

Granuloma

Granulomatous inflammation is a distinctive pattern of chronic inflammation encountered in a limited number of infectious and non infectious conditions. It is a cellular attempt to contain an offending agent which is difficult to eradicate. Typically there is strong activation of T lymphocytes, leading to activated macrophages, resulting in tissue injury.

A **granuloma** is thus a focus of this chronic inflammation consisting of a microscopic aggregation of macrophages that are transformed into epithelial-like cells (called histiocytes, or epithelioid cells), with variable numbers of lymphocytes and plasma cells. The epithelial-like cells (histiocytes) may often fuse to form multi-nucleated giant cells.

Types of Granulomas

3 Basic Histological Types Based on Morphology

1. **Foreign body granulomas:** will see **foreign material within histiocytes/giant cells**, sometimes called “foreign body giant cell reaction” by pathologists
2. **Caseating granulomas:** granulomas that induce cell mediated immune response and thus have **central necrosis**; these are usually associated with infection (e.g. mycobacterial, fungal infections)
3. **Non-caseating granulomas:** granulomas that induce cell mediated immune response **without central necrosis** (e.g. Sarcoidosis, Crohn’s disease)

Epithelioid Granuloma

A sharply circumscribed nodule that mainly consists of epithelioid cells (*modified macrophages*).

- Tuberculous granuloma.
- Sarcoidal granuloma.

Histiocytic Granuloma

An ill-defined nodule that consists of phagocytic histiocytes (*tissue macrophages*).

- Foreign-body granuloma.
- Rheumatoid granuloma.
- Rheumatic granuloma.

Morphology of Granulomas

Sarcoid Granuloma

Small granulomas that mostly consists of epithelioid cells. No necrotizing center, but fibrosis may be present. The outer layer consists mostly of collagen. Sarcoid granulomas can occur in:

- Sarcoidosis.
- Crohn’s disease.
- Berylliosis.
- Extrinsic Allergic Alveolitis.
- Primary Biliary Cirrhosis.

Tuberculous Granuloma

A large circumscribed granuloma consisting of epithelioid cells around a caseous necrotic core with interspersed Langhans cells. The outer layer consists mostly of lymphocytes. Tuberculous granulomas can occur in:

- Tuberculosis.
- Leprosy.
- Syphilis - A granuloma in syphilis is called gumma. They have coagulative necrosis and central vessels in their core, and plasma cells in their peripheral zone.

Pseudotuberculous Granuloma

As the name implies, they are quite similar to tuberculous granulomas. They are ill-defined granulomas consisting of macrophages and epithelioid cells. Granulocytes (*mostly neutrophils*) are present in the caseous core. They may form abscesses. Pseudotuberculous granulomas can occur in:

- Yersinia Pseudotuberculosis.
- Brucellosis.

- Listeriosis.
- Histoplasmosis.
- Cryptococcosis.
- Typhoid fever.

Rheumatic Granuloma

A granuloma with specialized macrophages (called *Anitschkow cells*) around a core of fibrinoid collagen necrosis. Aschoff cells (a variant of giant cells) are interspersed between the other cells, while lymphocytes make up the outer layer. Rheumatic granulomas mostly occur in myocardium and only in rheumatic fever.

Rheumatoid Granuloma

A granuloma with a core of fibrinoid collagen necrosis, surrounded by a wall of epithelioid cells. Several centimeters in diameter. Lymphocytes are present in the outer layer. Often occurring in multiple subcutaneous locations and articular nodules in rheumatoid arthritis.

Foreign-Body Granuloma

A granuloma with epithelioid cells surrounding a material that cannot be broken down, or that provides large enough difficulties in doing so. The foreign body is surrounded by epithelioid cells and giant cells. The outer layer consists of lymphocytes, fibroblasts and vessels.

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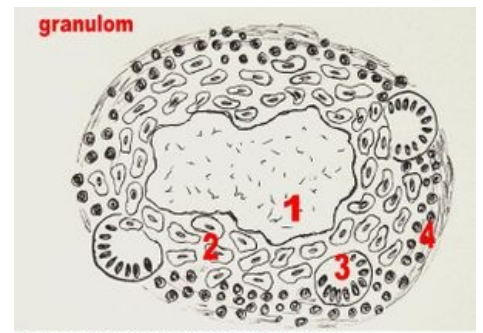
- Granulomatous Inflammation

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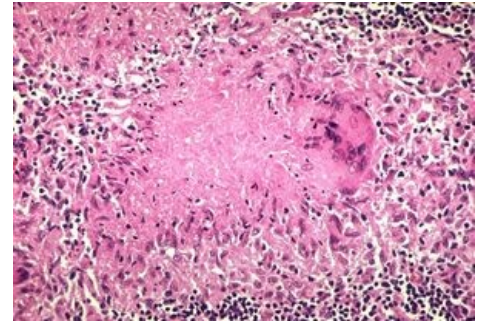
- Atlas of Granulomatous Diseases, Yale Rosen, M.D. (<http://granuloma.homestead.com/index.html>)

Bibliography

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- MACFARLANE, Peter S. *Pathology Illustrated*. 5th edition. 2000. ISBN 9780443059568.



Necrotizing granuloma scheme, 1 = zone of caseating necrosis, 2 = epithelioid cells, 3 = Langhans (giant) cells, 4 = lymphoid cells



Necrotizing granuloma, tuberculosis (compare with scheme).