Immune System

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Molecular recognition

Innate Immunity (all animals)

- skin
- mucous membranes
- secretions
- phagocytic cells
- Natural killer cells
- antimicrobial proteins
- Inflammatory Response

Adaptive Immunity (vertebrates)

Humoral response
- antibodies in body fluid

Cell-mediated Response
- Cytotoxic cells

specificity!!

Innate Immunity

Invertebrates
- lysozymes
- hemocytes
- antimicrobial peptides
- recognition proteins
- phagocytosis

⇒

Vertebrates

PLUS
- natural killer cells
- interferons
- inflammatory response.

Vertebrate Cellular Innate Defense

⇒ Toll-like receptor (TLR)

TLR3 ⇒ dsRNA
TLR4 ⇒ Lipopolysaccharide
TLR5 ⇒ flagellin
TLR9 ⇒ CpG DNA

Phagocytosis

(1) Neutrophils - circulate in blood
(2) Macrophages - i.e in spleen or migrating

- Dendritic Cells - in skin
- Eosinophils - under mucous membranes
  - destroy worms

Natural Killer Cells

- circulate, detect, and attack
⇒ release chemicals to destroy viral & cancer cells

- Antimicrobial Peptides / Proteins
- **Interferons** - secreted by infected cells
  - induce nearby uninfected cells to produce substances that inhibit viral reproduction.
- **Complement System**
  - ~ 30 proteins in blood plasma activated on contact with microbes

Inflammatory Response

(1) ✡ **Histamine** released by **MAST CELLS** located in connective tissue

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triggers blood vessels to **DILATE**

✡ **Macrophages** and **neutrophils** release **Cytokines** ⇒ signal molecules that promote **BLOOD FLOW** to injury or infection site

Hence ...

- Redness
- Swelling
- Hotness

→ inflamed

→ PUS accumulates (WBCs, pathogens, cell debris)

(2) FEVER

- Activated macrophages release substances that re-set thermostat "higher"
- ?? lots to learn here.

(3) SEPTIC SHOCK

- overwhelming systemic inflammatory response.

(4) Chronic Inflammation

- Crohn's Disease
- ulcerative colitis.

Pathogens evolve to escape the body's immune response

- TB
- S. pneumoniae.