



# Pathology

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## Inflammation

### Third and Fourth Lectures

### Microbial Killing and Degradation

#### Two mechanisms

1. **Oxygen- dependent mechanism** by formation of  $H_2O_2$  , superoxide  $\bar{O}_2$  and **Nitric Oxide ( NO )** which are **Powerful Bactericidal Agents** . They can cause cell injury if they leak out of phagolysosome. **Glutathione peroxidase** – cytoplasmic enzyme protect the cell by destroying  $H_2O_2$  and  $\bar{O}_2$  that leak out of phagolysosome.  
**In gout** → urate crystals are phagocytized by neutrophil exert toxic effect on lysosomal membranes → release of lysosomal enzymes which cause Acute Inflammation of the joint with destruction of joint.
2. **Oxygen - Independent Mechanism** – mediated by Lysozyme & others.

#### Five Cardinal Clinical Signs of Acute Inflammation

1. Redness ( Erythema )( **Rubor** ): Due to vasodilation and congestion.
2. Heat ( Warmth )( **Calor** ): Due to vasodilation and increased blood flow.
3. Swelling ( Edema )( **Tumor** ): Due to fluid exudation.
4. Pain ( **Dolor** ): Due to irritation of nerve endings and chemical mediators.
5. Loss of function( **Functio laesa** ): Reflex immobilization due to pain & edema.

( PRISH )

## Microscopic appearance of acute inflammation

- ❖ Dilation and Engorgement of blood vessels.
- ❖ Exudation of fluid.
- ❖ Infiltration of tissue by acute inflammatory cells mainly Neutrophils.  
( Monomorphic Infiltrate )

## Morphologic Patterns of Acute Inflammation

1. Catarrhal
2. Serous
3. Suppurative ( Purulent )
4. Hemorrhagic
5. Fibrinous
6. Pseudomembranous
7. Gangrenous
8. Ulceration

### 1. Catarrhal Inflammation :

- ✓ Mild acute inflammation of the mucous membrane.
- ✓ Excessive mucous fluid secretion and little necrosis of tissue.
- ✓ E.g. Common cold = coryza → nasal obstruction + congestion.
- ✓ **Commonest type** of acute inflammation.

### 2. Serous inflammation :

- ✓ Moderate acute inflammation of serous membrane, characterized by clear watery fluid in serous cavity ( pleural, peritoneal, pericardial and synovial cavities ) which is called Effusion.
- ✓ Effusion = accumulation of fluid in any serous cavity.
- ✓ Ascites = accumulation of fluid in peritoneal cavity.
- ✓ Serous Exudates ( clear watery fluid ).
- ✓ Other examples: Skin Blisters caused by Burns or Viral Infection.

### 3. Fibrinous inflammation :

- ✓ **Severe** acute inflammation of serous membrane with excessive deposition of Fibrin in serous cavity ( **Fibrinous Exudate** )  
E.g. **Fibrinous Pericarditis**.
- ✓ Fluid is removed by lymphatic.
- ✓ Both visceral and parietal layers of cavity are stuck by fibrin meshwork giving **Bread and Butter appearance** when separated from each other.
- ✓ Fibrinous exudates may be degraded by fibrinolysis and removed by macrophage with clearance of cellular debris resulting in **Resolution**.
- ✓ Incomplete removal of excessive fibrin resulting in **organization** and **fibrous adhesion** of pleura or pericardium. Organization is replacement of fibrinous exudate by the ingrowth of fibroblasts and blood vessels, leading to form fibrous tissue ( fibrosis ) in body cavity.

### 4. Suppurative inflammation :

- ✓ It is characterized by large amount of **Purulent Exudate** ( Pus ).
- ✓ Caused by **pyogenic** bacteria ( *Staph. Aureus and Strepto. Pyogenes* ).
- ✓ **Boil** = **Furuncle** = Abscess of hair follicles
- ✓ **Empyema**: collection of pus in a body cavity or a hollow organ  
E.g. Gall Bladder. ( **Pyogenic** bacteria = Pus-forming bacteria )

## Pus :

- ❖ It is a thick creamy viscous yellowish-greenish fluid.
- ❖ It consists of :
  - Dead and dying neutrophils
  - Fluid
  - Exudate
  - Bacteria
  - Necrotic tissue or cellular debris

- ❖ Pus is a **Purulent Inflammatory Exudates** rich in neutrophils and cellular debris.

## Abscess :

It is a localized collection of Pus, has central necrotic cavity ( **liquefactive necrosis** ), surrounding by a layer of inflamed granulation tissue, which is called ( **Pyogenic Membrane** ).

### Outcomes of abscess:

- ✚ Burst by itself.
- ✚ Surgical drainage.
- ✚ Healing by Fibrosis ( Scarring ).

## 5. Pseudomembranous Inflammation :

- ✓ **Very severe ulcerative** inflammation of mucous membranes with extensive necrosis of surface epithelium or mucosa.
- ✓ Formation of **pseudomembrane** consisting of exudate, fibrin, neutrophils, RBC, bacteria and tissue debris.
- ✓ Whitish – dirty membrane.
- ✓ E.g. ● **Diphtheria** → Larynx ( *Corynebacterium diphtheriae* )
  - **Pseudomembranous Colitis** → *Clostridium difficile*  
( Antibiotic-associated colitis = Lincomycin and Clindomycin ).

## 6. Gangrenous Inflammation :

- ✓ **Gangrene: Tissue Necrosis + Putrefaction** due to invasion with digestion of tissue by Saprophytic Bacteria – like putrefaction of meat in a hot weather.
- ✓ Black discoloration of tissue with Bad odor ( Foul smell ).

- ✓ E.g. ● **Diabetic Foot** – Atherosclerosis

Ischemia of leg + Loss of Sensation

- **Gangrenous Bowel ( Volvulus )**.

## 7. Ulceration :

- ✓ **Ulcer** is a loss of continuity ( **Local Defect** ) of the surface epithelium such as skin or any mucosa in the body such as GIT mucosa or Genito-urinary tract mucosa ( GUT ).
- ✓ Ulcer is associated with acute and chronic inflammations which induce **Necrosis of cells with sloughing ( shedding )** of inflamed-necrotic tissue of surface epithelium or mucosa of involved organ leading to the formation of ulcer.
- ✓ E.g. **Gastric ( Peptic ) Ulcer** and **Ulcerative Colitis**.