

# MECHANISM OF INFLAMMATION



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## MECHANISM OF INFLAMMATION

Inflammation is a complex biological response to tissue injury, infection, or damage, and it involves a series of cellular and molecular mechanisms. The process of inflammation is mediated by various cells, including leukocytes, mast cells, and macrophages, and it is regulated by a variety of cytokines, chemokines, and other signaling molecules.

It is having two pathways, **Alteration in vascular permeability and blood flow and migration of WBC.**

### **Migration of WBCs:**

- The migration of WBCs to the site of infection or injury is an important part of the body's immune response, and it helps to clear foreign invaders, prevent further tissue damage, and promote tissue repair.

### **Altered vascular permeability and blood flow:**

- During inflammation, the blood vessels in the affected tissue become more permeable, which allows immune cells and other proteins to exit the bloodstream and enter the surrounding tissue.
- Altered blood flow refers to changes in the rate and direction of blood flow in the affected tissue. During inflammation, blood vessels in the affected area dilate, allowing increased blood flow to the area. This increased blood flow is associated with an increase in temperature and redness in the affected tissue.

### **PROCESS:**

1. **Tissue injury or damage:** Inflammation is triggered by an external or internal stimulus that causes tissue damage or injury, such as physical trauma, infection, or exposure to irritants.
2. **Vasodilation and increased vascular permeability:** Following tissue injury, vasodilation of blood vessels in the affected area occurs,

allowing increased blood flow to the area, which leads to redness and warm.

- The increased blood flow is associated with an increase in the permeability of the blood vessels by exerting pressure upon endothelial cell.
- Which allows immune cells, such as leukocytes and plasma proteins, to migrate from the bloodstream into the affected tissue or extracellular space.
- Then concentration of formed elements (RBC, WBC and Platelets) increases within the blood vessels, which leads to increase in blood viscosity.

3. **Migration:** Then migration or movement of WBC cell occurs towards the endothelial cell.

4. **Rolling:** WBCs in the bloodstream begin to roll along the surface of the endothelial cells lining the blood vessel. This is facilitated by adhesion molecules on the surface of both the WBCs and the endothelial cells.

5. **Adhesion:** The WBCs stick more firmly to the endothelial cells via the adhesion molecules, then degeneration or breakdown of endothelial cell occurs.

6. **Emigration:** The WBCs then begin to migrate through the walls of the blood vessel into the surrounding tissue.

7. **Recruitment of immune cells:** Immune cells, particularly neutrophils, macrophages and other immune cells, are recruited to the site of injury. These cells release cytokines and chemokines, and other signaling molecules released by the damaged tissue or pathogens, which cause the inflammatory response and attract additional immune cells to the site.

8. **Phagocytosis:** Once immune cells reach the site of inflammation, phagocytosis, or engulfing and digestion of any foreign particles, such as bacteria or cellular debris, in the affected tissue occurs.

9. **Release of inflammatory mediators:** During the process of phagocytosis, immune cells release inflammatory mediators, such as histamine,

prostaglandins, and leukotrienes. These mediators increase vascular permeability, causing swelling, which leads to inflammation.

10. **Resolution:** As the cause of inflammation is resolved, the immune response is down regulated, and the inflammatory cells, mediators, and fluids are removed from the site. This process is important to prevent further tissue damage and promote tissue repair.