

Inflammation

It is the response of living tissues to injury or infection by the help of the immune system in the site of infection or damage. It is a reaction and an ordered process mediated by the inflammatory mediators produced by injured tissues and immune cells. This process consists of four major events:

1. Increased blood supply to the region.
2. Increased capillary permeability in the affected area (vasodilation).
3. Increase the degree of temperature (fever).
4. Migration of W.B.Cs from the blood vessels into the tissues.

Neutrophils are the first cells reach inflammatory sites followed by macrophages and lymphocytes in order to generate an immune response.

Inflammatory mediators include; complement system proteins, fibrin, clotting plasmin, kinin system, prostaglandin, serotonin, histamine, etc. the function of these mediators is very important to initiate the immune response.

Importance of inflammation

1. Limitation of the infection and make it localized.
2. Control the infection by stop spreading of infectious organisms to the surrounding healthy tissues by forming the fibrin clot around.
3. Activation of the immune system to generate the proper immune response against the pathogen.

Cells of Inflammation

1. Blood cells
 - Granulocytes (Neutrophils, Basophils, eosinophils and Platelets).
 - Non-Granulocytes (Monocytes, Lymphocytes).

2. Tissue cells

- Mast cells (specific Basophils).
- All fixed macrophages.
- Giant cells (group of macrophages united as one giant cell).
- Plasma cells.

Types of inflammations

1. Acute inflammation

The most common type of inflammations characterized by swelling, pain, redness and heat at the site of inflammation due to Odema, increase blood supply and toxic effects of inflammatory products on nerves in the site of inflammation the most important sign of acute inflammation is exudate formation.

Exudate defined as the odema inflammatory liquid forms during acute inflammations contain high levels of protein, many inflammatory cells, low glucose, pus and sometimes fibrin clot.

The importance of exudates is:

- A. Killing causative pathogen.
- B. Dilution of toxins in the site of inflammation.
- C. Media for immune response (Abs reaction with Ag).
- D. Localization of infection and stop spreading.

Pus: it is the solid components of inflammatory exudates contain living and dead neutrophils and the debris of dead cells of necrotic tissues.

Steps of Acute inflammation

1. After infection, increase permeability of blood vessels in the infected site.
2. Formation of exudate which contain proteins (e.g. Albumin, Globulins, plasmin).
3. Aggregation of RBCs due to conjection.
4. Migration of PMNs (polymorph nucleus cells) to the site of inflammation), followed by monocytes by the effect of chemotaxis.

5. Reversible vascular changes.
6. Repair damage: [reabsorption of liquids, regeneration of damaged cells of infected tissues by repair blood vessels and fibroblast cells. This process is called regeneration and that is the end of inflammation.

NOTE: when the damaged tissue repaired by fibrous tissue and new blood vessels from nearby tissues (neighboring tissue), this process is called granulation tissue formation or scar tissue. This repaired tissue under microscope look like dotted.

Factors affect the repair are:

- 1) Nutrition (vit D and C).
- 2) Medications and drugs e.g. antibiotics increase repair while cortisone drugs decrease due to prevent new blood vessels formation.

Microscopic view of acute inflamed tissues:

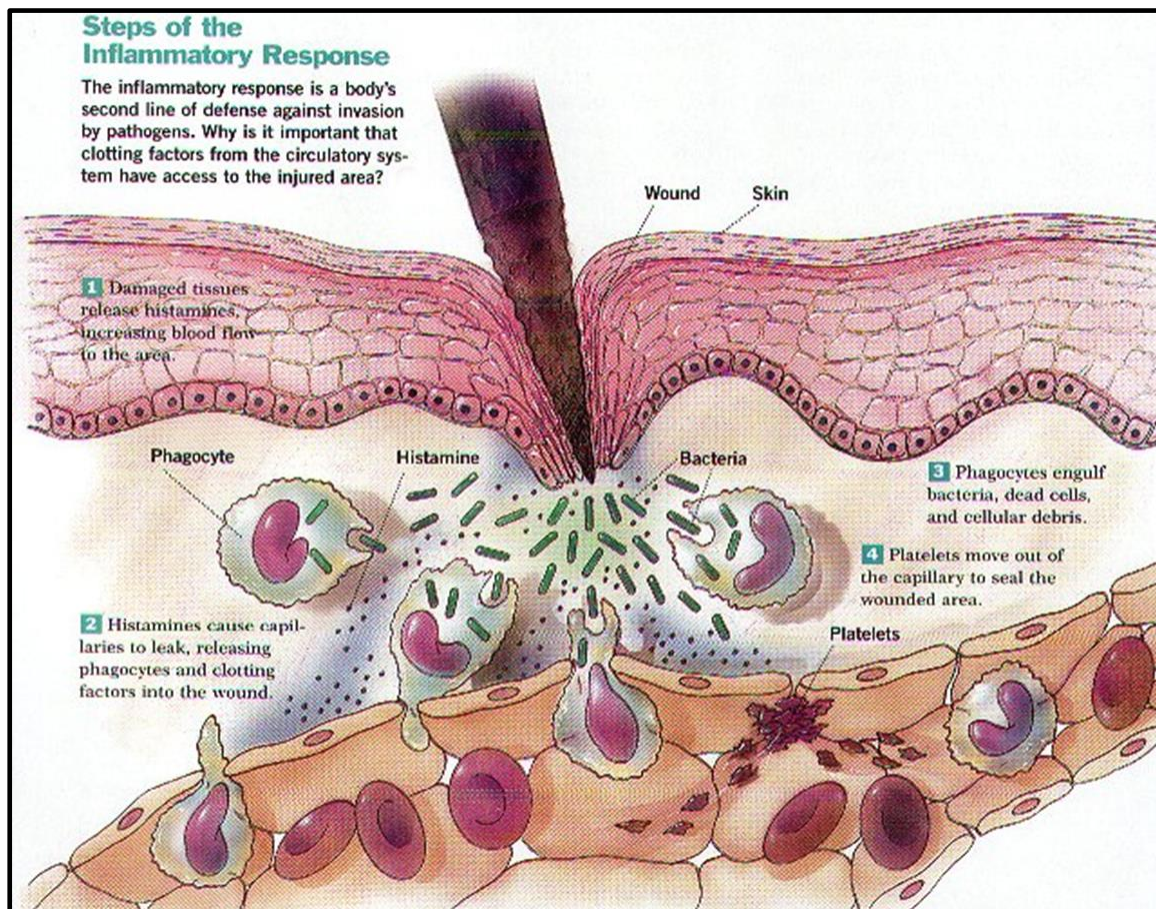
- 1) Serous exudates.
- 2) Large number of PMNs.
- 3) Large number of monocytes.
- 4) Fibrin.

Types of acute inflammations:

Acute inflammations can be classified according to the type of exudates formed as following:

- 1) Serous inflammation (the exudate is serum e.g.: Tuberculosis).
- 2) Mucoid or catarrhal inflammation (the exudate is mucous e.g. flu or influenza).
- 3) Fibrinous inflammation (the exudate is fibrin. e.g.: Diphtheria, caused by *Corynebacteria diphtheriae*).
- 4) Purulent or suppurative inflammation (the exudate is pus and called abscess).

- 5) Combined Inflammation when there are more than one type of inflammation like muco-purulent or sero-fibrinous usually occur during mixed infections.



2. Chronic inflammation

Occurs when the pathogenic infection last for long time without treatment or with low immune response or when the pathogen is intracellular parasite lives inside cells and escape immune system defense mechanisms and has no Immunogenic antigens, also when the acute inflammation left without treatment will become chronic inflammation.

Signs of chronic inflammation:

- 1) Long standing inflammation.
- 2) Low exudate.
- 3) Histological changes in tissue (most important sign) e.g.: Hyperplasia, hypertrophy.

Metaplasia and suppress the physiological function, hence giving immunosuppressor drugs with the therapy in order to avoid these histological changes for example chronic inflammation in middle ear (chronic otitis media) lead to hearing loss due to ear drum damage.

3. **Granulomatous inflammation.**

Long standing inflammation transformed from chronic inflammation, occurs due to internal fungal infections and some intracellular bacterial infections e.g.: Tuberculosis, leprosy, brucellosis, syphilis, when the pathogenic microorganism hide and escape from host immune system mechanisms inside cells.

Granuloma: it is the site of this type of inflammation and composed of nodule containing a giant cell (merge of macrophage cell) in the center surrounded by epithelial cells and some lymphocytes with fibrin deposited around these cells.

Lesion: Any abnormality in any tissue caused by any process that damages tissues or metabolic defects scientists usually depend on lesion formation during researches for understanding and comparing the effects of harmful organisms or when testing a new drug or treatment for example on laboratory animals.