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)

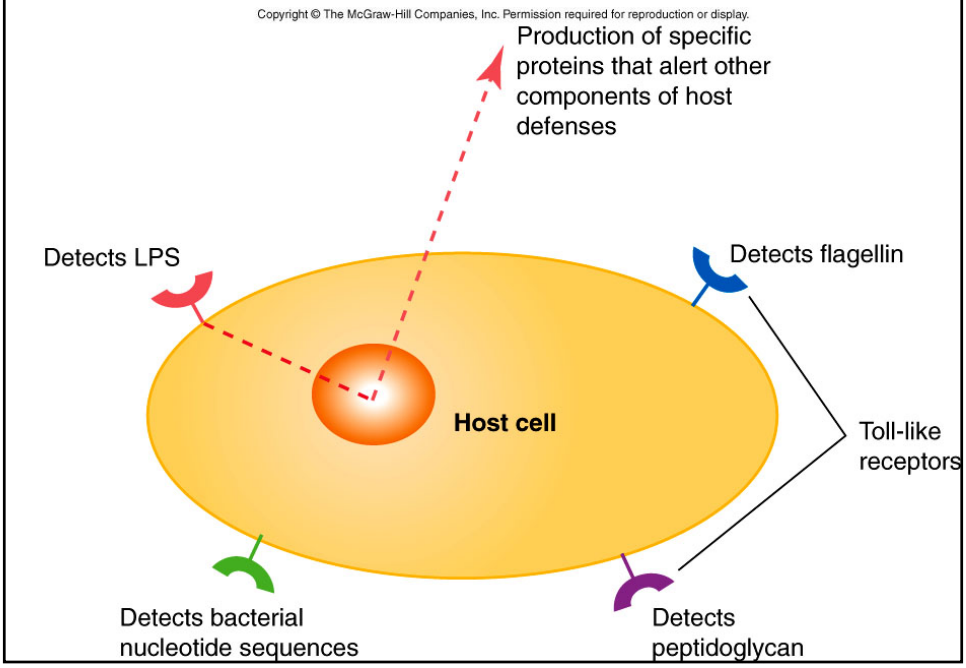
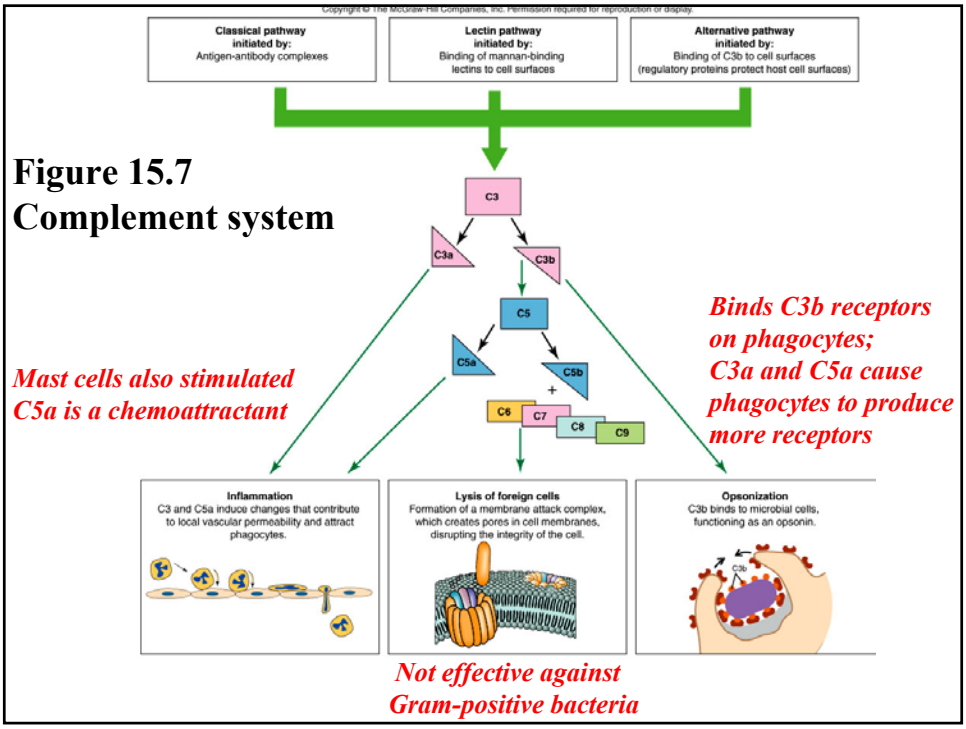


Figure 15.7 Complement system



Mast cells also stimulated
C5a is a chemoattractant

Binds C3b receptors on phagocytes;
C3a and C5a cause phagocytes to produce more receptors

Not effective against Gram-positive bacteria

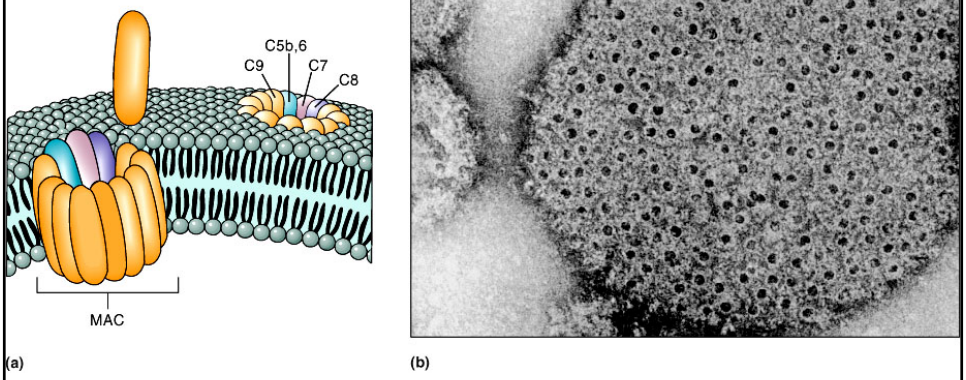


Figure 15.8
Membrane Attack Complex of Complement (MAC)

Phagocytosis

- **Process of phagocytosis**
- **Macrophages**
- **Neutrophils**

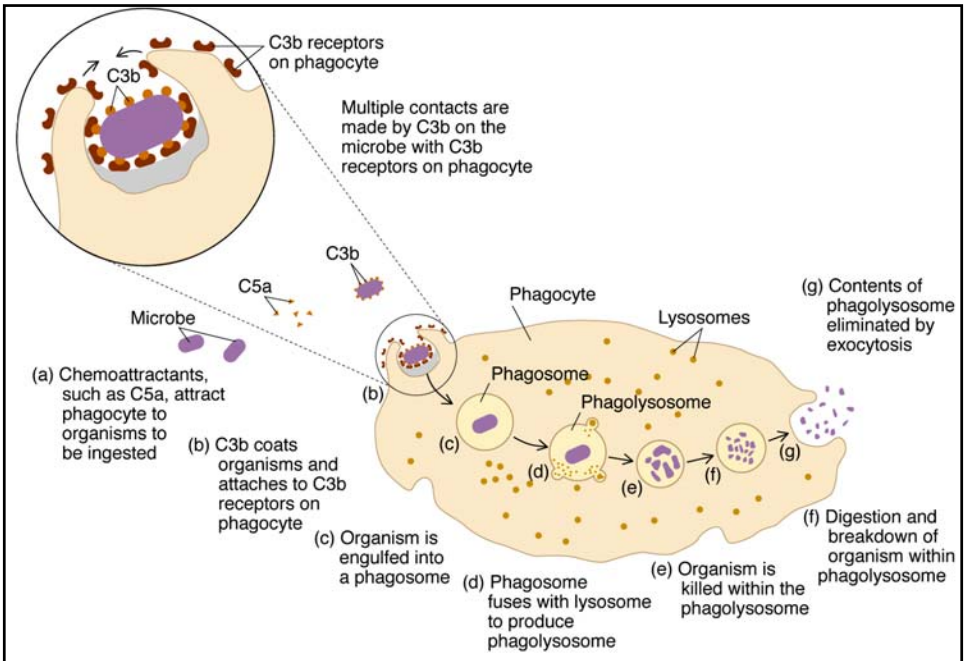
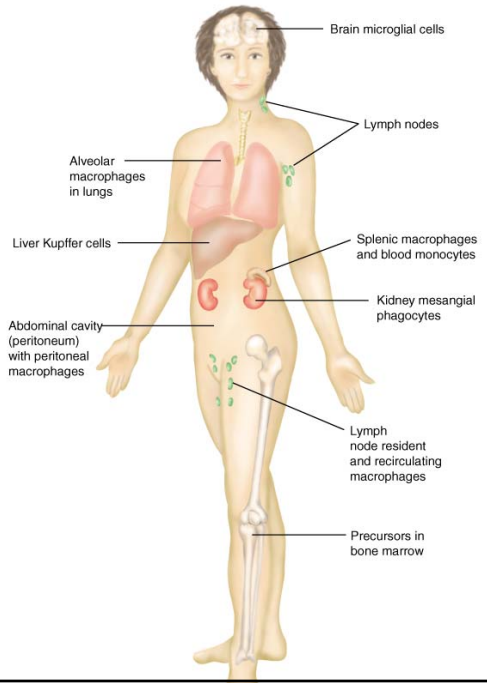


Figure 15.9 - Process of phagocytosis

Macrophages

- **Located throughout the body (Kupffer cells, alveolar, etc.)**
- **Produce cytokines**
- **Interact with T helper cells – activated macrophages**
- **Help form granulomas**
- ***Have Toll-like receptors and are stimulated by microbial substances***

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)
  TNFα causes liver to secrete acute phase proteins
  acute phase proteins facilitate phagocytosis and complement activation
- Complement cascade
  Triggered by microbial surfaces
  Activates mast cells to secrete inflammatory cytokines
- Tissue damage

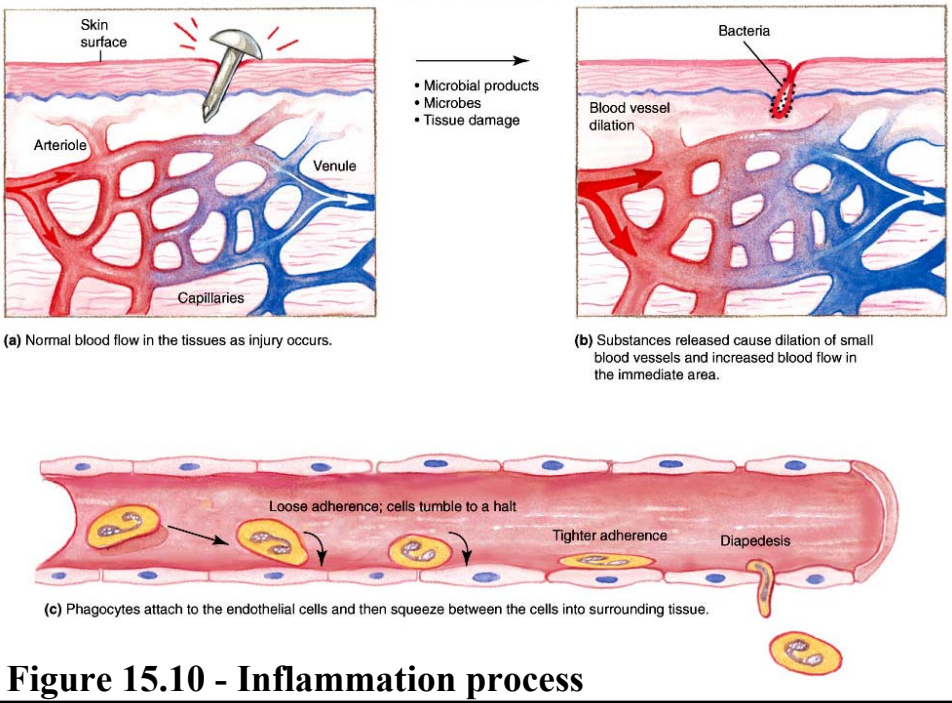
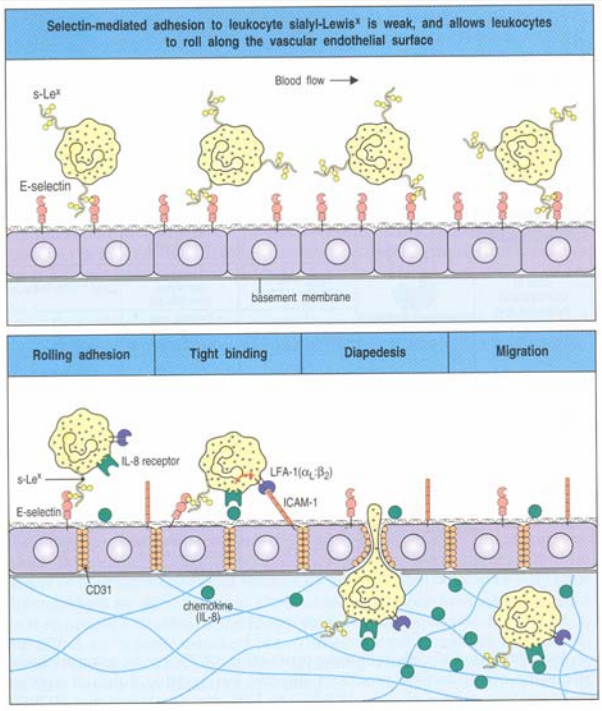
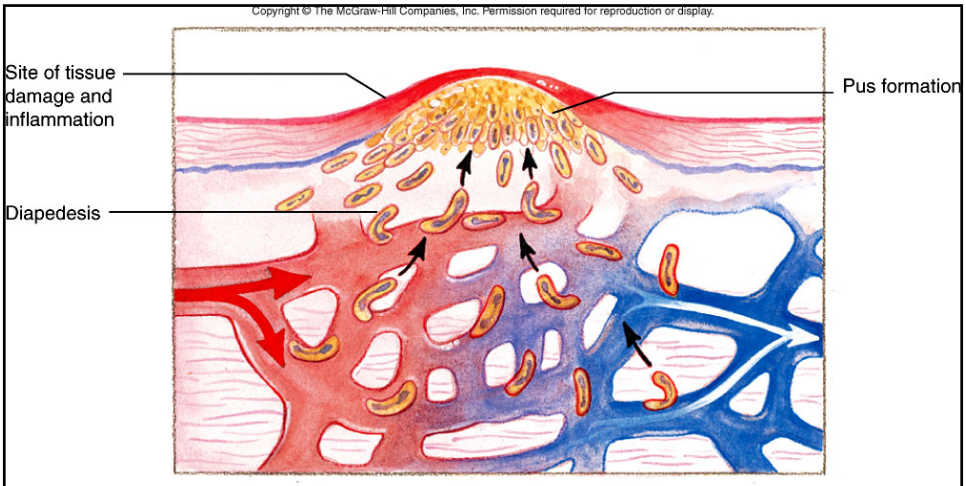


Figure 15.10 - Inflammation process





(d) The attraction of phagocytes causes them to move to the site of damage and inflammation. Collections of dead phagocytes and tissue debris make up the pus often found at sites of an active inflammatory response.

Figure 15.10 - Inflammation process

Outcomes of inflammation

- **Damage to surrounding tissue**
  caused 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
- **Damage to surrounding tissue**
- **Eliminate invading pathogen**

Interferons

- **Glycoproteins**
- **Control viral infections**

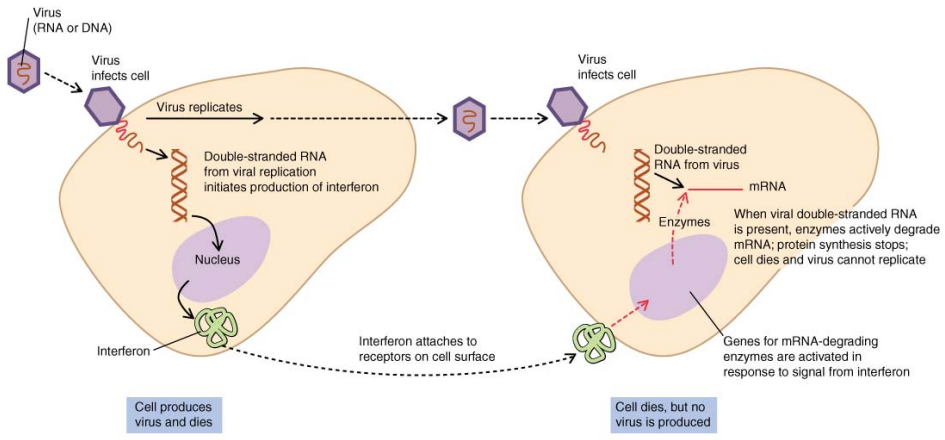


Figure 15.11 - Interferons

Fever

- **Hypothalamus controls temperature**
- **Pyrogens (endogenous or exogenous)**

  cytokines that induce fever via hypothalmus

Fever

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