Topics

Immunity

Lymphoid system

16-1

Immunity

Matures throughout life
Has memory – enhanced response to pathogens
Vaccination – deliberate exposure to pathogens
Molecular specificity
Discriminates between self and foreign
Tolerance – ability to ignore given molecules
Informed by innate immune system

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Strategies of the Adaptive Immune System

Primary response – 1st response to an antigen
- requires 1-2 weeks
- generates "memory" of effective mechanism

Secondary response – enhanced, antigen-specific
- "anamnistic response"
- consequence of memory

Two basic strategies
- humoral immunity – extracellular antigens
- cellular immunity – intracellular antigens

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Humoral immunity

B lymphocytes (B cells)
- develop in bone marrow
- proliferate, differentiate into:

Plasma cells
- antibody factories
- short lived
- antibodies bind antigens, provide protection

Memory cells produced from some B cells
- long lived
- respond quickly upon reexposure to Ag

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Antibodies

Y – shaped molecules, two functional regions
- two identical arms bind antigen
  - highly specific
  - aa sequences differ
- stem recognized by other components

Protect by:
- direct mechanisms
  - coating inhibits pathogen binding
- indirect mechanisms
  - stem facilitates phagocytosis
  - Ag-Ab stimulates complement

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B cell receptor

Membrane form of Ab
Different on different B cells
Binding to Ag causes B cell to multiply
B cell clones become plasma cells
- secrete large amounts of specific Ab
- requires second signal from T helper cells

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Cellular Immunity

- T lymphocytes
  - T-cytotoxic cells – intracellular pathogens
  - T-helper cells – orchestrate responses
- T lymphocytes have T cell receptor
  - functionally analogous to B cell receptor
  - permits recognition of specific antigen
  - recognizes Ag presented on surface of host cells
- T cell clones differentiate into effector T cells
  - second signal provided by dendritic cells
  - some T cells form memory cells

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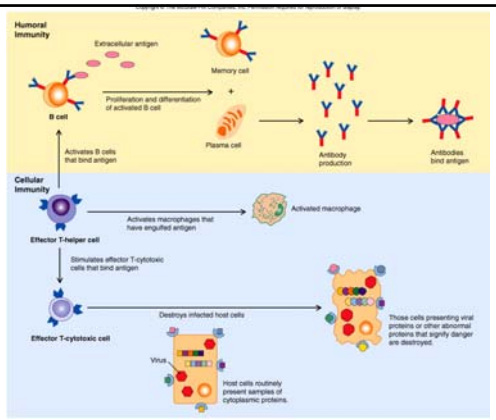

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Figure 16.1 – Humoral and cellular immunity

Lymphoid system

- Lymphatic vessels carry lymph
  - fluid extruded from oxygentated blood
  - provides oxygen to tissues
  - most reenters capillaries
  - remainder enters lymphatics as lymph
- Lymph may contain antigens from tissues
  - travels to lymph nodes
  - lymph nodes remove protein and cells
  - processed lymph reenters circulation
- Inflammation increase fluids, increasing lymph
  - carrying antigen from tissues

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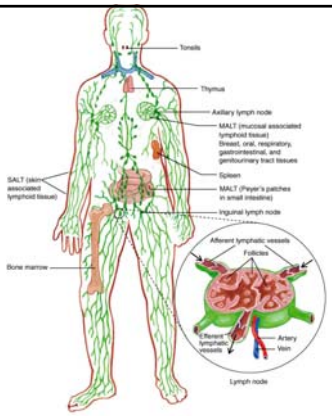

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Figure 16.2 – Anatomy of the lymphoid system

Secondary Lymphoid Organs

- Sites where lymphocytes gather to contact Ag
- Located at strategic positions in body
- Include:
  - lymph nodes – Ag from lymphatics
  - spleen – Ag from blood
  - tonsils – Ag from throat
  - adenoids – Ag from throat
  - appendix – Ag from intestine
- Secondary lymphoid anatomy facilitates:
  - cell interactions
  - information exchange via cytokines
  - meeting place for lymphocytes, dendritic cells and macrophages
  - swelling indicative of lymphocyte proliferation

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Other secondary lymphoid organs

- Less organized
- Peyer's patches in small intestine
  - contain M cells
  - collect intestinal material
  - transfer to lymphoid tissue below mucosa
- MALT – mucosal-associated lymphoid tissue
  - includes Peyer's patches
  - provides "mucosal" immunity
  - prevents organisms from entering mucosal membranes
- SALT – skin-associated lymphoid tissue
  - collections of lymphocytes under the skin

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Primary Lymphoid Organs

Bone marrow – hematopoiesis
- **both B and T cells originate**
- **B cells mature in bone marrow**

Thymus
- **immature T cells migrate to thymus**
- **T cells mature in thymus**

Mature lymphocytes migrate to
- **secondary lymphoid organs**
- **wait to encounter antigen**

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