CHRONIC INFLAMMATION
Chronic inflammation

Persistent response to injury
Prolonged duration (weeks, months, years)

- Characters
- Causes
- Types
Chronic inflammation

Characters:
1. Infiltration with mononuclear cells: lymphocytes, microphages and plasma cells
2. Tissue destruction
3. Repair, new vessel proliferation (angiogenesis) and fibrosis
COMMON CAUSES

Cause: continuous existence of inflammatory agents.

a. Persistent microbial infections

b. Prolonged exposure to potential toxic agents: foreign body that cannot be degradation
COMMON CAUSES

c. Type IV allergic reaction caused by some special infection, e.g. TB et al.

d. Some autoimmune disease, e.g. rheumatoid arthritis, colitis, graves’ disease.
Morphological patterns

Nonspecific proliferative inflammation

Granulomatous inflammation
Nonspecific proliferative inflammation

is characterized by coexist of many kind of inflammatory cells.

Pathological changes: mononuclear cells (lymphocytes, macrophages, plasma cells) infiltration and proliferation of fibroblasts and connective tissue, vessels, epithelial cells.
Nonspecific proliferative inflammation

*Inflammatory polyp:* an inflammatory mass formed by excess proliferation of local epithelial cells, glands and connective tissues, often with peduncle.

**Example:** Cervical polyp, Nasal polyp
Cervical polyp
Cervical polyp
Nasal inflammatory polyp
Nonspecific proliferative inflammation

*Inflammatory pseudo tumor*: a clear tumor-like mass formed by local tissues and cells proliferation, it is rather difficult to distinguish with real tumor by X-ray or naked-eyes. It is located in lung and eye orbit.
tumor-like mass in lung with X-ray examination
Inflammatory pseudo tumor
Granulomatous inflammation

Granuloma: a distinct nodular lesion that is consisted of aggregation of macrophages or its derived cell.
Conception of Granulomatous inflammation:
a distinctive pattern of chronic inflammation characterized by aggregation of activated macrophages.

Macrophages derived from blood monocytes.

Liver: Kupffer cells;
Spleen and lymphnodes: sinus histiocytes;
Nervous system: microglial cells;
Lung: alveolar macrophages
Classification of granuloma

1). Foreign body granuloma: Granuloma may occur in response to foreign body or T-cell mediated immune response to organism. *silicosis*

2). Infectious granuloma: it often acts as a diagnostic evidence. *tuberculosis, typhoid fever, rheumatic disease, schistosomiasis, leprosy etc.*
Note:
some granulomatous inflammation may be acute inflammation.
Example: typhoid fever.
<table>
<thead>
<tr>
<th><strong>Table 2-2. EXAMPLES OF GRANULOMATOUS INFLAMMATION</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Bacterial</strong></td>
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<tr>
<td>Tuberculosis (<em>Mycobacterium tuberculosis</em>)</td>
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<tr>
<td>Leprosy (<em>M. leprae</em>)</td>
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<tr>
<td>Syphilitic gumma (<em>Treponema pallidum</em>)</td>
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<tr>
<td>Cat-scratch disease (gram-negative bacillus)</td>
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<tr>
<td><strong>Parasitic</strong></td>
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<tr>
<td>Schistosomiasis (<em>Schistosoma mansoni, S. haemotobium, S. japonicum</em>)</td>
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<tr>
<td><strong>Fungal</strong></td>
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<tr>
<td><em>Histoplasma capsulatum</em></td>
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<tr>
<td>Blastomycosis</td>
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<tr>
<td><em>Cryptococcus neoformans</em></td>
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<tr>
<td><em>Coccidioides immitis</em></td>
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<tr>
<td><strong>Inorganic metals or dusts</strong></td>
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<tr>
<td>Silicosis</td>
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<tr>
<td>Berylliosis</td>
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<tr>
<td><strong>Foreign body</strong></td>
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<tr>
<td>Suture, breast prosthesis, vascular graft</td>
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<tr>
<td><strong>Unknown</strong></td>
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<tr>
<td>Sarcoidosis</td>
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</tbody>
</table>
Morphology of granuloma:

In the usual condition, there are foreign body or necrosis in the central area and they were surrounded by epithelioid cells and multinucleated giant cells.
**granuloma**: surrounding fiber, epithelioid cells and multinucleated giant cells
Infectious/Immune Granuloma

- Tuberculosis
- Rheumatic
- Typhoid fever
- Leprosy
Typhoid fever (granulomatous inflammation)
rheumatic myocarditis
Leprosy of skin (foam cells)
**Schistosomiasis**

*pseudotubercle*: eggs surrounded by epithelioid cell, multinucleated giant cell; eggs are often necrotic or calcified. This structure is like that of a tubercle.

Egg of *Schistosoma*
Foreign Body Granuloma
Foreign body granuloma
Foreign body granuloma

multinucleated giant cell
### Difference of two basic patterns

<table>
<thead>
<tr>
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<th>Duration</th>
<th>Characters</th>
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<tr>
<td>Acute inflammation</td>
<td>Short, minutes up to a few days</td>
<td>Fluid and plasma protein exudation, neutrophilis accumulation</td>
</tr>
<tr>
<td>Chronic inflammation</td>
<td>longer, days to years</td>
<td>Lymphocytes, plasma cells, macrophages, vascular, proliferation and scarring</td>
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</tbody>
</table>
Influence factors to the inflammation

*local factors:*
  - local circulation; inflammatory exudate

*general factors:*
  - Immunity
  - Nutrition
  - Endocrine
OUTCOMES OF INFLAMMATION
Outcome of acute inflammation

**Resolution:** restoration to histological and functional normalcy

**Scarring or fibrosis:** extensive fibrinous exudates; abscess formation—scarring extensive neutrophilic infiltrates in certain bacterial or fungal infections, these organisms are said to be pyogenic, or pus forming
the persistence of a fibrinosuppurative exudate into alveolar spaces
the exudate in the alveolar spaces undergoes progressive enzymatic digestion, debris is resorbed, ingested by macrophages, coughed out.
Fibrosis of pneumonia
Progression to chronic inflammation:
last months or years

Spread:

• local spread
• lymphatic spread
• vascular spread

Death: result from toxemia, e.g. endotoxemia shock and its complication, such as encephalitis and myocarditis
Vascular spread

*bacteremia*: bacteria are found within the blood

*toxemia*: bacteria are not found within the blood, while toxins are absorbed into blood and producing a systemic illness

*septicemia*: bacteria within the blood are proliferating and producing a systemic illness

*pyemia*: pyogenic bacteria within the blood are proliferating and producing multiple abscess in different organs and a systemic illness
Outcome of Chronic inflammation

• **Healing:**
  
  Complete resolution (complete Healing)
  Scarring or fibrosis (incomplete Healing)

• **Persistence and Delay**
complete Healing
incomplete Healing

Scarring

Protruding, redness, irregular
THANKS