponema pallidum, (causative organism of syphilis), and certain viruses and fungi, all of which tend to establish persistent infections and elicit a delayed-type hypersensitivity . In fact, most viral infections elicit chronic inflammatory reactions dominated by lymphocytes and macrophages

2. hypersensitivity disease

diseases that are caused by excessive and inappropriate activation of the immune system are increasingly recognized as being important health problems under certain conditions, immune reactions develop against the individual's own tissues, leading to autoimmune diseases, in these diseases, auto-antigens evoke a self-immune reaction that results in chronic tissue damage and inflammation, inflammation secondary to autoimmunity plays an important role in several common and debilitating chronic diseases, such as rheumatoid arthritis and inflammatory bowel disease, immune responses against common environmental substances are the cause of allergic diseases, such as bronchial asthma.

3. Prolonged exposure to potentially toxic agents.:

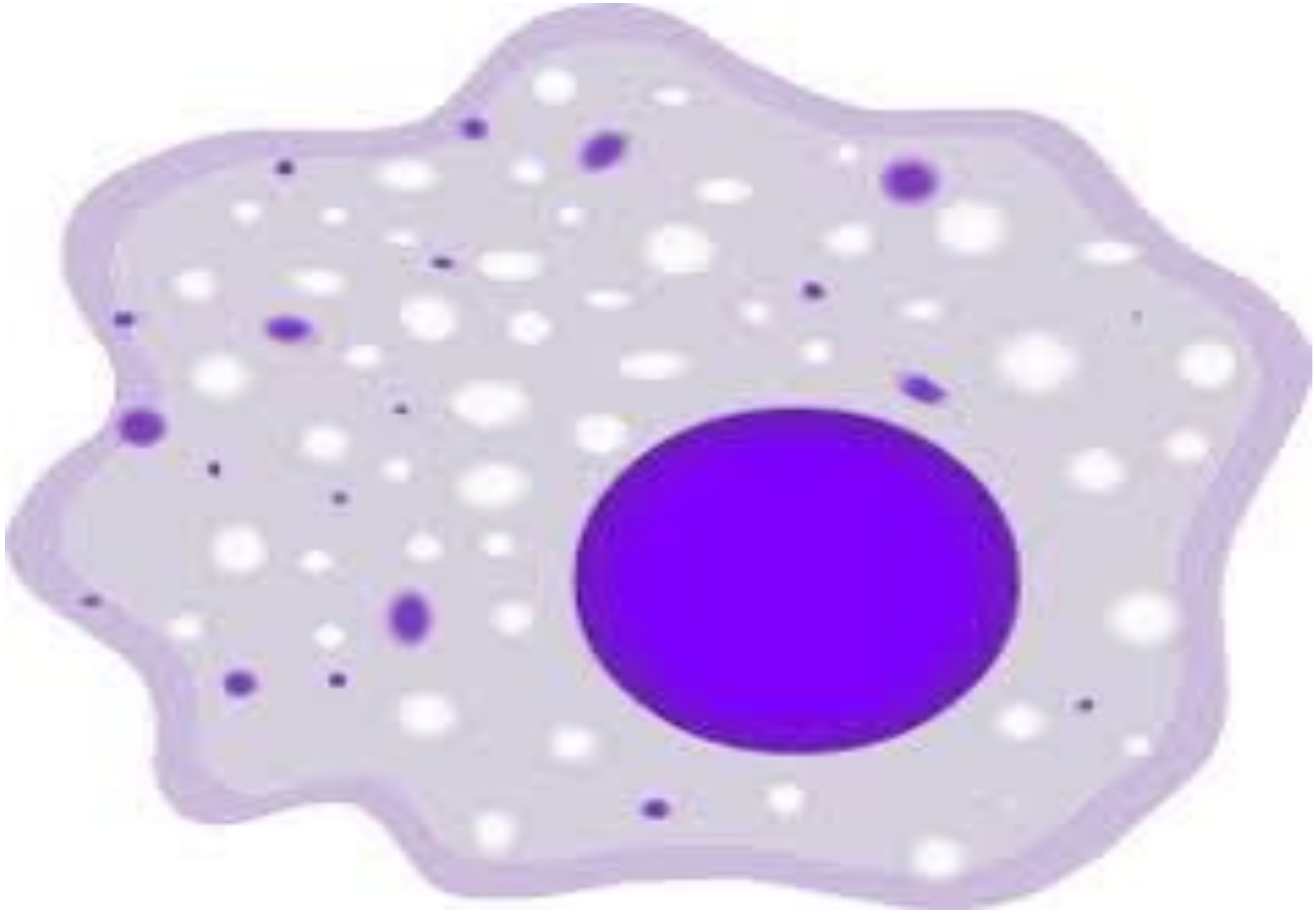
- either exogenous materials such as inhaled particulate silica, which can induce silicosis or endogenous agents such as chronically elevated plasma lipid components, which may contribute to atherosclerosis.

Chronic Inflammatory Cells :

- chronic inflammation results from complex interactions between the cells that are recruited to the site of inflammation and are activated at this site.

- *1. Macrophages:*

the dominant cells of chronic inflammation, are tissue cells derived from circulating blood monocytes after their emigration from the blood stream, macrophages are normally diffusely scattered in most connective tissues.



2. Lymphocytes:

- are mobilized to the setting of any specific immune stimulus (i.e., infections) as well as non-immune-mediated inflammation (e.g., due to infarction or tissue trauma), both T and B lymphocytes migrate into inflammatory sites using some of the same adhesion molecule pairs and chemokines that recruit other leukocytes.

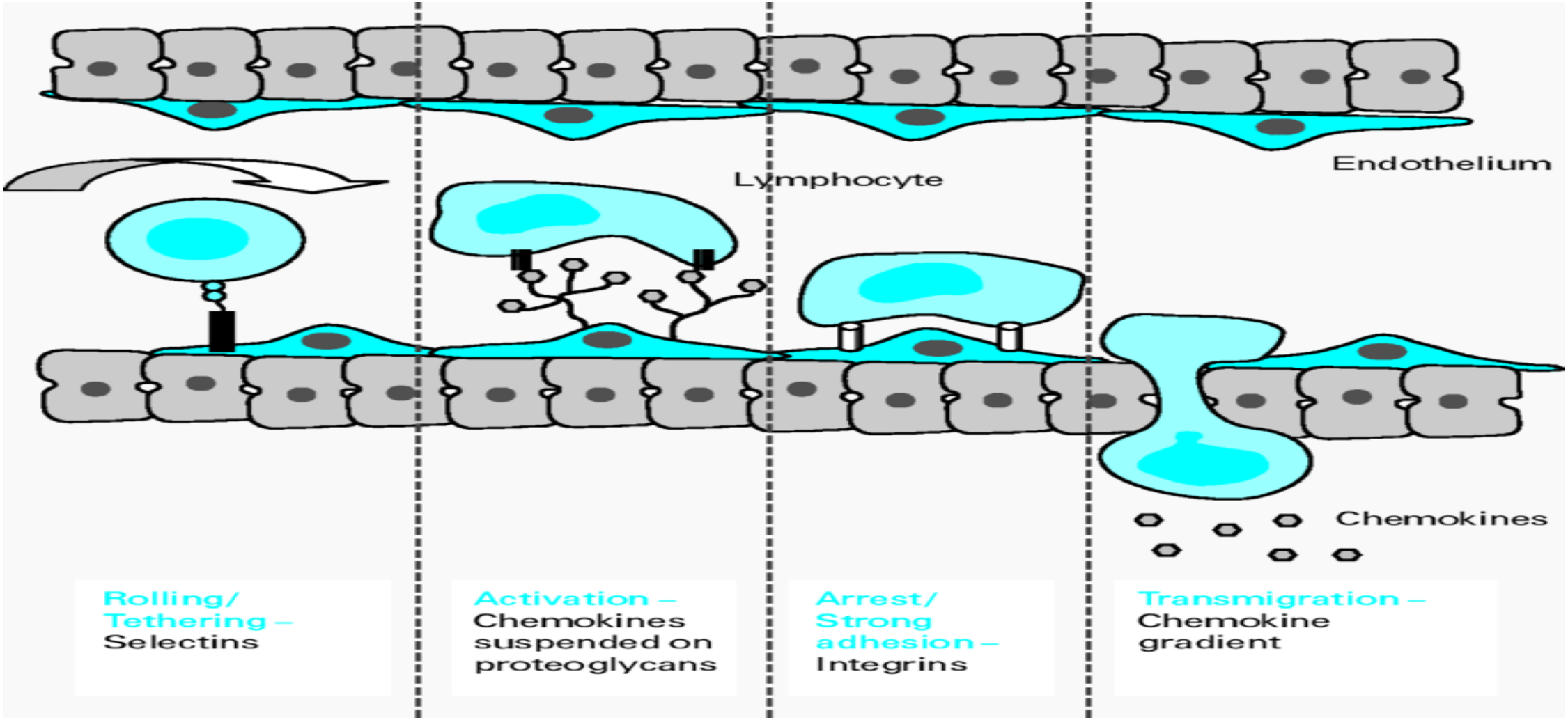
3-Eosinophils:

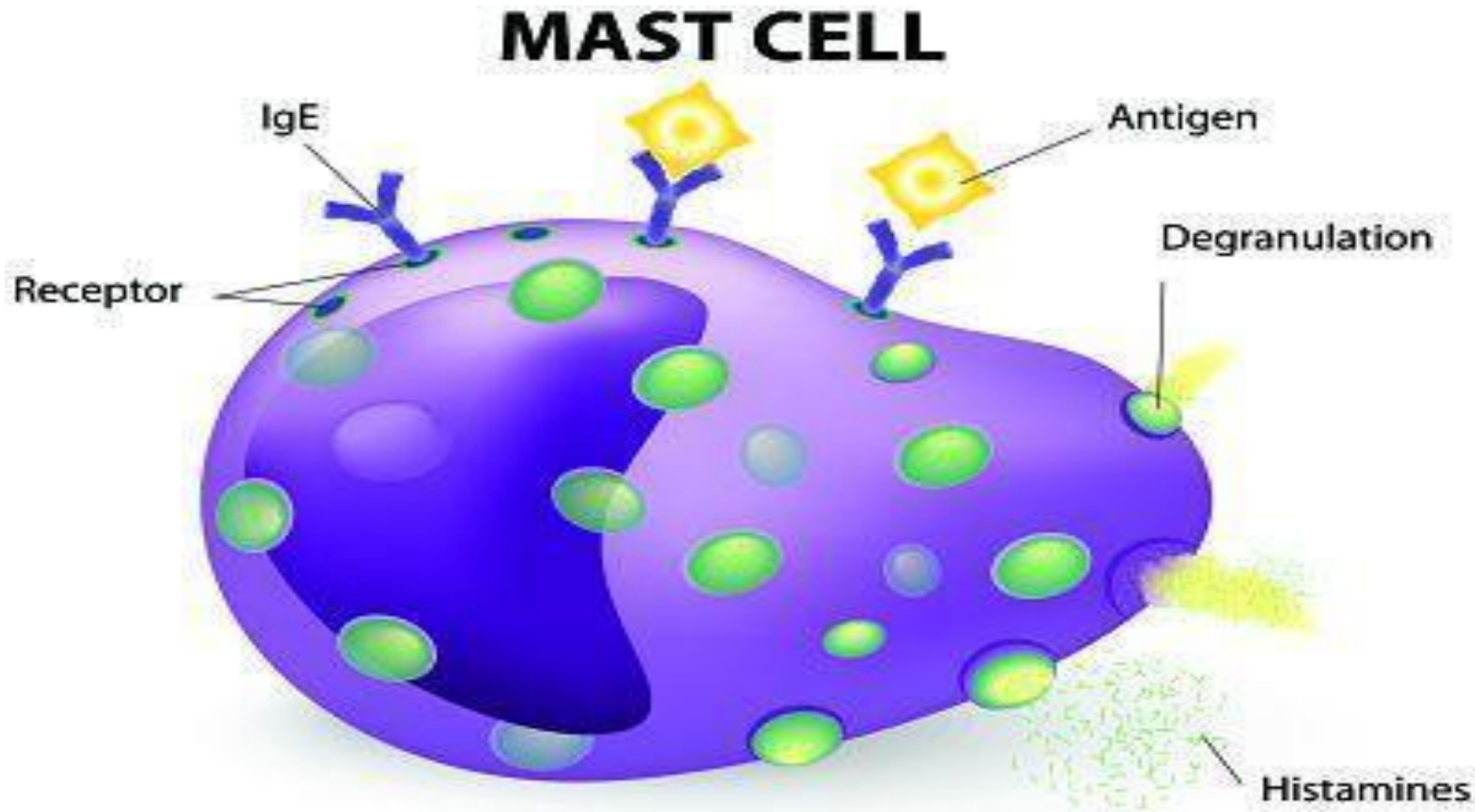
- are characteristically found in inflammatory sites around parasitic infections or as part of immune reactions mediated by IgE, typically associated with allergies.

4. Mast cells:

- are sentinel cells widely distributed in connective tissues throughout the body, and they can participate in both acute

the sequence of events for recruitment of lymphocytes to site of chronic inflammation




MAST CELL
IgE
Antigen
Degranulation
Receptor
Histamines

tissue section with chronic inflammatory cells