

Inflammation Lecture Summary

This is a summary of the most important concepts from the Dr. Reinartz's Inflammation lecture. Exam questions will come from this summary – so if you understand this stuff, you should be good for the exam.

What is inflammation?

Inflammation is the body's reaction to injury. It can be broken down into two phases: acute inflammation and chronic inflammation, the details of which are discussed below. Inflammation can occur in just about any place in the body, and the suffix “-itis” is used to indicate its presence (so appendicitis = inflammation of the appendix, meningitis = inflammation of the meninges, etc.).

What causes inflammation?

TONS of things, but it's easier to remember them in groups:

- Infectious agents (bacteria, viruses, etc.)
- Physical damage to tissues (burns, cuts, radiation, etc.)
- Chemical agents (toxins, acid, etc.)
- Other stuff (immunologic reactions and diseases, for example)

What does inflammation look like clinically?

There are four “cardinal” signs of inflammation:

- Rubor (redness)
- Tumor (swelling)
- Calor (heat)
- Dolor (pain)

And a fifth, added later: Loss of function.

Two key differences between acute and chronic inflammation

Time course

- Acute inflammation: occurs first, and is finished within 48 hours after injury
- Chronic inflammation: occurs after acute inflammation (starts around 48 hours after injury) and can last weeks – years.

Cell type

- Acute inflammation: neutrophils
- Chronic inflammation: macrophages and lymphocytes

What happens in acute inflammation?

Two big things: hemodynamic changes and neutrophil exudation.

Hemodynamic changes

- Vessels constrict briefly (to stop blood loss), then they dilate
- They also become more permeable
- The dilated, leaky vessels allow fluid to escape from the bloodstream into the surrounding tissues
- As fluid leaves the bloodstream, the blood becomes sludgier and more viscous, and the circulation slows

Neutrophil exudation

1. Margination (neutrophils drift towards the inner vessel wall), rolling (neutrophils roll along the endothelium), and adhesion (neutrophils stick to the endothelium)
2. Diapedesis (neutrophils squeeze through gaps in the endothelium)
3. Migration (neutrophils move towards the area of interest)
4. Phagocytosis (recognition, engulfment, and killing of the pathogen)

What happens after acute inflammation has run its course?

There are four potential outcomes:

- Abscess formation (an abscess is a localized collection of pus*)
- Progression to chronic inflammation
- Resolution (tissue goes back to normal)
- Repair (tissue heals but with a scar)

*Pus is a thick, yellow fluid that accumulates during acute inflammation. It's made up of neutrophils and cell debris.

What happens in chronic inflammation?

- Lymphocytes and macrophages accumulate in the injured tissue
- After a while, if the chronic inflammation hangs around long enough, fibrosis can accumulate in the tissue.

What are the most important things to know about macrophages?

- Macrophages carry out a lot of important jobs (phagocytosis, production of toxic substances, attraction of other inflammatory cells, coordination of tissue healing)
- They are derived from monocytes
- Macrophages are also called histiocytes, and in some organs, they have special names (Kupffer cells in the liver, microglia in the brain)

What are granulomas?

- Little round clusters of macrophages, often surrounded by a rim of lymphocytes
- The macrophages in granulomas are “epithelioid” (they’re big, with lots of eosinophilic cytoplasm, like epithelial cells), and occasionally they fuse together forming a gigantic multinucleated cell called a Langhans giant cell.
- Granulomas are considered to be a special type of chronic inflammation
- They form in order to get rid of indigestible substances like foreign bodies, or mycobacterium tuberculosis (which has a waxy coat and is hard to kill using normal methods)
- T cells help granulomas form (so if your T cells are depleted, or if they don’t function well, then you won’t be able to make granulomas)

What happens after chronic inflammation has run its course?

- Resolution (tissue goes back to normal)
- Repair (tissue heals, but with a scar)
- Sometimes, chronic inflammation just never leaves (for example, in rheumatoid arthritis, it hangs around permanently)