

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

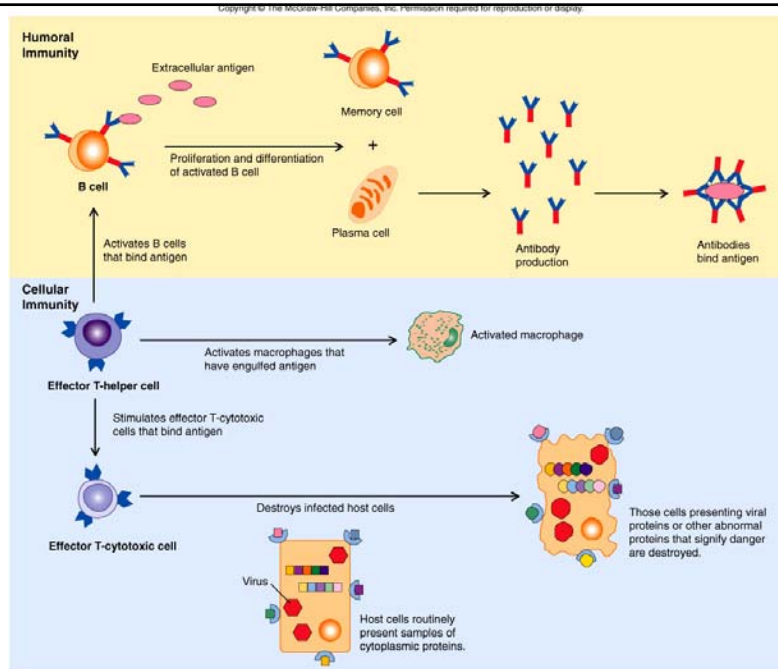
of host cells

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

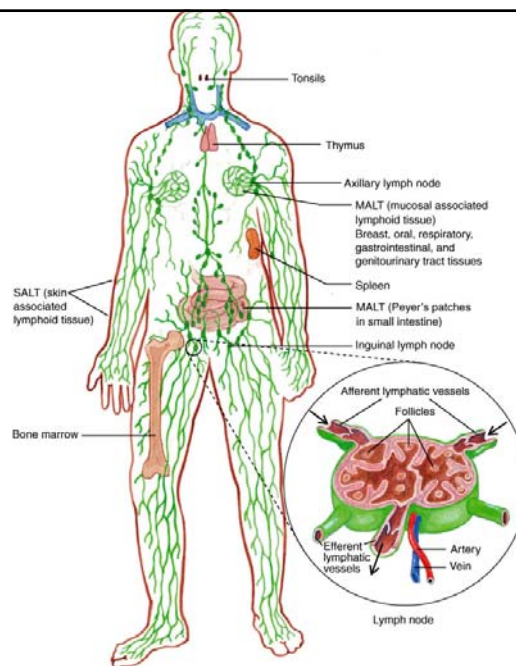
Lymphoid system

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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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**