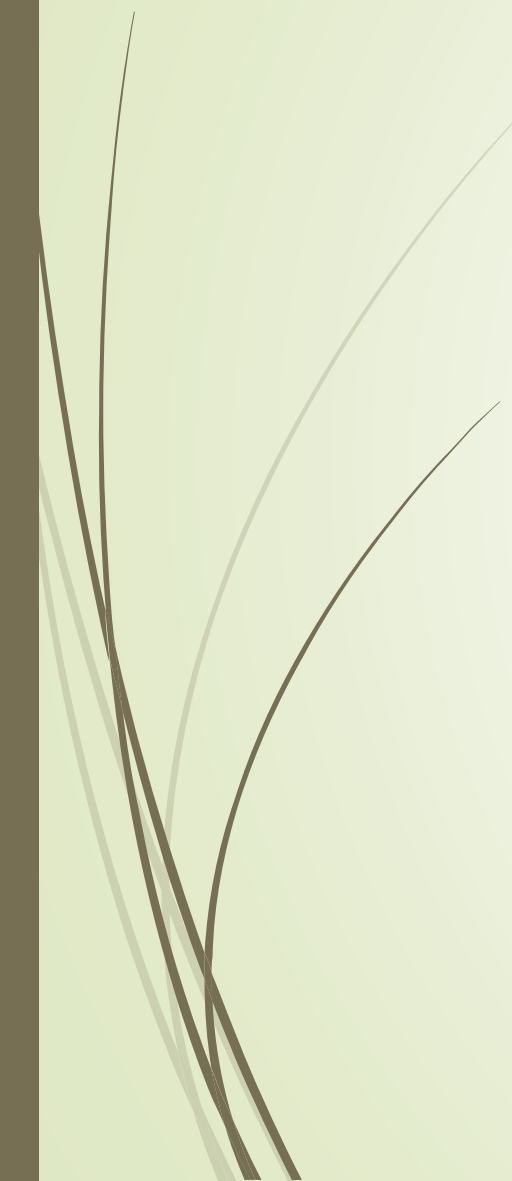



CELLS OF ACUTE INFLAMMATION

DR MUNIR HUSSAIN



Learning objectives:

- By the end of this lecture student should be able to;
 - Enumerate cells of acute inflammation.
 - Describe different cells of inflammation
 - Discuss their properties and functions.
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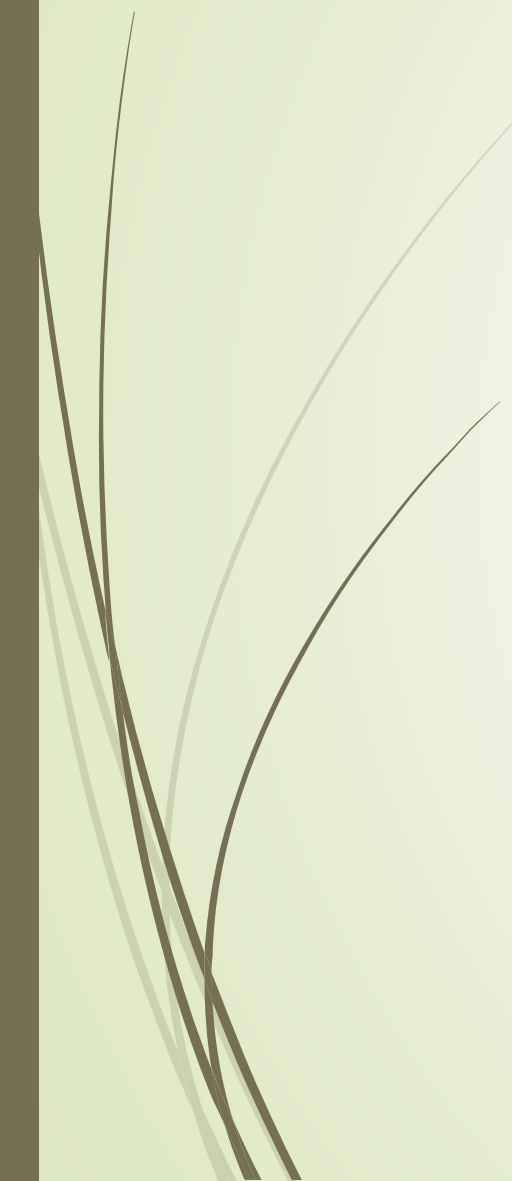
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- Acute inflammation has got two components.
 - A vascular component
 - A cellular component
 - Cells of inflammation are themselves part of cellular phase and also take part in mediating both the components of inflammation as well.


➔ Cells which take active part in acute inflammation include;


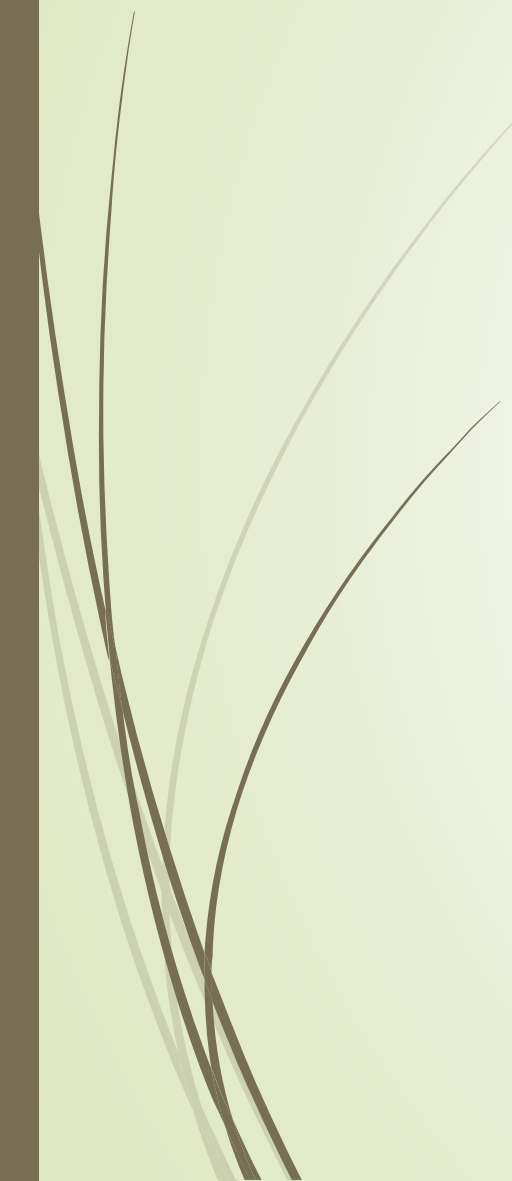
1. Neutrophils
2. Macrophages
3. Endothelial cells
4. Mast cells
5. Dendritic cells
6. Basophils
7. Platelets
8. Eosinophils



➤ **Neutrophils:**

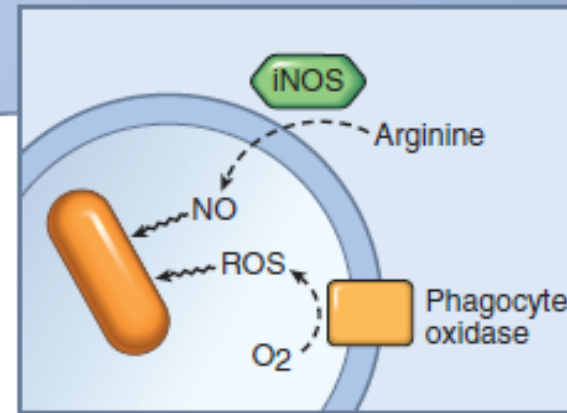
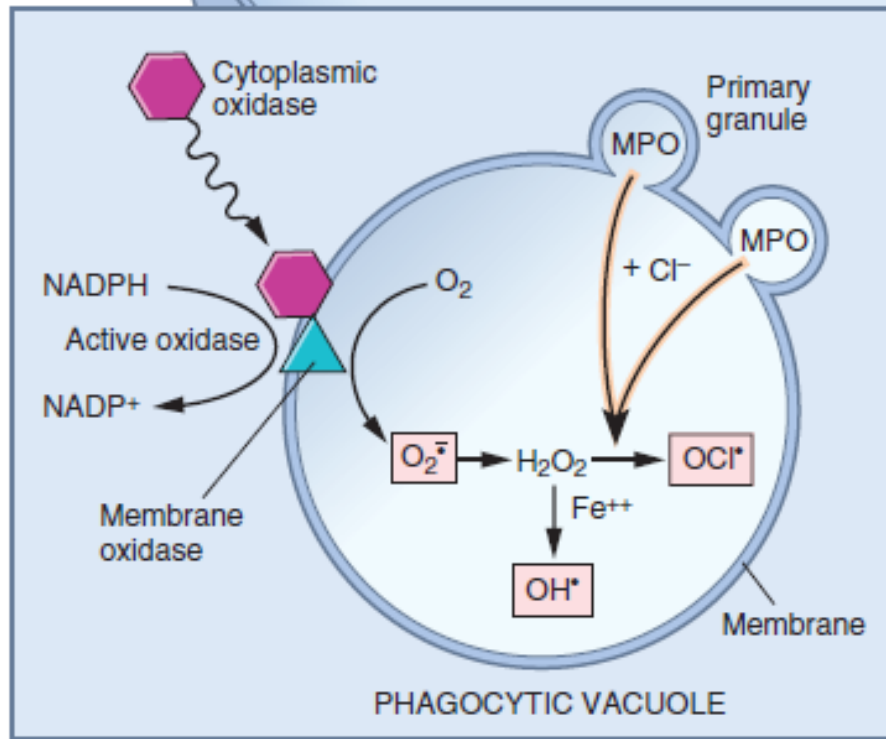
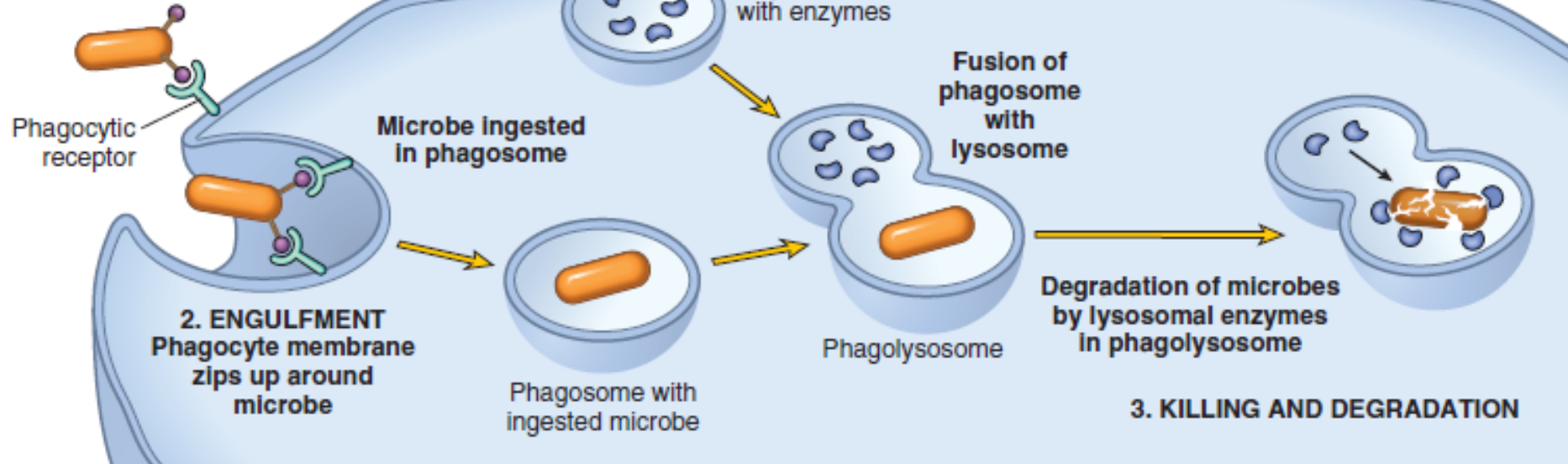
- Predominant cells of acute inflammation.
 - Stored in bone marrow, circulate in the blood and rapidly accumulate at sites of injury or infection.
 - Within the first hour of inflammation large numbers of neutrophils invade the inflamed area.
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- They are basically phagocytes.
 - Neutrophils are already mature cells.
 - Immediately begin their phagocytic functions.
 - Second line of defense.
 - Within few hours count rises to 4-5 times normal
 - It is called neutrophilia.


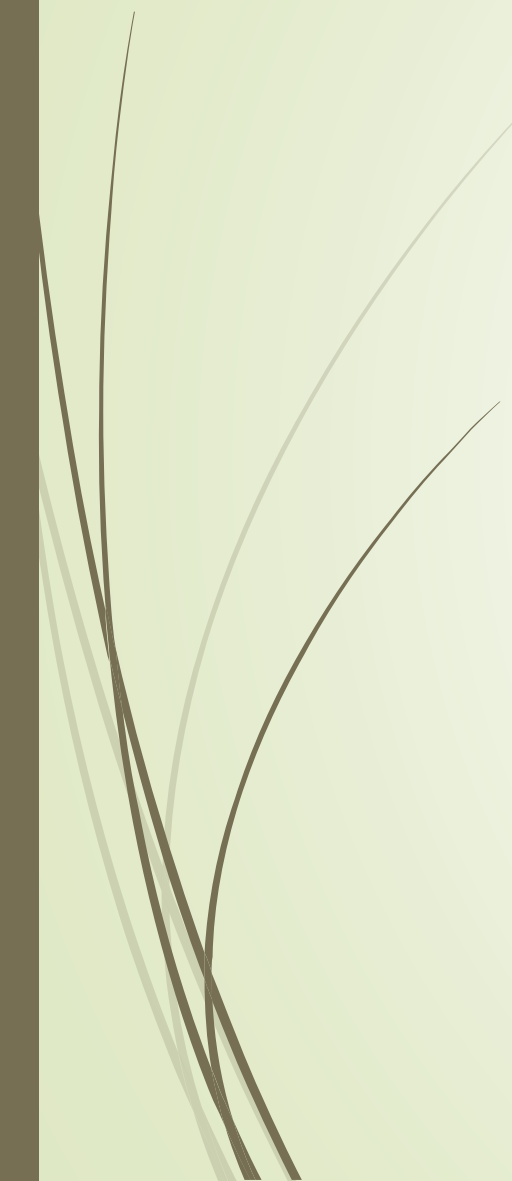
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- When encounter a microorganism their receptors attach with the microorganisms and engulf them.
 - Neutrophils phagocytose dead tissue as well.
 - Undergo apoptosis, largely during the resolution phase of acute inflammation.
 - In addition to phagocytosis and subsequent killing also exhibit NET release.

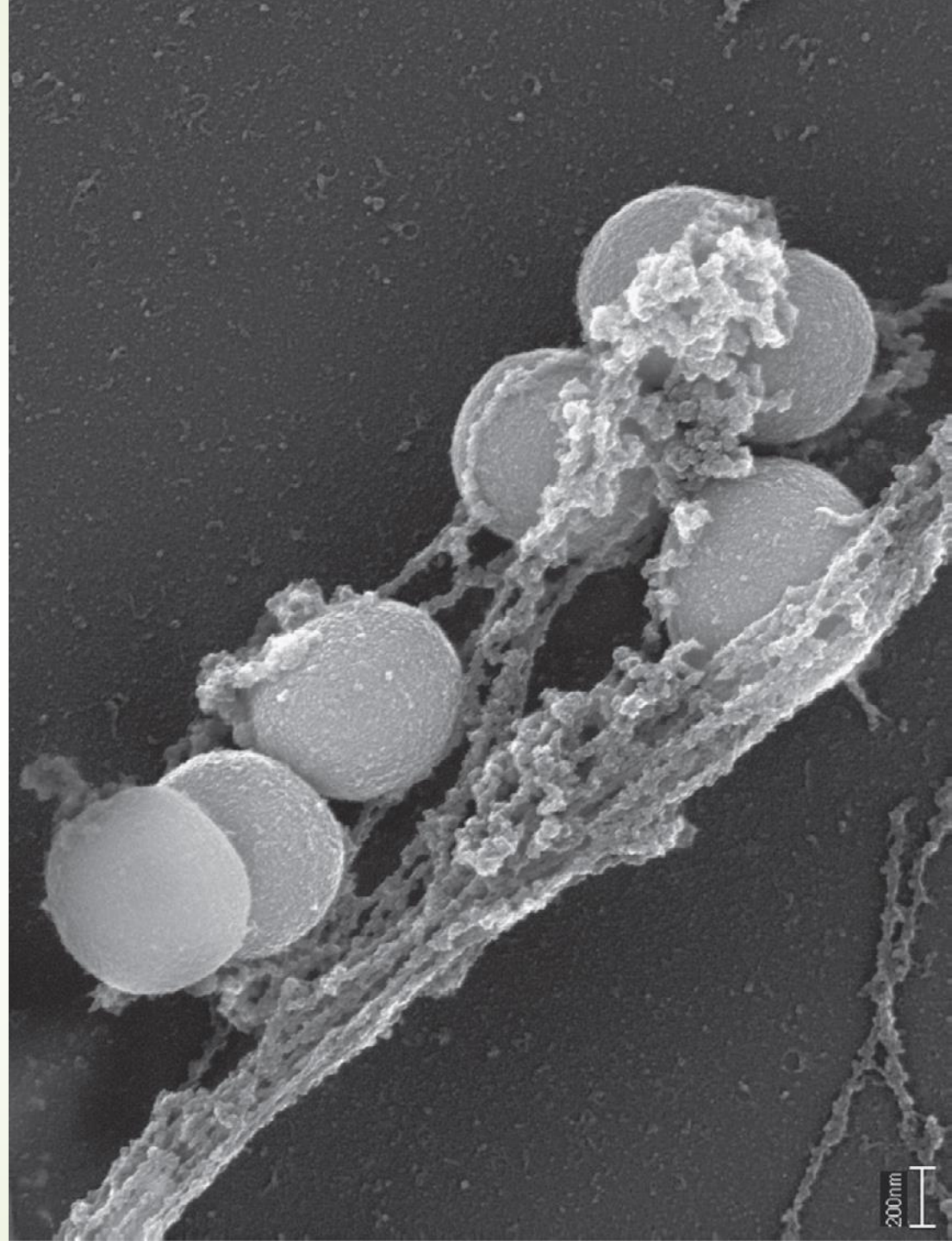
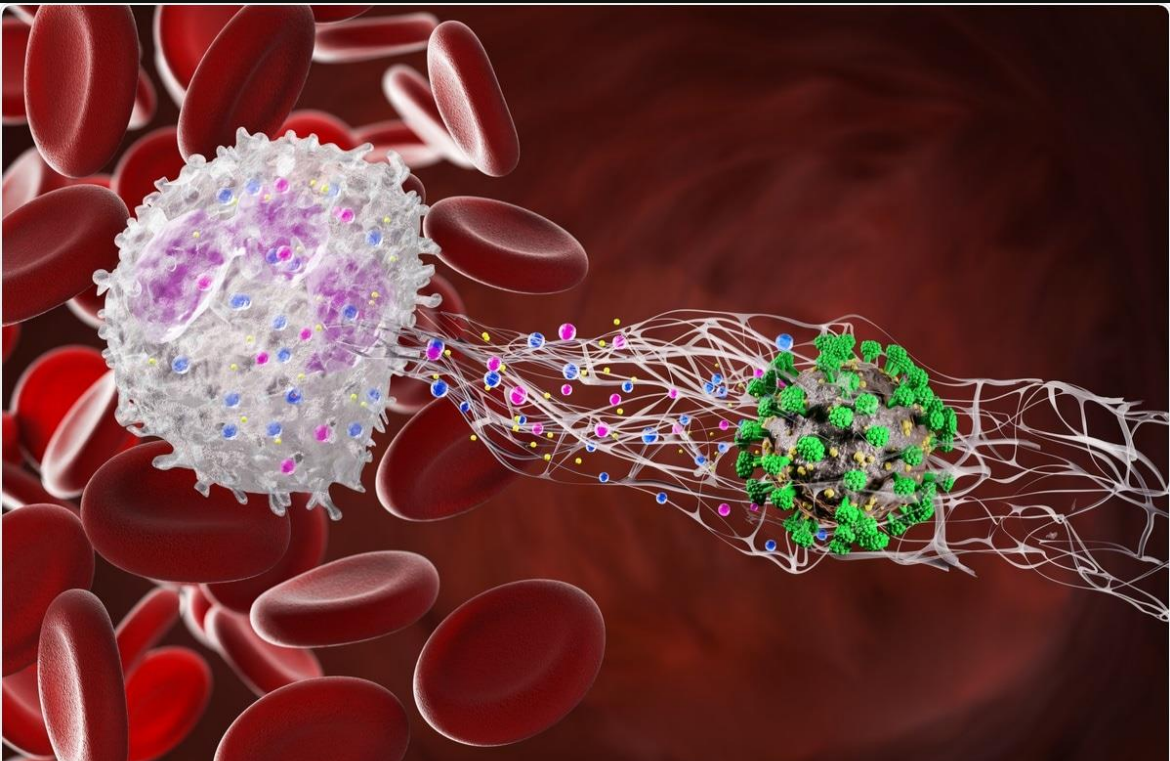
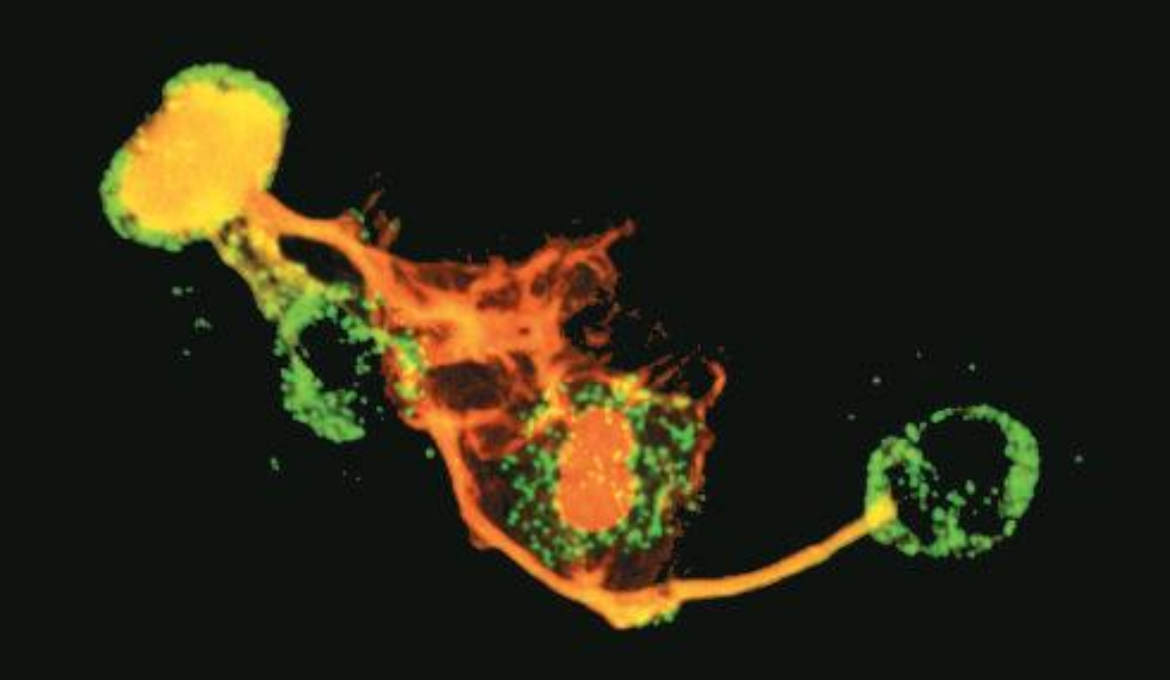
1. RECOGNITION AND ATTACHMENT

Microbes bind to phagocyte receptors



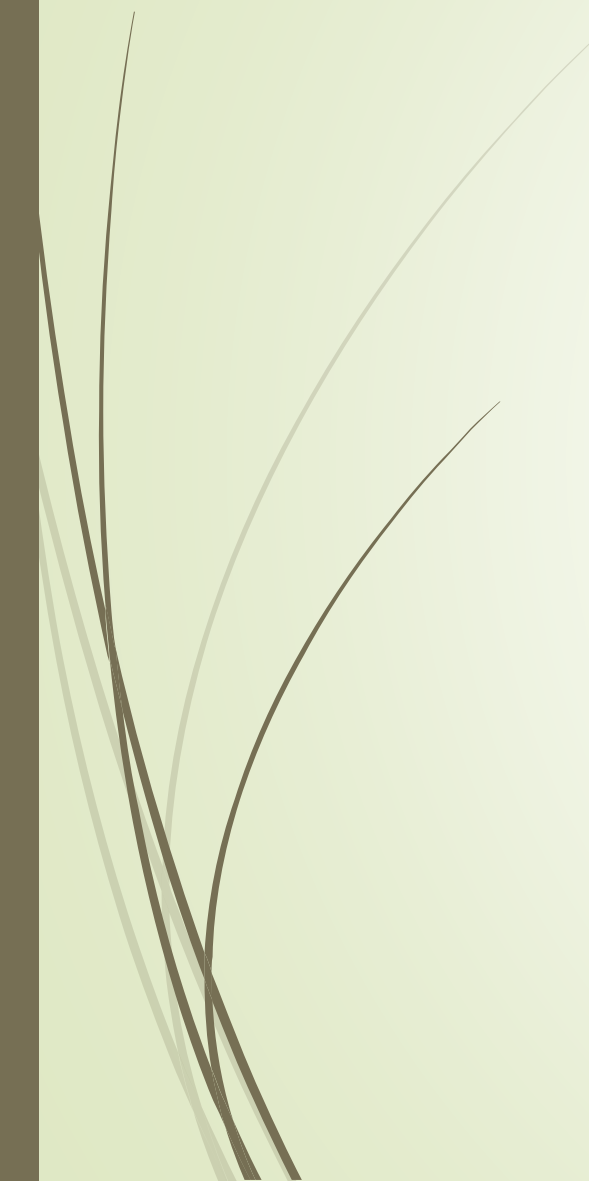
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- NET is basically Neutrophil Extracellular Traps.
 - Also called NETOSIS
 - NET are extracellular fibrillar network which are used to trap microorganisms.
 - These are derived from neutrophil DNA and basically are chromatin threads.
 - Contain microbicidal agents for killing the organisms.



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- A unique mechanism of trapping and killing microbial invaders, while at the same time dying themselves.
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➤ Endothelial Cells

- Line blood vessels as a monolayer.
 - They produce antiplatelet and antithrombotic (Tissue-type plasminogen activator) agents that maintain blood vessel patency
 - Secrete vasodilators (NO) and vasoconstrictors (Endothelin 1,2 and 3)
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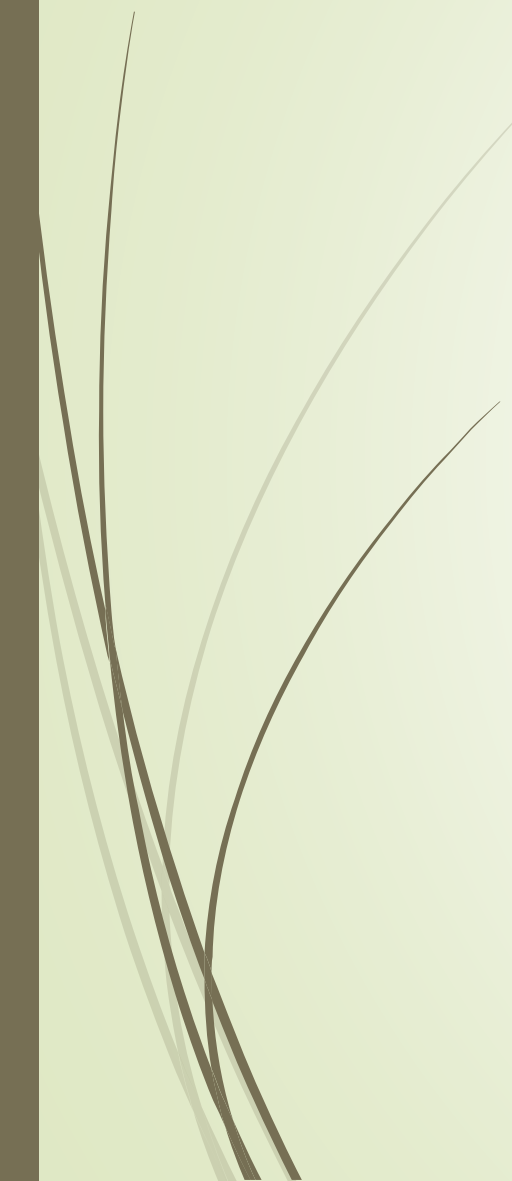



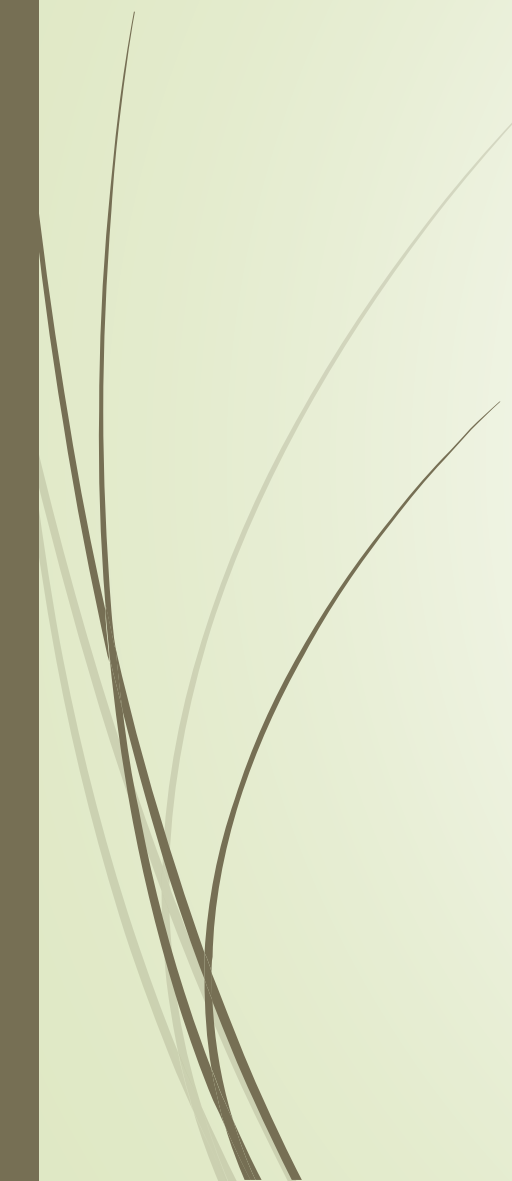
that regulate vascular tone. Injury to a vessel wall interrupts the endothelial barrier and exposes subendothelial procoagulant substances leading to thrombosis.

- ▶ Produce lots of chemical mediators which perform different functions.
- ▶ Express selectins and integrins.



➤ **Macrophages:**


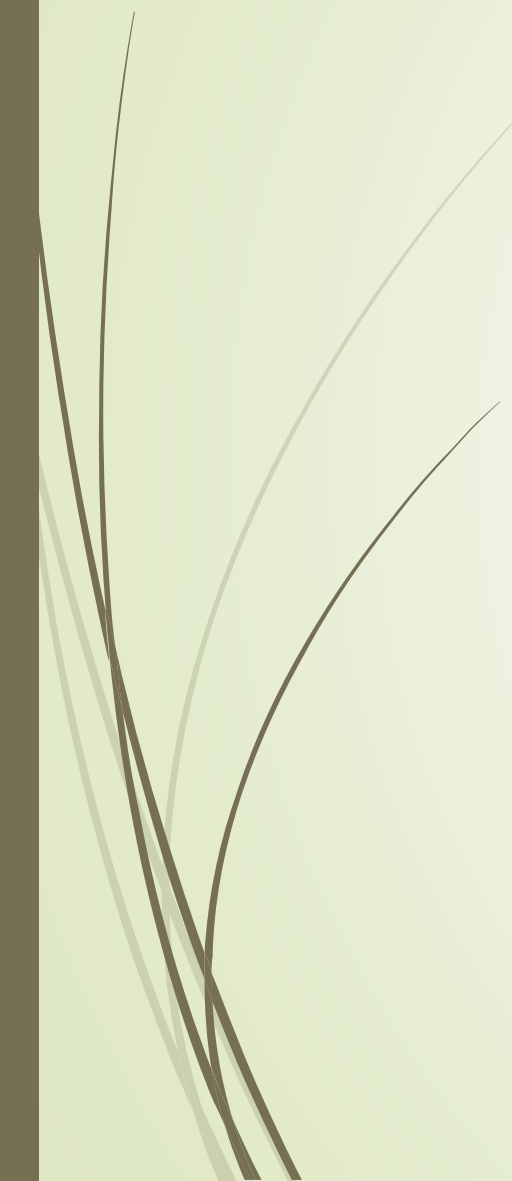
- Macrophages are dominant cells of chronic inflammation, but play very important role in acute inflammation.
 - Are tissue cells derived from circulating blood monocytes after their emigration from the bloodstream.
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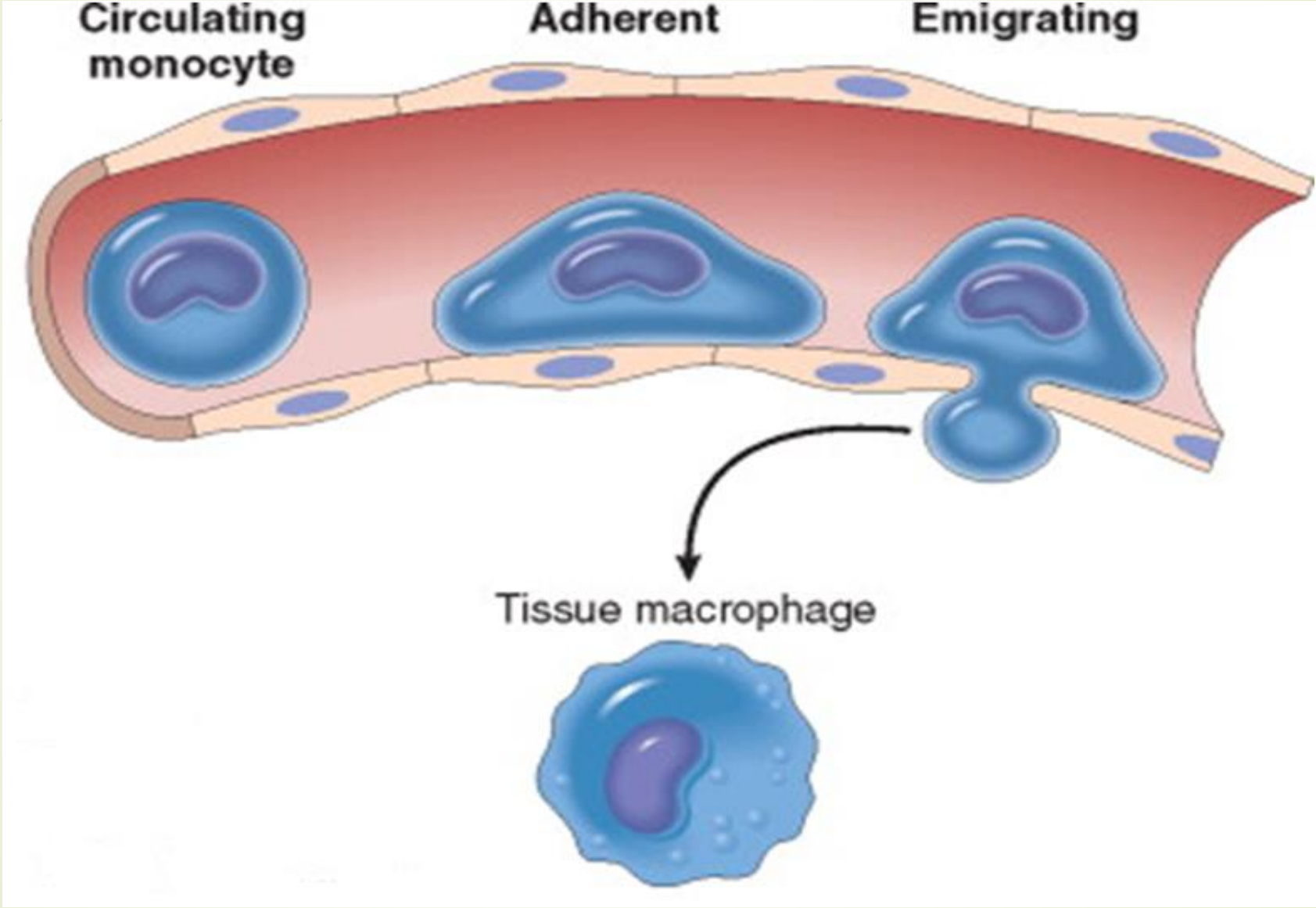
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- Macrophages once brought to tissues remain for years until utilized.
 - In an inflammatory response first of all macrophages already present in tissues come into action within minutes.
 - First line of defense.


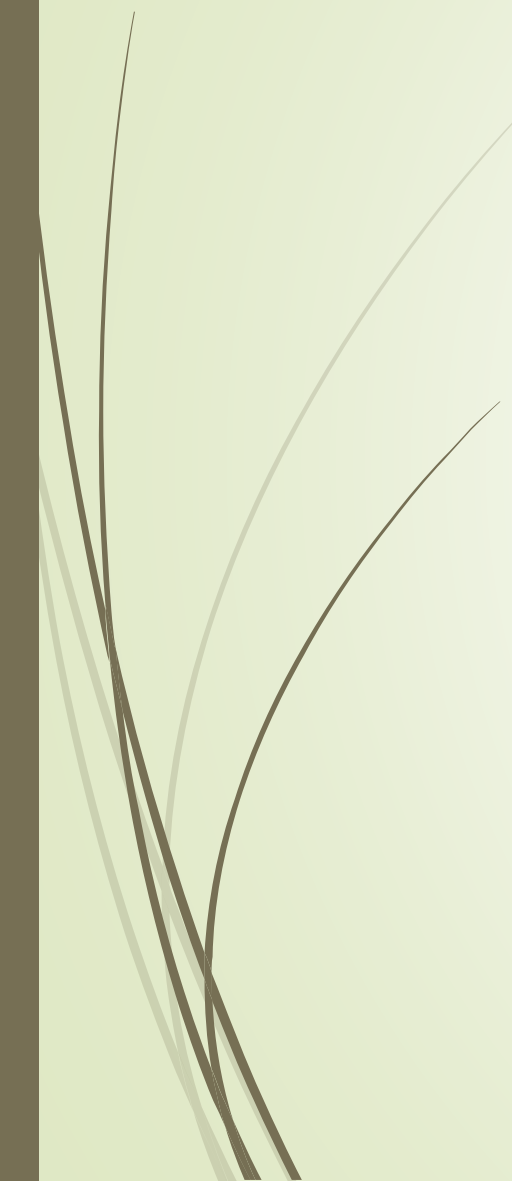




Macrophages have got different names in different tissues

1. Kupffer cells (liver)
 2. Sinus histiocytes (spleen)
 3. Microglia or Microglial cells (CNS)
 4. Alveolar macrophages (lung)
 5. Mesangial cells (Kidney)
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- Tissue macrophages form Mononuclear Phagocyte System (MPS) together with neutrophils.
 - In 2nd phase more macrophages produced from circulating monocytes.
 - Monocyte to macrophage (8 hours).

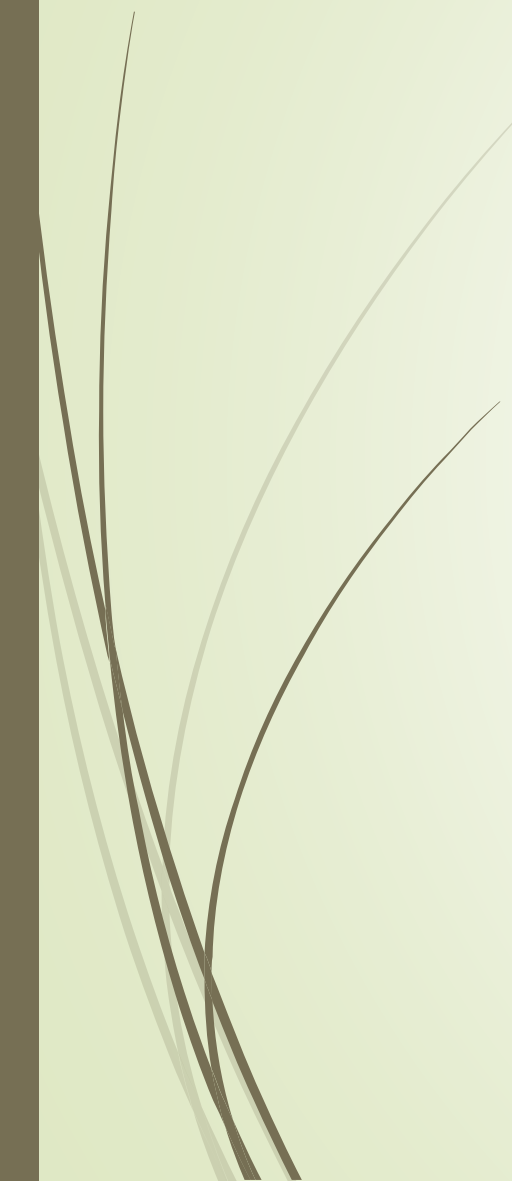


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- Due to more demand more monocytes and neutrophils produced from bone marrow (3rd phase).
 - Substances responsible are;
 - GMCSF, GCSF, MCSF, IL1 and TNF.
 - Produced by activated macrophages.

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- They are major phagocytes of the body.
 - More phagocytic than neutrophils.
 - They are also important antigen presenting cells.
 - Present antigens to other cells for recognition and activation.

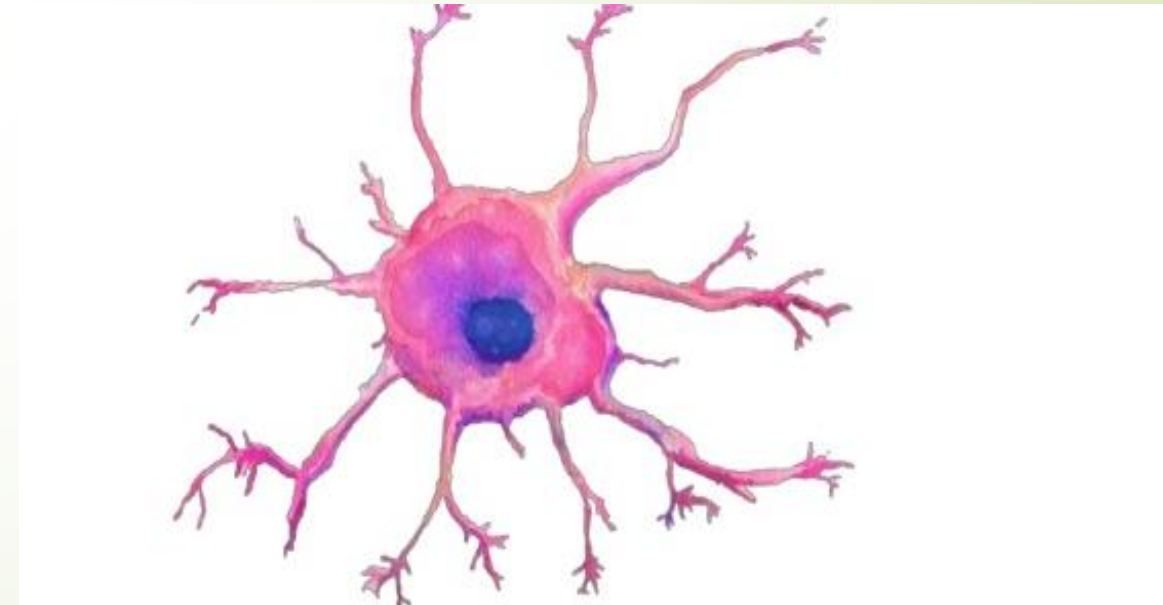
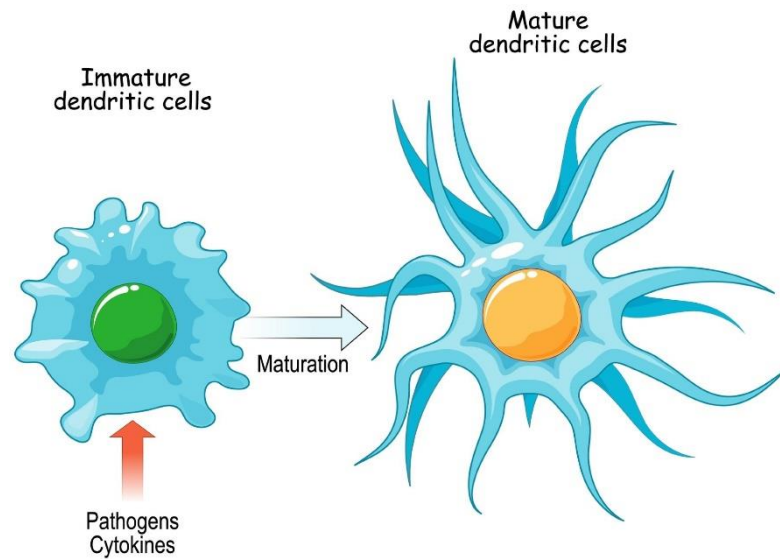


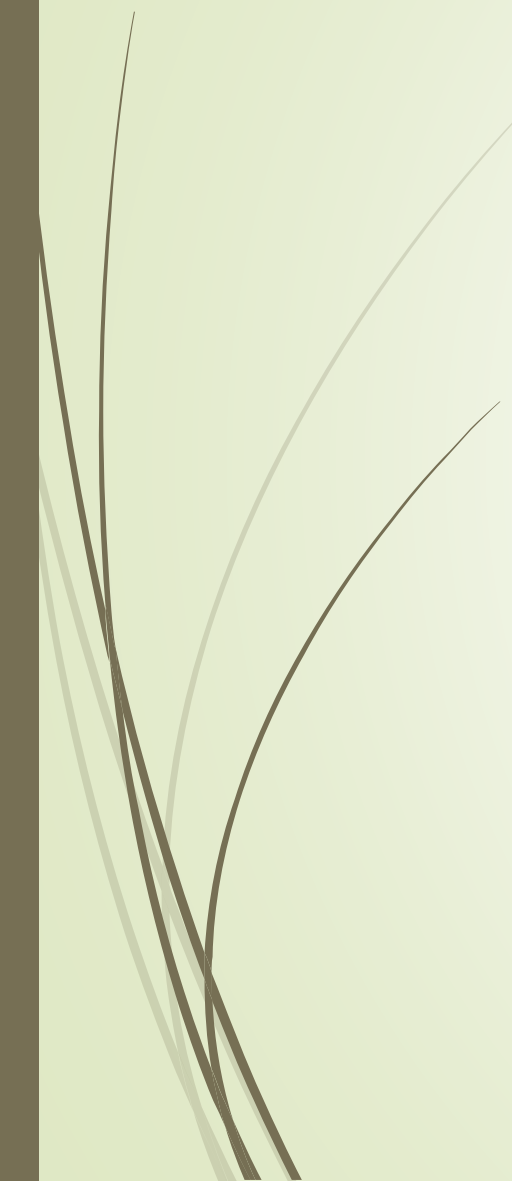
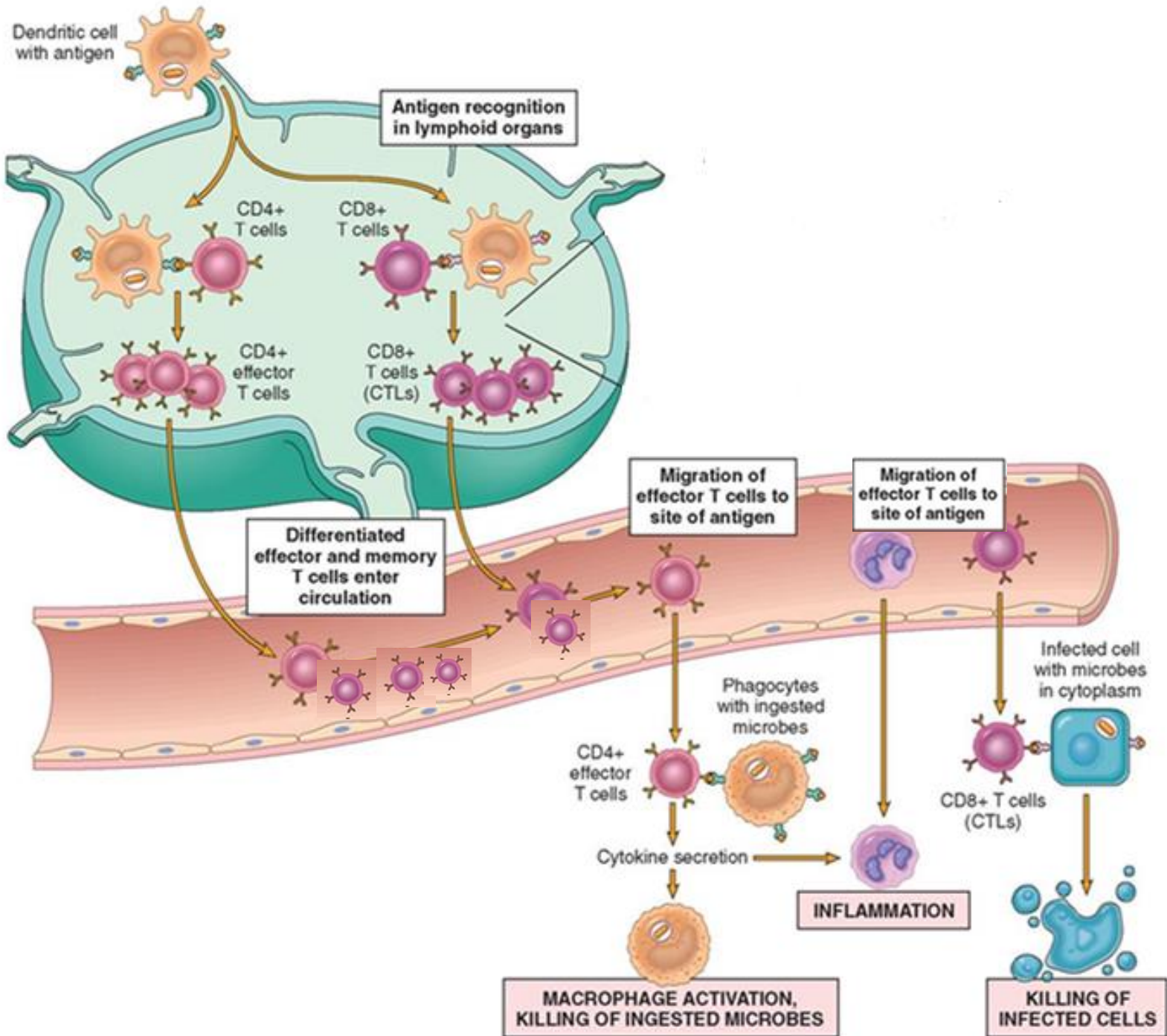
➤ Dendritic Cells

- Derived from bone marrow and circulate in the blood as immature precursors.
 - Settle in tissues, where they differentiate and mature.
 - Highly efficient, antigen-presenting cells
 - Stimulate naive T cells.
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- Antigens bind to MHC class II molecules on dendritic cells and are presented to lymphocytes, which are subsequently activated

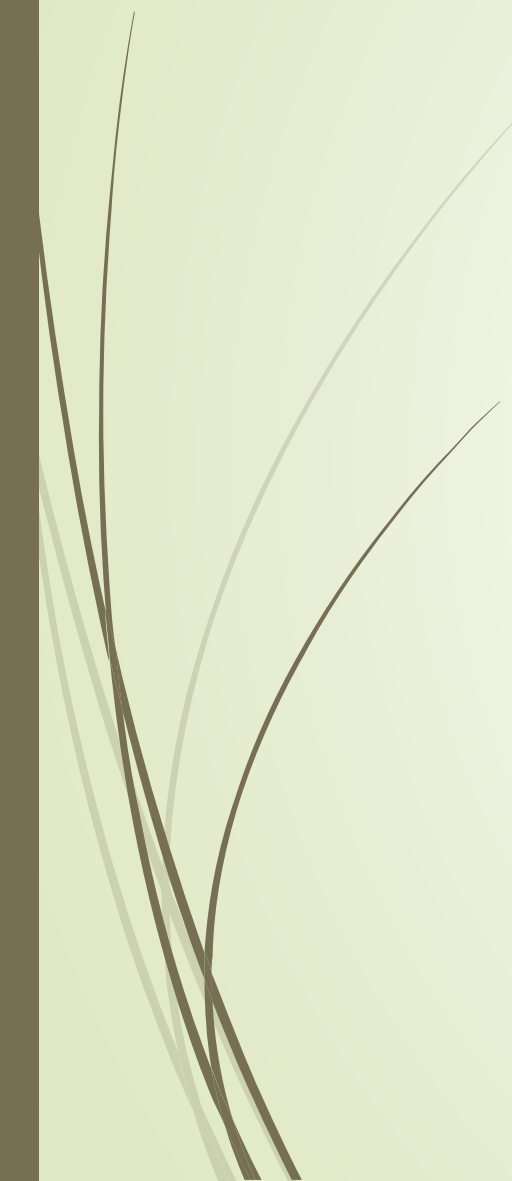
Dendritic cells


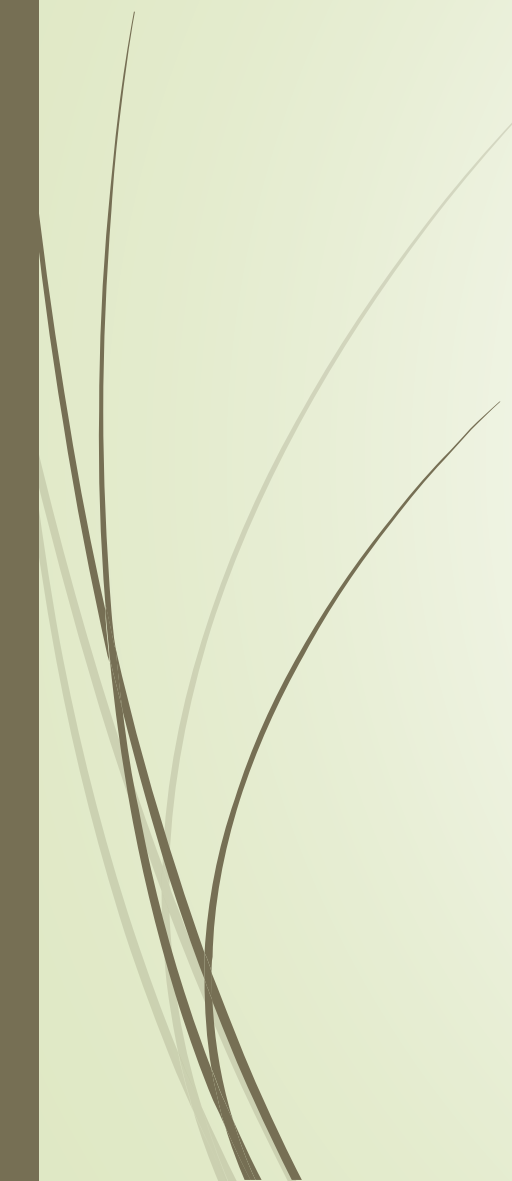






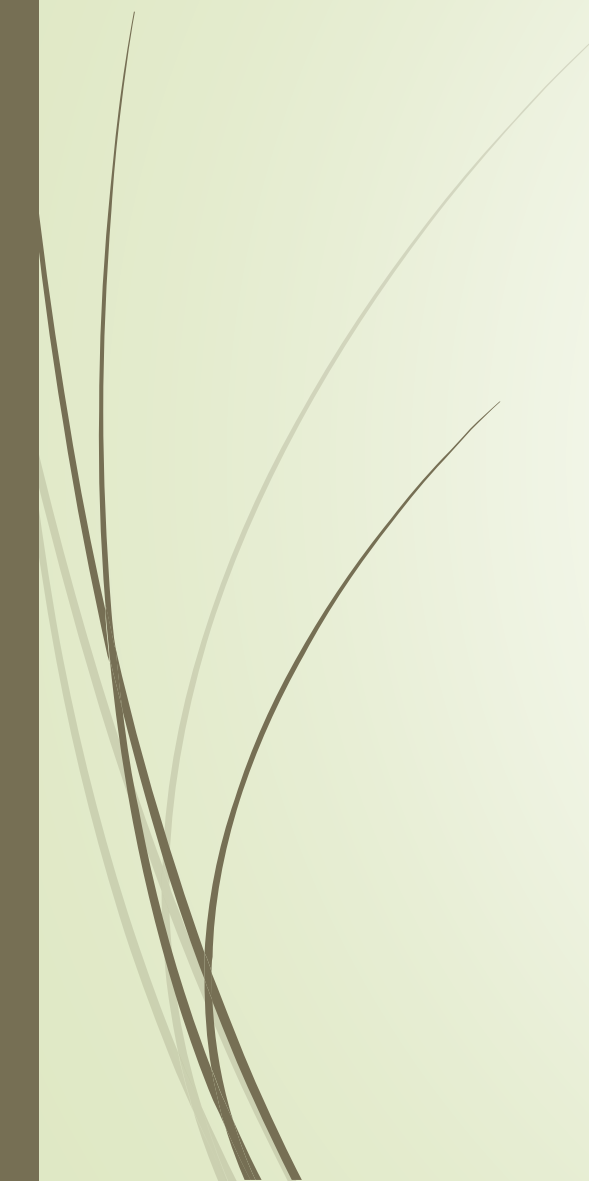
➤ **Mast cells:**



- Are widely distributed in connective tissues throughout the body, and they can participate in both acute and chronic inflammatory responses.
 - They produce histamine which causes vasodilation and increase vascular permeability.
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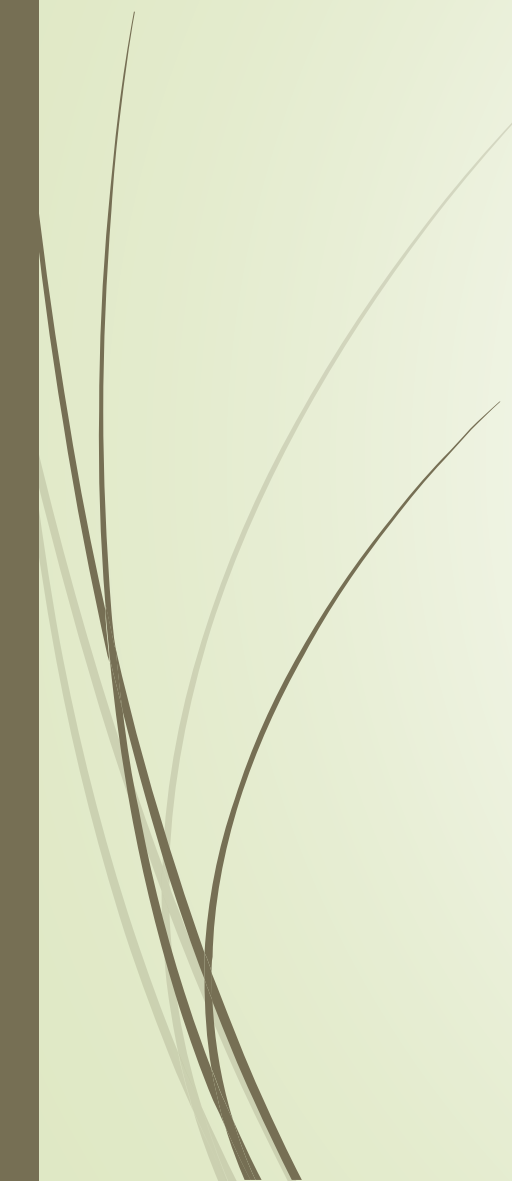
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- In atopic individuals (individuals prone to allergic reactions), mast cells are armed" with IgE antibody specific for certain environmental antigens.
 - They release enormous amount of histamine when specific antigen/allergen comes in contact and cause allergic reaction.



- **Eosinophils:**

- They are found in inflammatory sites around parasitic infections or as part of allergic reactions mediated by IgE.
 - Eosinophil granules contain major basic protein, a highly charged protein that is toxic to parasites.
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- These granules also contain ROS, Phospholipase, Acid phosphatase and other enzyme and substances
 - **Basophils and Platelets:**
 - Basophils perform same functions as mast cells.
 - Produce histamine like mast cells but short lived as compared to mast cells.

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- ▶ Platelets play a primary role in normal homeostasis and in initiating and regulating clotting.
 - ▶ Produce different chemical mediators like serotonin, histamine, platelet derived growth factor etc.