

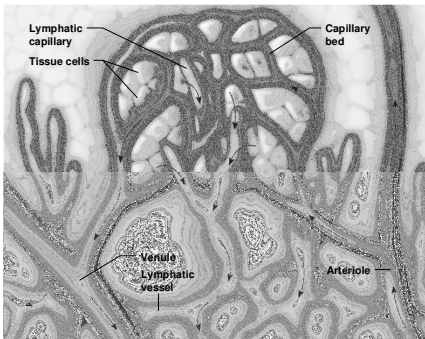
Lymphatic System

Chapter 12

- FYI**
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- Immunology –
 - Chicken soup can help the inflammatory response associated with colds and other upper-respiratory infections. Researchers determined that the soup had inhibitory activity
 - Stress plays havoc to the immune system

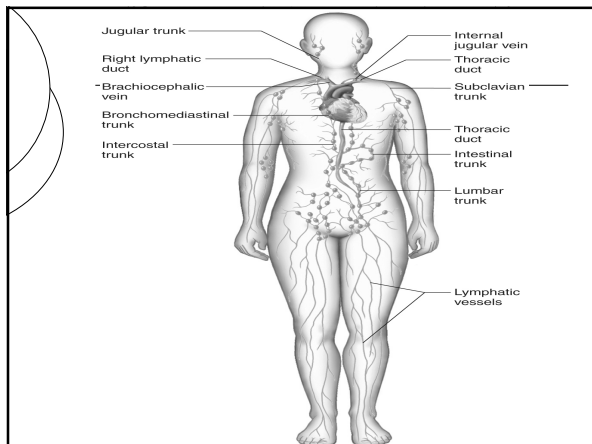
- Lymphatic System Functions**
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- Network of vessels that assist in circulating fluids
 - Closely associated w/cardiovascular system (except no pump)
 - Transports excess fluid away from the interstitial spaces & back to the blood
 - Transports fats to the bloodstream
 - Helps defend the body against pathogens
 - Fluid is called lymph

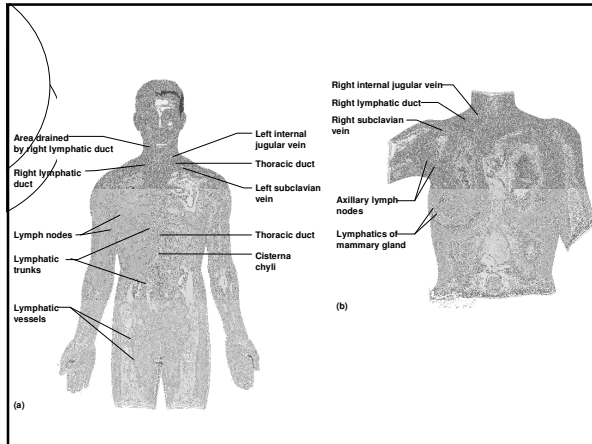
Lymphatic Capillaries



Lymphatic Vessels

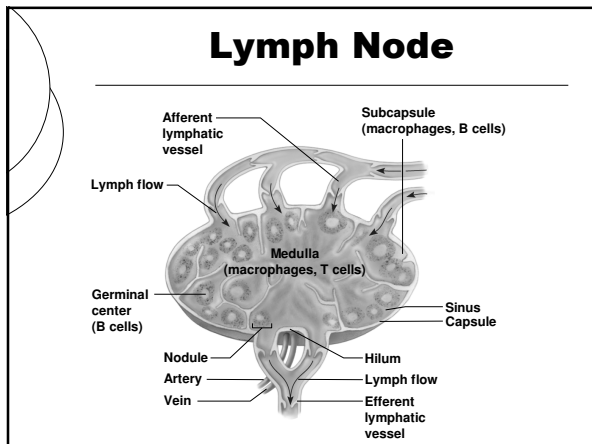
- The walls are thinner than those of veins
- Larger vessels lead to lymph nodes and then to larger lymphatic trunks
- Lymph nodes are located along the lymphatic pathways
- Have valves that prevent backflow of lymph
- They contain lymphocytes & macrophages to fight pathogens





Lymph Node Function

- Filter lymph before returning it to the blood
- Contain
- Materials returned to blood include:
 - Water, blood cells, proteins
- Harmful materials removed from lymph:



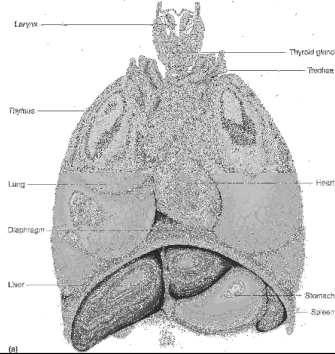
Other Lymphatic Organs

- Thymus, Spleen, Tonsils and Peyer's Patches all function similar to those of the lymph nodes

Thymus

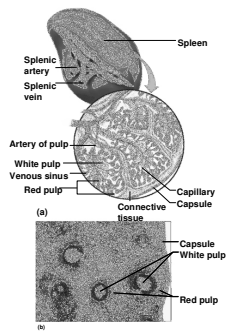
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- Located below throat area
- Site of T cell production
- Secretes hormones called



Spleen

- Largest lymphatic organ
- Located in the upper left abdominal quadrant
- Contains 2 types of tissues:
 - White pulp (lymphocytes)
 - Red pulp (RBC, lymphocytes & macrophages)



Tonsils

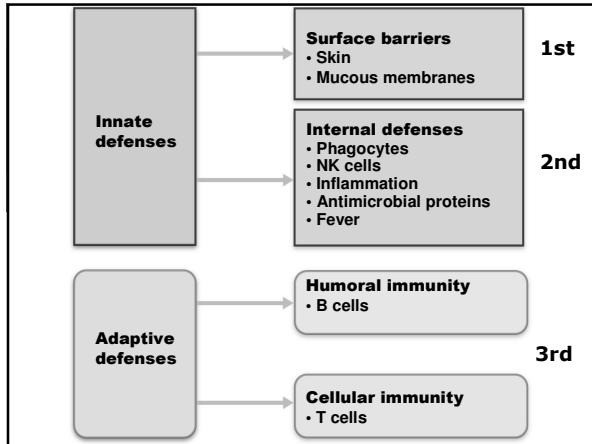
- Small masses of lymphatic tissue near the throat
- Trap and remove pathogens entering the throat
- Tonsillitis is when they become congested with too many bacteria

Peyer's Patches

- Small masses located in the walls of the small intestines
- Protects the digestive tract from the bacteria present in the food.

Body Defenses Against Infection

- The presence of a pathogen in the body may cause an infection
- Pathogens are disease causing agents
 - Bacteria, viruses, fungi, protozoa or multicellular organisms like worms, etc.
- The body can prevent entry of pathogens or destroy them with defense mechanisms such as:
 - Innate (nonspecific) defenses :
 - Defenses that protect against many pathogens; doesn't care who pathogen is – just kills
 - Adaptive (specific) defenses:
 - Known as immunity
 - More specific & precise targeting specific antigens
 - Are carried out by lymphocytes



Mechanical Barriers

- The skin & mucous membranes prevent entrance
- Tears & saliva contain lysozymes; enzymes that digest foreign material
- pH of secretions can inhibit growth of pathogens
- First line of defense (all other non-specific defenses are part of the Second line of defense)

Species Resistance

- Refers to the fact that an organism may be resistant to diseases that affect other species
- EX. Canine distemper and equine HIV do not affect humans and other mammals do not get mumps or measles

Chemical Barriers

- Interferons –
- Defensins are produced by neutrophils & other WBC. They cripple microbes by eating holes in bacteria cell walls.
- Complement is a group of proteins in plasma & other body fluids that stimulate inflammation, attract phagocytes and enhance phagocytosis

Natural Killer (NK) Cells

- Defend against viruses & cancer by secreting cytolytic substances called perforins that destroy the infected cell

Inflammation

- Inflammation produces local redness, swelling, fever and pain
- Redness due to blood vessels dilating
- Dilated vessels increase blood flow causing swelling
- Fever caused by

- Pain caused by pressure on nearby receptors
- Phagocytes remove dead cells

Phagocytosis

- Phagocytosis removes foreign particles from the lymph
- The most active phagocytic cells are neutrophils and monocytes
- Chemotaxis -

Fever

- A fever begins when a viral or bacterial infection stimulates lymphocytes to secrete a substance called pyrogen
- Fever slows or ceases bacterial cell growth
- Fever increases speed of tissue repair
- High fever can denature important enzymes and proteins in the body

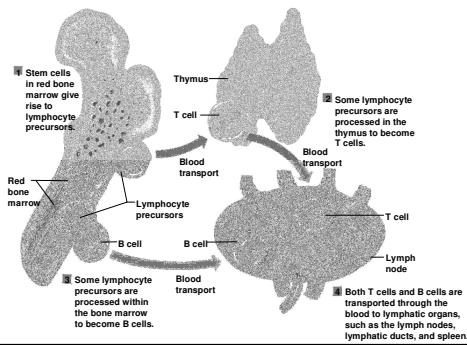
Adaptive (Specific) Defenses or Immunity

- 3rd line of defense - known as immunity
- Resistance to specific pathogens based on exposure
- Ability to distinguish molecules that are part of the body ("self" from "non-self")
- Antigens are foreign molecules that can trigger an immune response
- Has memory; after initial exposure to pathogen, it prepares for future meetings by producing antibodies
- When it fails, devastating diseases may occur – AIDS, cancer

Lymphocytes

- A type of WBC or leucocyte
- 2 types of lymphocytes
 - B-cells are produced in the
 - T-cells are produced in the

Lymphocyte Origins

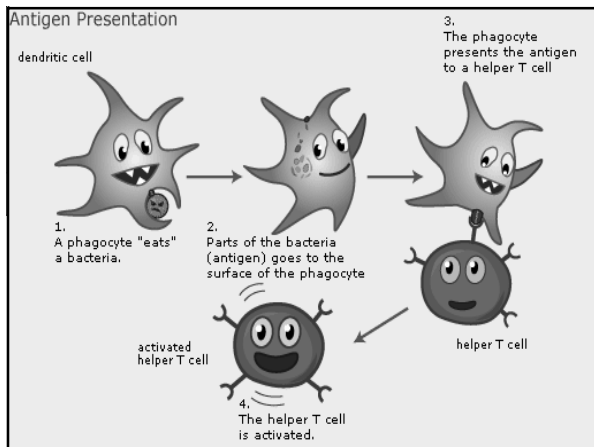


Antigens

- Antigens are specific for a pathogen;
- 2 types of immunity include
 - Cellular immunity – cell mediated
 - T- cells
 - Humoral immunity – antibody mediated
 - B - cells

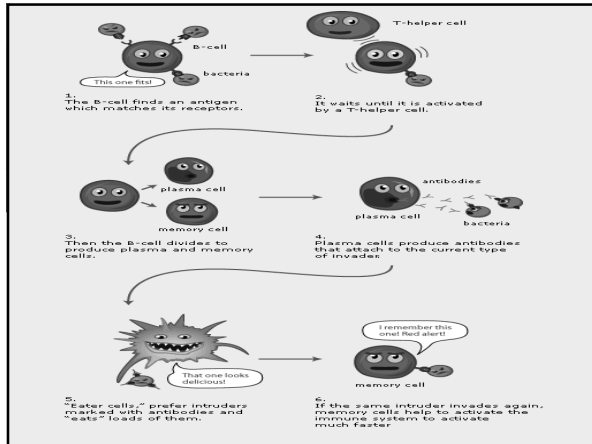
T Cells & Cellular Immune Response

- A lymphocyte must be activated before it can respond to an antigen
- Lymphocyte eats pathogen and particles of pathogen form on ends of membrane receptor
- Major histocompatibility complex is also part of membrane and used to recognize “non-self”



B Cells & Humoral Immune Response

- B cells can be activated when an antigen fits the shape of its receptor
- Some B cells become memory cells while others become plasma cells and produce



Antibodies

- Secreted by B-cells in response to antigens
- Y shaped proteins located on the cell membrane
- They are specific for each antigens

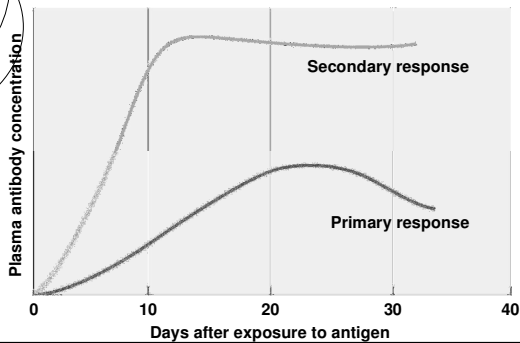
Immune Response

- Primary Immune Response – 1st response to antigen
 - Antibodies released into lymph
 - Gradual rise and then a rapid decline in the level of antibodies
- Secondary Immune Response – 2nd response to antigen
 - Long last immunity
 - Dormant memory cells cause rapid and intense release of antibodies

Vaccination

- **Vaccine is a solution that includes an antigen for a specific pathogen and will trigger a immune response**
- **Usually contains a weakened or dead form of the virus or bacteria**
- **EX. Mumps, measles, rubella, chickenpox, flu, hepatitis, human papillomavirus, tetanus, meningitis, pneumonia**

Immune Responses



Transplantation & Tissue Rejection

- Successfully transplanted tissues and organs:
 - Cornea, Kidney, Liver, Pancreas, Heart, Skin
- When the donor's tissues are recognized as foreign there is a tissue rejection reaction just like the immune response against antigens
- Important to match MHC antigens
- Immunosuppressive drugs

TABLE 16.10 | Transplant Types

Type	Donor	Example
Isograft	Identical twin	Bone marrow transplant from a healthy twin to a twin who has leukemia
Autograft	Self	Skin graft from one part of the body to replace burned skin
Allograft	Same species	Kidney transplant from a relative or closely matched donor
Xenograft	Different species	Heart valves from a pig
