

20.106J – Systems Microbiology  
Lecture 18  
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- Chapters 22 and 23
- Innate immunity and inflammation
  - Cells and organs
  - Innate response
  - Signals (chemokines, cytokines)
  - Inflammation
  - Adaptive immune response
- Why do we have an immune system?
  - Vertebrates and mammals have the most developed immune system, with both arms active
- Cells of the immune system
  - Differentiation starts from bone marrow cells
  - Today we'll be talking about polymorphonuclear leukocytes and macrophages
- The immune system can also be called the Lymphatic system
  - Similar to the circulatory system in that there are vessels that can carry things throughout your body
  - Lymph nodes
- An overview of the immune response
- Cell characteristics
  - We're mainly going to be talking about neutrophils
  - There are PMN and Monocytes – both are phagocytic
- PRRs – pathogen recognition receptors
  - Toll-like receptors (TLRs) in mammals
- Monocytes and Neutrophils perform phagocytosis, gobbling up the microbe and then creating a very acidic environment inside the phagolysosome to kill it
  - Respiratory burst
- Chemokines and cytokines
  - Chemokines are potent chemoattractants
    - CXC, CC, and C
  - Cytokines are activator molecules
    - A lot of these are acute phase response, which can lead to septic shock

- Typically produced by leukocytes
- When all these cells are attracted to the site of infection what results is inflammation
  - This is visually noticeable (redness, swelling, heat, pain), so it's been described by physicians for thousands of years, going back to ancient Greece
  - Lymph nodes, spleen, thymus, mucosal tissues
  - Accumulation at the extravascular tissues
  - Increased blood flow
  - Increased permeability
  - Emigration of leukocytes from the microcirculation and their accumulation at the site of injury
  - Leukocyte extravasation
- Healing
  - Resolution
  - Pus formation
  - Healing with fibrosis – tissue that is no longer functional
  - Chronic inflammation – tissue that is no longer functional
- Adaptive Immunity
  - Trying to specifically target the pathogen, rather than risking damaging other cells with a generalized, nonspecific reaction
  - Specificity for the antigen
  - Memory – if exposed a second time, it can kick in immediately
  - Tolerance – ability to discriminate self antigens from non-self antigens
  - Antibody-mediated immunity
  - Cell-mediated immunity