

Lymphatic System

One-way system: ends at blood vessels

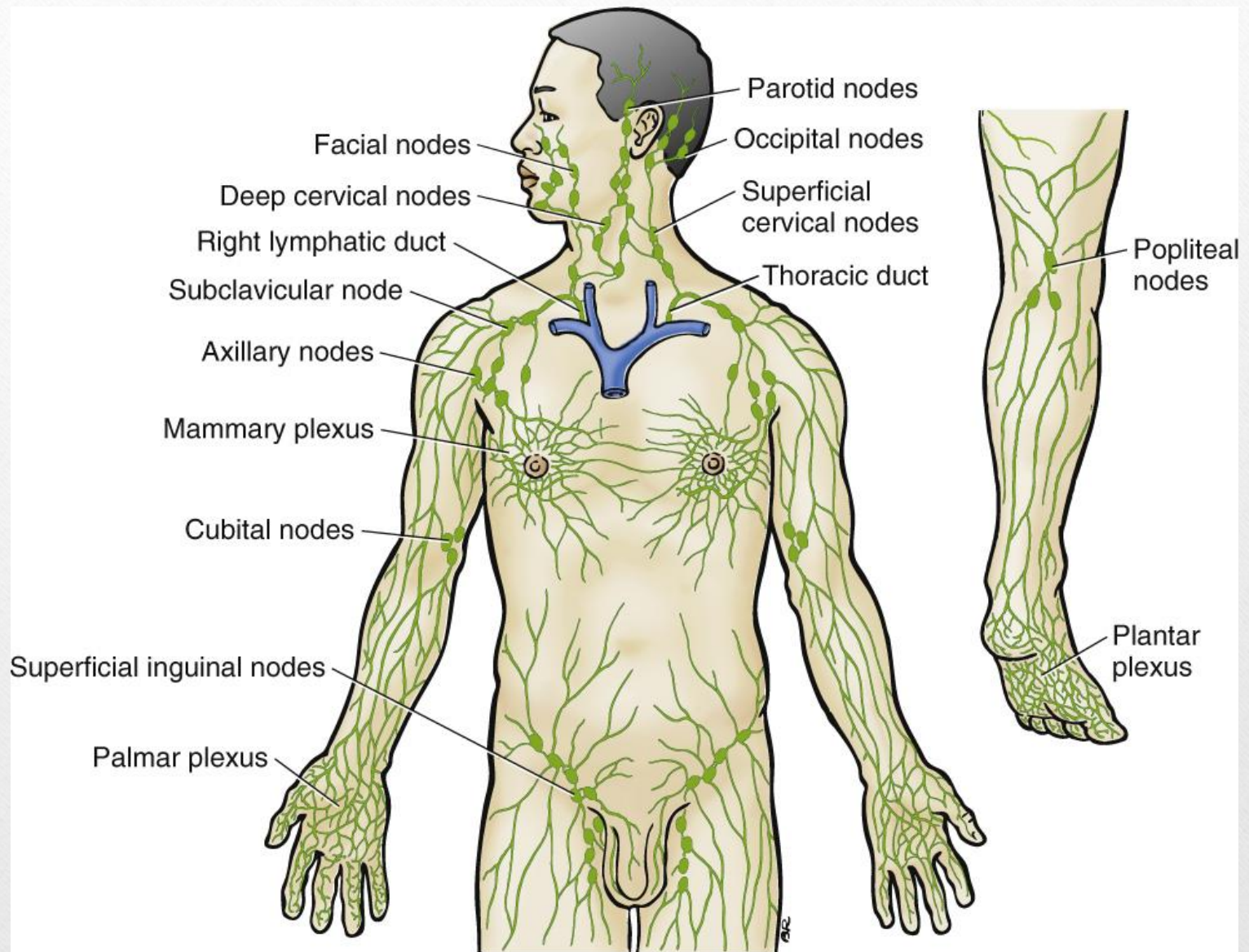
Lymph: less protein, fewer red and white cells than blood

Carries plasma proteins to the bloodstream

Carries absorbed fats to the bloodstream

What are some of the components of the lymphatic system?

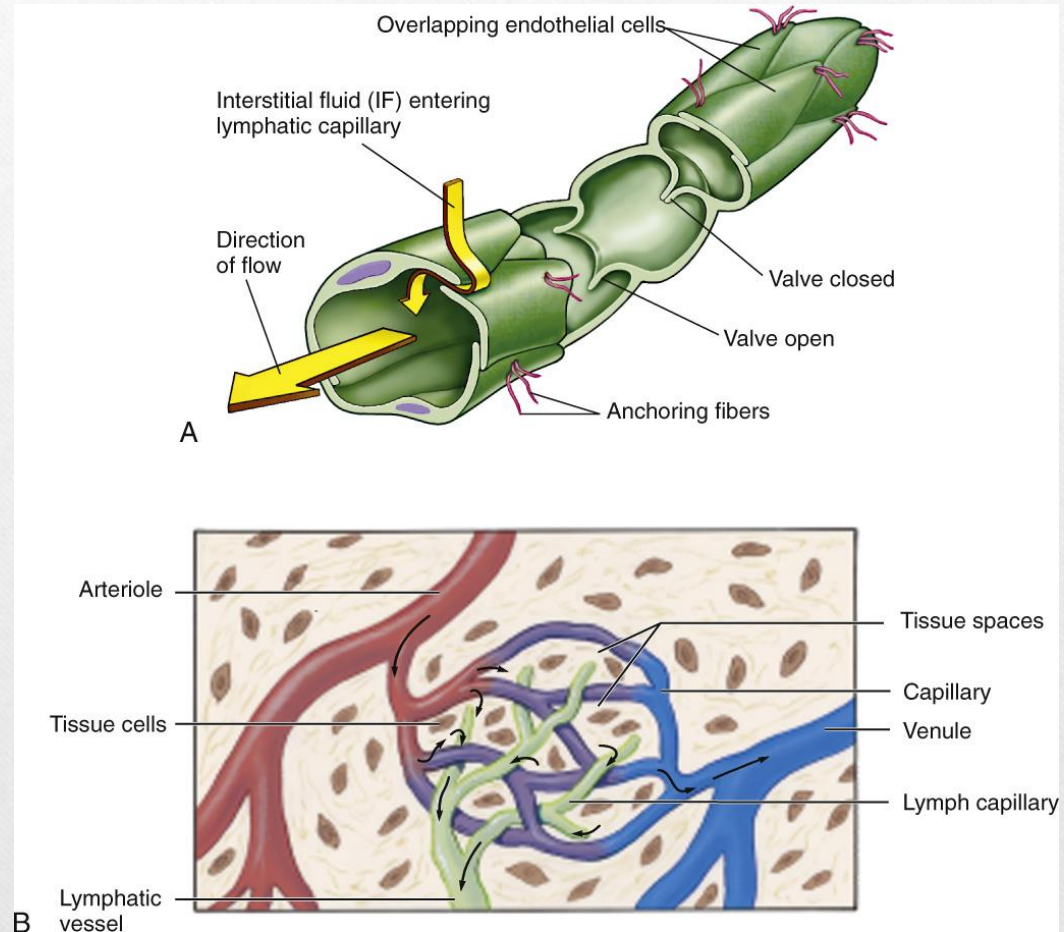
The spleen, the thymus, the lymph nodules; the lymph channels, ducts, and nodes; and lymph and lymphocytes.



Lymph Vessels, Nodes, and Organs

Lymph vessels

The lymph capillaries are tiny open-ended channels located in tissue spaces throughout the entire body except for the brain, spinal cord, and cornea.



Lymph nodes

Spleen

Functions with lymphatic system by storing lymphocytes and releasing them as part of the immune response

Thymus

Important in development and maturation of certain lymphocytes and in programming them to become T cells in the immune system

Lymph nodules

Lymph nodes are small, round structures located along the lymph vessels, mostly clustered at the joints. All lymph passes through one or more nodes before it enters the bloodstream.

Lymph nodules are small masses of lymph tissue that contain lymphocytes enmeshed within reticular fibers. Lymph nodules include the tonsils, solitary lymphatic follicles, aggregated lymphatic follicles, and the vermiform appendix.

Lymph nodules appear to be distributed strategically to defend the body against disease-causing organisms that could penetrate the linings of passageways that open outside the body.

A Peyer patch is a mass of lymph nodules together. Most are solitary.)

Lymphatic Pump and Drainage

No muscular pumping organ

Joints provide some pumping action.

Valves permit fluid to flow only toward center of body.

Lymphatic drainage: movement of lymph

Specialized application of massage may be effective in increasing lymph removal from stagnant or edematous tissue.

Massage that uses light pressure to drag the skin has the potential to increase superficial lymph movement.

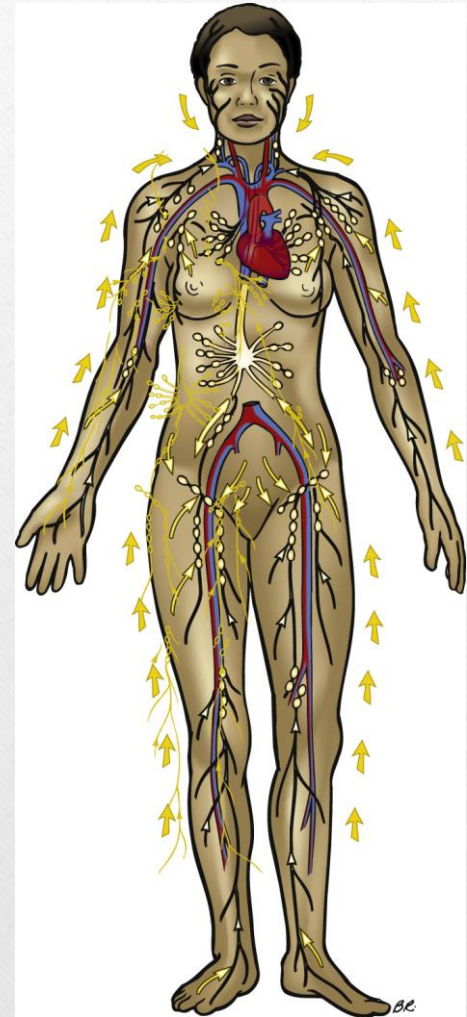
Crosswise and lengthwise stretching of the lymph vessels' anchoring filaments opens the lymph capillaries, thus allowing the interstitial fluid to enter the lymphatic system.

The practitioner applies the massage strokes in the direction of normal lymphatic drainage, thus speeding up lymph movement.

Lymphatic Pump and Drainage

Lymphatic massage mechanically stimulates the flow of lymph by tracing the lymphatic routes with light pressure.

The direction of strokes for facilitating lymphatic flow is shown here.



Pathologic Conditions

Edema

Lymphedema

Lymphatic filariasis: parasitic disease

Infectious mononucleosis: contagious

Leukemia

Lymphomas: tumors of lymphatic system

- Hodgkin's disease

- Non-Hodgkin's lymphoma

- Lymphatic malformation

Why should clients always be referred if they exhibit any form of edema?

The practitioner should refer a client with any form of edema for diagnosis because edema is symptomatic of many disease processes, particularly cardiovascular disease.

What are the two categories of leukemia that are described by the white blood cell they affect?

They are lymphocytic leukemia, which affects the cells that become lymphocytes, and myelocytic leukemia, a cancer of the cells that develop into granulocytes or monocytes.

Indications/Contraindications for Therapeutic Massage

Contraindicated in the presence of malignant and infectious conditions until the client's health care professional gives approval

Do not specifically massage a lymphatic malformation.

Medical supervision necessary in clients with complicated lymphedema

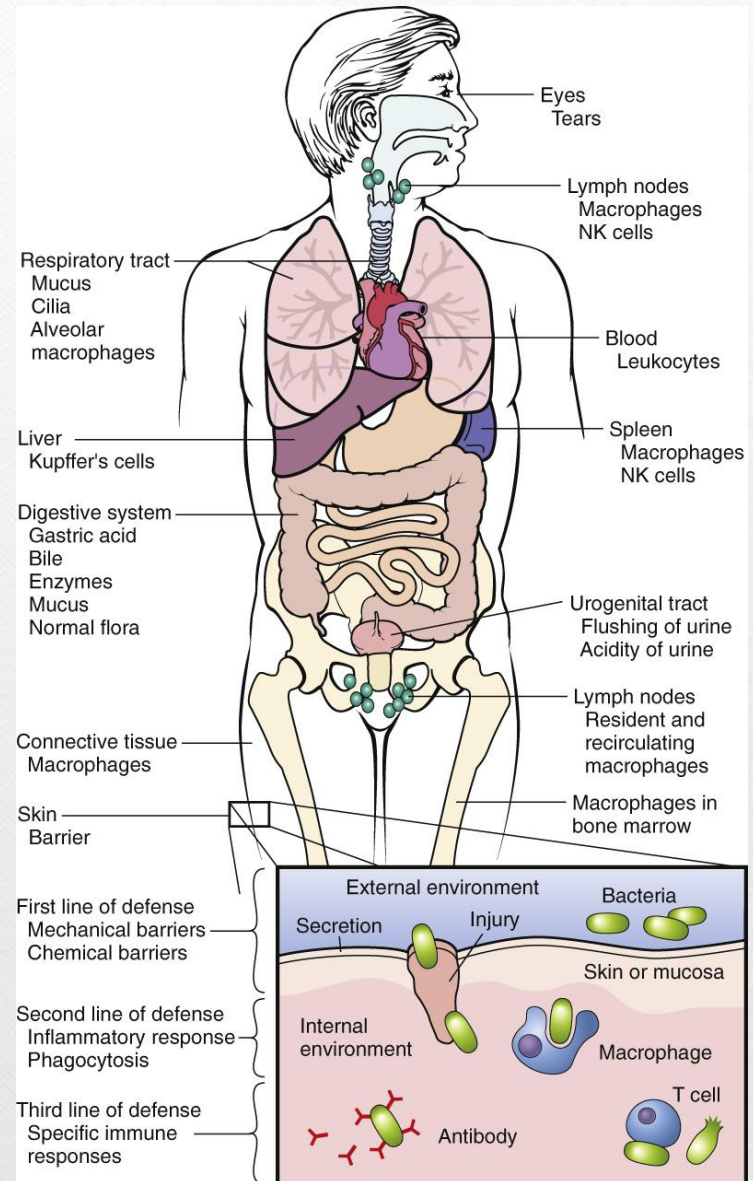
Modification of massage application is necessary according to the type of treatment the client is receiving and his or her stress and fatigue levels.

Massage that relaxes the client supports well-being and is helpful.

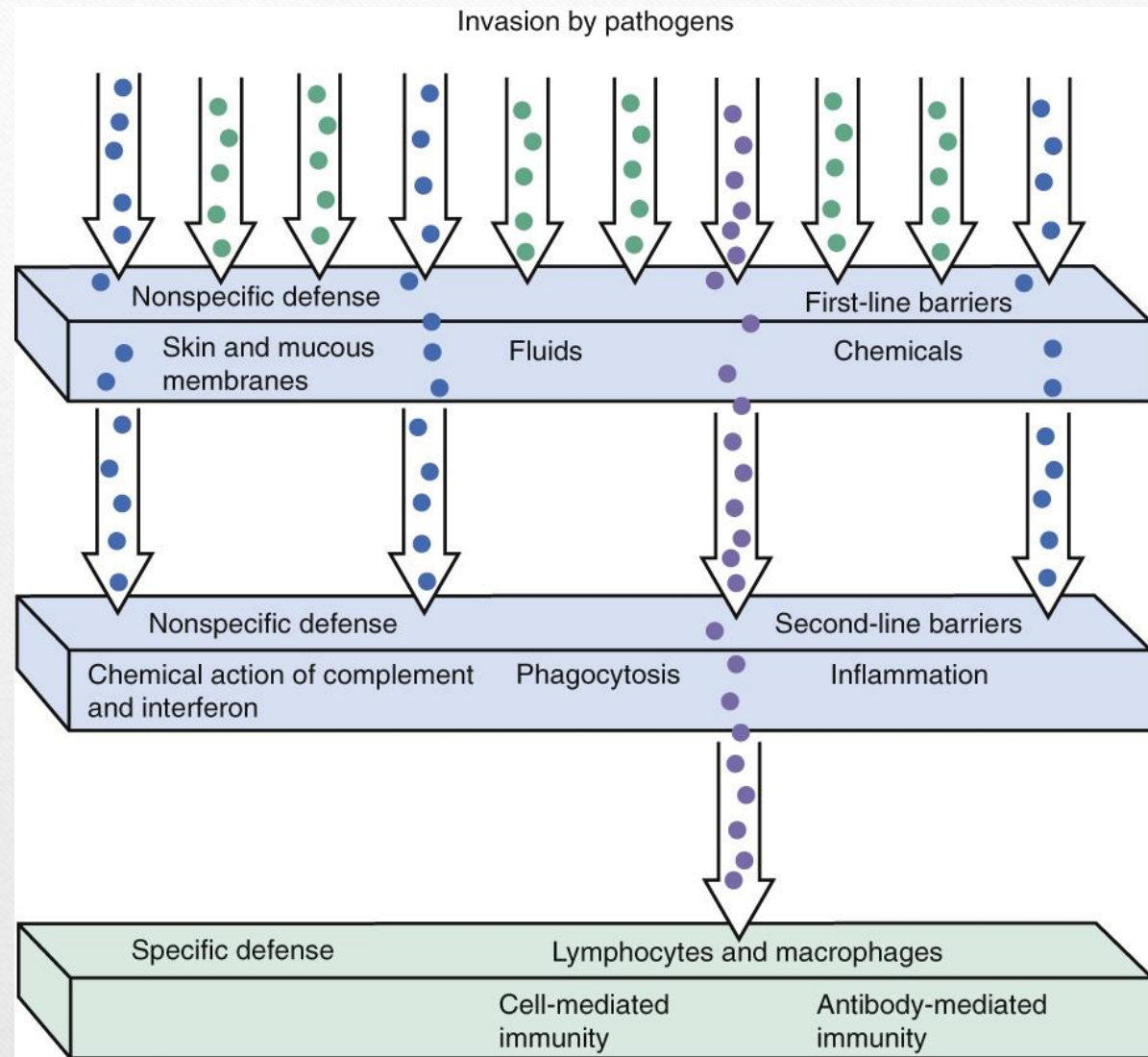
Immune System

The immune system is not a specific structural organ system.

Immunity is a complex response that involves all the systems of the body as they join together to eliminate any pathogen, foreign substance, or toxic material that could damage the body.



Cells of the immune system come from the stem cells of bone marrow. When they mature, they are released into the peripheral blood flow.



Pathogens

Viruses

Bacteria

Fungi

Protozoa

Pathogenic animals

What are pathogens?

Microorganisms that can cause infectious disease.

What other two classes of small agents can cause disease?

Ticks and mites and mesozoa and leeches.

Infections

Symptoms of infectious disease

Fever

Increased catabolism

Malaise

Incubation period

Time between exposure to a pathogen and the first appearance of symptoms

Prodrome: time when nonspecific signs and symptoms appear before acute stage and specific symptoms

Infections that are not sufficiently severe to produce clinical symptoms are called asymptomatic or subclinical infections.

What is latency?

The term latency refers to a situation in which a pathogen persists in a dormant, inactive form without causing damage but could reactivate to cause problems at a later date. Herpes simplex is an example.

Nonspecific Defenses

Skin: waterproof, antibacterial

Eye: tears

Ear: wax

Mouth: saliva enzymes

Stomach: acid environment

Intestines: lymphatic tissue, beneficial flora

Respiratory tract: nose hairs, mucous membranes

Genitourinary tract: urine

Each area of the body has its own way of protecting the body through innate immunity.

Inflammatory Response

Destroys pathogens

Aids in the repair of tissues

Steps

Damage to tissue

Increased blood flow

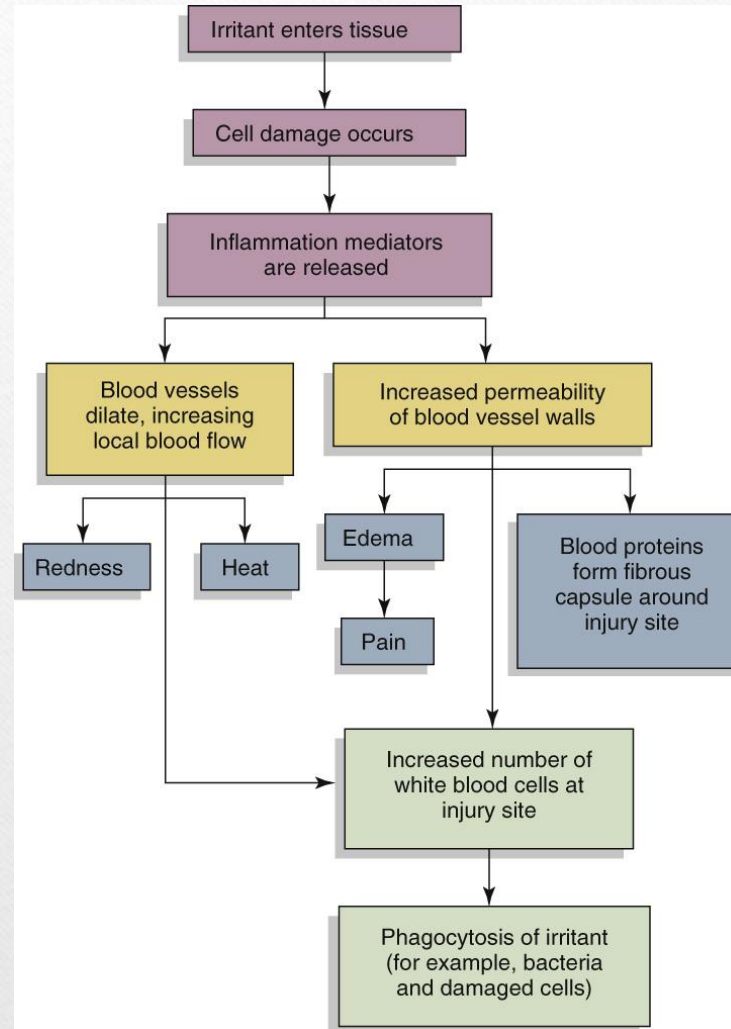
Increased leukocytes, mediators

Tissue repair

What happens if the first release of leukocytes and mediators fails to destroy invading bacteria?

The process repeats itself until the problem is resolved. More mediators are released.

Inflammatory Response



Tissue damage caused by bacteria triggers a series of events that produces the inflammatory response and promotes phagocytosis at the site of injury.

These responses tend to inhibit or destroy the bacteria.

Specific Immunity

Ability to recognize certain antigens and destroy them

Lymphocytes

T cells

B cells

Natural killer cells

Where do T cells, B cells, and natural killer cells develop?

All three of these lymphocytes develop in the bone marrow.

Specific Immunity

Table 11-1 Types of Adaptive Immunity

Type	Description or Example
Natural immunity	Exposure to the causative agent is not deliberate.
Active (exposure)	A child develops measles and acquires an immunity to a subsequent infection.
Passive (exposure)	A fetus receives protection from the mother through the placenta, or an infant receives protection through the mother's milk.
Artificial immunity	Exposure to the causative agent is deliberate.
Active (exposure)	Injection of the causative agent, such as a vaccination against polio, confers immunity.
Passive (exposure)	Injection of protective material (antibodies) that was developed by another individual's immune system.

From Patton KT, Thibodeau GA: *Anatomy and physiology*, ed 7, St Louis, 2010, Mosby.

Lymphocytes fight infection by:

Elimination of extracellular microorganisms

Production of local hormones to stimulate T cells

Elimination of microorganisms that have infected body cells

Vaccines are weakened or killed forms of the actual pathogen, whereas homeopathic substances are energetic forms of the actual substance. Both systems seek to activate the body's immunity so it can protect and heal itself.

Mind/Body Connection

Power of mind over body is amazing.

Lefthanders are more likely to suffer immune disorders.

Immunity is a bodywide process.

Immune system takes a multidisciplinary approach.

The immune system functions less effectively as we age. This effect can be minimized by physical activity, a healthy diet, and spiritual strength

Pathologic Conditions

Hypersensitivity (allergy)

Types I-IV

AIDS and HIV infection

Opportunistic infections

HIV is a retrovirus (reverse-writing of DNA).

Immune deficiency is a condition in which the body is unable to mount the proper immune response to a pathogen.

Chronic stress can also suppress and weaken the immune system.

Hepatitis

Inflammatory process and viral infection of liver

Types B, C, D, E

Autoimmune disease

Body cannot distinguish self from nonself.

Self-antigens are treated as foreign antigens.

Many types

Some autoimmune diseases include arthritis, vasculitis, and glomerulonephritis.

Table 11-2 Examples of Autoimmune Diseases

Disease	Possible Self-Antigen	Description
Addison disease	Surface antigens on adrenal cells	Hyposecretion of adrenal hormones, resulting in weakness, reduced blood sugar, nausea, loss of appetite, and weight loss
Cardiomyopathy	Cardiac muscle	Disease of cardiac muscle (i.e., the myocardium), resulting in loss of pumping efficiency (heart failure)
Diabetes mellitus (type I)	Pancreatic islet cells, insulin, insulin receptors	Hyposecretion of insulin by the pancreas, resulting in extremely elevated blood glucose levels (in turn causing host of metabolic problems, even death if untreated)
Glomerulonephritis	Blood antigens that form immune complexes that deposited in kidney	Disease of the filtration apparatus of the kidney (renal corpuscle), resulting in fluid and electrolyte imbalance and possibly total kidney failure and death
Graves disease (type of hyperthyroidism)	TSH receptors on thyroid cells	Hypersecretion of thyroid hormone and resulting increase in metabolic rate
Hemolytic anemia	Surface antigens on RBCs	Condition of low RBC count in the blood resulting from excessive destruction of mature RBCs (hemolysis)
Hypothyroidism	Antigens in thyroid cells	Hyposecretion of thyroid hormone in adulthood, causing decreased metabolic rate and characterized by reduced mental and physical vigor, weight gain, hair loss, and edema
Multiple sclerosis (MS)	Antigens in myelin sheaths of nervous tissue	Progressive degeneration of myelin sheaths, resulting in widespread impairment of nerve function (especially muscle control)
Myasthenia gravis	Antigens at neuromuscular junction	Muscle disorder characterized by progressive weakness and chronic fatigue
Pernicious anemia	Antigens on parietal cells; intrinsic factor	Abnormally low RBC count resulting from the inability to absorb vitamin B ₁₂ , a substance critical to RBC production
Reproductive infertility	Antigens on sperm or tissue surrounding ovum (egg)	Inability to produce offspring (in this case, resulting from the destruction of gametes)
Rheumatic fever	Cardiac cell membranes (cross reaction with group A streptococcal antigen)	Rheumatic heart disease; inflammatory cardiac damage (especially to the endocardium valves)
Rheumatoid arthritis (RA)	Collagen	Inflammatory joint disease characterized by synovial inflammation that spreads to other fibrous tissues
Systemic lupus erythematosus (SLE)	Numerous	Chronic inflammatory disease with widespread effects and characterized by arthritis, a red rash on the face, and other signs
Ulcerative colitis	Mucous cells of colon	Chronic inflammatory disease of the colon characterized by watery diarrhea containing blood, mucus, and pus

From Patton KT, Thibodeau GA: *Anatomy and physiology*, ed 7, St Louis, 2010, Mosby.

Indications/Contraindications for Therapeutic Massage

No specific methods

Gauge intensity and duration of bodywork methods against ability of the body to adapt

The massage therapist needs to apply Standard Precautions when massaging clients with immune conditions.

To Test

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