

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
“anamnestic 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

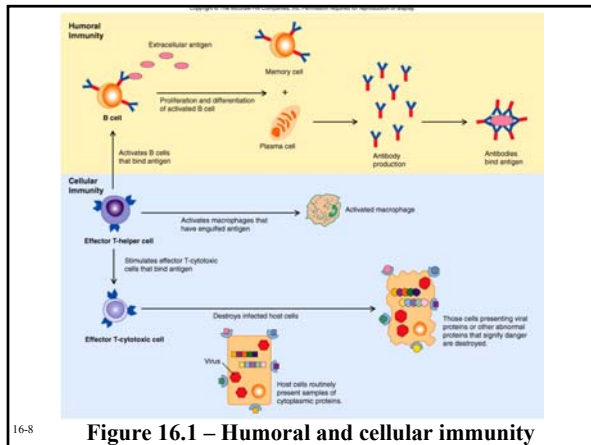
of host cells

T cell clones differentiate into effector T cells

second signal provided by dendritic cells

some T cells form memory cells

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Figure 16.1 – Humoral and cellular immunity

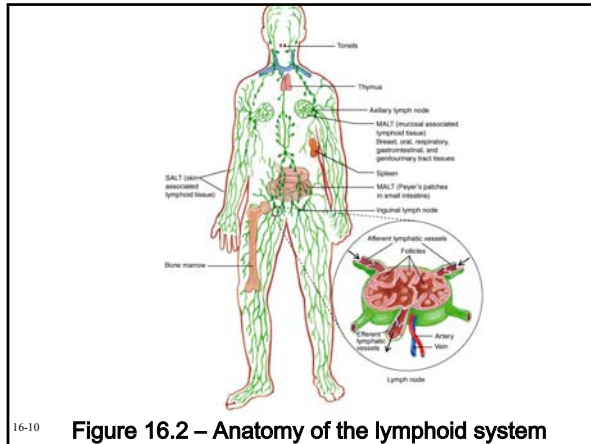
Lymphoid system

Lymphatic vessels carry lymph
fluid extruded from oxygenated 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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16-10 **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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