Topics

Sensor systems
Phagocytosis
Inflammation
Interferons
Fever

Sensor systems

• Toll – like receptors
• Complement system
  – Classical pathway
  – Alternate pathway
  – Lectin pathway
Figure 15.6 - Toll-like receptors (TLRs)

Production of specific proteins that alert other components of host defenses

- Detects LPS
- Detects flagellin
- Detects bacterial nucleotide sequences
- Detects peptidoglycan

Figure 15.7 - Complement system

- Classical pathway: Antigen-antibody complex
- Lectin pathway: Binding of mannose binding lectin to cell surface
- Alternative pathway: Binding of C3b to cell surface (regulatory protein prevent host cell autolysis)
**Phagocytosis**

- Process of phagocytosis
- Macrophages
- Neutrophils

*Figure 15.9 - Process of phagocytosis*
Macrophages

- Located throughout the body (Kupffer cells, alveolar, etc.)
- Produce cytokines
- Interact with T helper cells – activated macrophages
- Help form granulomas

Figure 15.5 – Mononuclear Phagocytes
Neutrophils

- First to arrive during an immune response
- Involved in inflammation
- Inherently have more killing power than macrophages

Inflammation

- Initiation
- Inflammatory process
- Outcomes of inflammation
Initiation

- Microbial products (LPS, flagellin, DNA) trigger toll-like receptors on macrophages. Macrophages make cytokines (TNFα) and chemokines. TNFα causes liver to secrete acute phase proteins, which facilitate phagocytosis and complement activation.
- Complement cascade: Triggered by microbial surfaces, it activates mast cells to secrete inflammatory cytokines.
- Tissue damage

Figure 15.10 - Inflammation process
Leukocyte motility is mediated by interaction of selectins expressed on the endothelial cell surface with ligands on the leukocyte cell surface, slowing leukocyte motility and inducing cell rolling.

Diapedesis is initiated via stronger interactions of integrins expressed on the leukocyte cells surface with adhesion molecules (ICAM-1 and ICAM-2) on endothelial cells.

Activation of the endothelium is driven by macrophage cytokines such as TNF-α, causing selectin expression and synthesis of ICAM-1 by the endothelial cells.

Figure 15.10 - Inflammation process
Outcomes of inflammation

• Damage to surrounding tissue
cau sed by toxic products of phagocytes
• Release of bacterial endotoxins
  released as LPS from Gram negative bacteria
  stimulates inflammation, loss of blood pressure
  bloodstream infection = septic shock
• Eliminate invading pathogen

Interferons

• Glycoproteins
• Control viral infections
Figure 15.11 - Interferons

Fever

- Hypothalamus controls temperature
- Pyrogens (endogenous or exogenous)
- High temperature inhibits pathogen growth