Tissues & Membranes

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Tissues & Membranes

- Tissues are a group of cells with similar structure & function
- 4 Major Types:
  - Epithelial (skin, mouth, resp. tract)
  - Connective (bones, ligaments, cartilage)
  - Nervous
  - Muscle

Epithelial Tissue

- Epithelial is found on the surface as either coverings (our skin) or linings (inner cavities)
- Forms large continuous sheets
- 2 surfaces:
    - free or unattached
    - undersurface or bottom is attached to a basement membrane which anchors epithelium to underlying structure
- Has no blood supply, nourishment comes from underlying connective tissues
- Regenerates and repairs self quickly

Epithelial Tissue

- Main function:
  - **Protection**: skin protects from invasion of bacteria, resp tract: helps clean inhaled air
  - **Absorption**: in digestive tract absorbs large amounts of water & digested food
  - **Filtration**: in kidneys for water & electrolytes
  - **Secretion**: hormones & enzymes

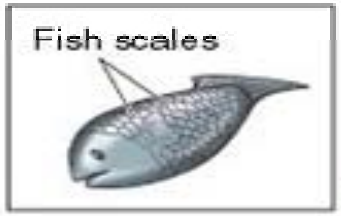
Epithelial Tissue

- Classified according to the type of cell the tissue is made of
- Shape:
  - Squamous: scales
  - Cuboidal: cubes
  - Columnar: columns
- Number of layers:
  - Simple: one layer
  - Stratified: multi-layered
  - Pseudostratified: one irregular layer: looks like multi layers

Looks like:

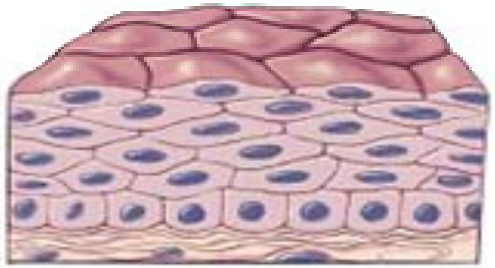
Cell shapes:

Types of cell layers:

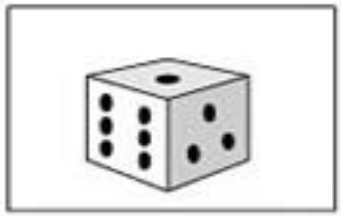


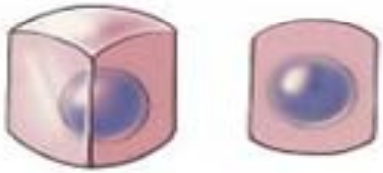
Squamous

Simple

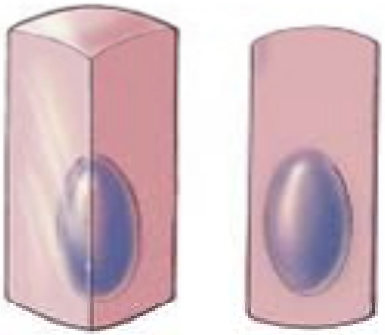


Stratified





Cuboidal



Columnar

Simple Epithelial

- Simple epithelia:
  - Thin
  - Primary function: transportation of substances across membrane of one body compartment to another
- Types:
  - Simple sqaumous epithelium
  - Simple cuboidal epithelium
  - Simple columnar epithelium
  - Pseudostratified columnar epithelium

Simple Epithelial

- Simple squamous:
  - Simple layer of flat cells, thin & smooth
  - Found in walls of capillaries, aveoli & kidneys
  - Function is the exchange of nutrients & waste
  - By way of diffusion (of O_2 & $CO_{2)}$ in lungs
  - By way of filtration (of H_2O & electrolytes) in kidneys

Simple Epithelial

- Simple Cuboidal:
  - Single layer of cube shaped cells
  - Found in glands & kidney tubules
  - Function is the transport & secretion of substances
  - Re-absorption of water & electrolytes in kidney
  - Secretion of enzymes & hormones

Simple Epithelial

- Simple columnar:
  - Single layer of columnar cells located on basement membrane
  - Located along the whole digestive tract
  - Functions include absorption of the production of digestion, protection, secretion of digestive juices
  - Goblet cells (modified columnar cells) produce needed mucus for lubrication

Simple Epithelial

- Pseudostratified columnar:
  - Single layer of irregularly shaped cells
  - Also called ciliated epithelium, cells have cilia
  - Lines in the respiratory tract & fallopian tubes
  - Cleans respiratory passages & sweeps egg toward uterus

Stratified Epithelia

- Multi-layer of flat cells
- Stronger than simple epithelial
- Two types:
  - Stratified squamous epithelium
  - Transitional epithelium

Stratified Epithelial

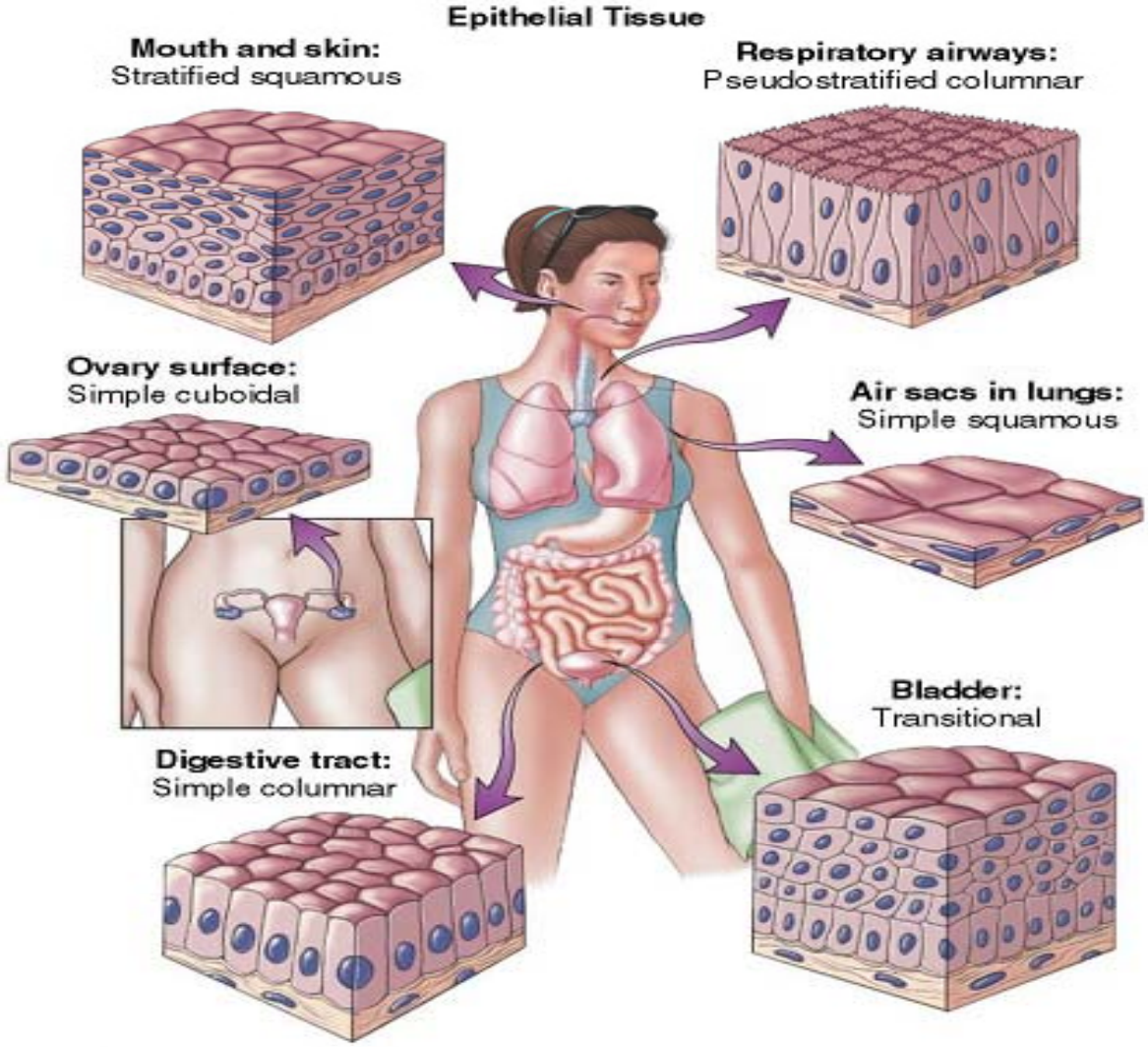
- Stratified squamous epithelium
  - Most common stratified epthelium
  - Located in the mouth, esophagus, vagina, anus & outer layer of skin
  - Protects the body from invading microorganisms & friction
- Transitional epithelium:
  - Located in organs that stretch such as the bladder & uterus
  - Cells slide past each other when tissue is stretched
  - Appear stratified when bladder is empty & simple when full
  - Allows the organ to stretch without tearing

Glandular Epithelial

- Glandular Epithelial:
  - Main function is secretion
  - A gland is made up of one or more cells that secrete a substance
  - Most glands are made up of simple cubodial epithelium
  - Two types: Exocrine & Endocrine

Glandular Epithelial

- Glandular Epithelial
  - Exocrine Glands
    - Have tiny tubes or ducts
    - Secrete mucus, sweat, saliva & digestive enzymes
    - Carries exocrine secretions to outside body
  - Endocrine Gland:
    - Do not have ducts; called ductless glands
    - Secrete hormones directly into the blood stream i.e. insulin
    - Blood carries hormones to site of action


Epithelial Tissue
Mouth and skin:
Stratified squamous
Respiratory airways:
Pseudostratified columnar
Ovary surface:
Simple cuboidal
Air sacs in lungs:
Simple squamous
Bladder:
Transitional
Digestive tract:
Simple columnar

Connective Tissue

- Connective Tissue:
  - Most abundant of all 4 tissue types
  - Widely distributed throughout the body
  - Bind the body together, supports, protects, stores fat & transports substances

Connective Tissue

- 2 Characteristics:
  - Good blood supply
  - Abundance of intracellular matrix
- Intracellular matrix:
  - Found between cells
  - varies depending on the type of connective tissue
  - May be liquid, gel or hard
  - May have large or small amount
  - Contains proteins fibers: collagen (white), elastin (yellow) & reticular (fine)

Connective Tissue

- Loose connective tissue: contains fibers that are loosely arranged around cells
  - Areolar
  - Adipose
  - Reticular connective
- Dense fibrous connective tissue: contains many collagen & elastic fibers
  - Tendons– Ligaments—capsules—fascia—dermis
- Cartilage
- Bone
- Blood & Lymph

Loose Connective Tissue

- Arelolar
  - Made up of collagen & elastic fibers in a gel-like matrix
  - Soft & surrounds, protects & cushions organs
  - Holds organs in place “tissue glue”
  - Most widely distributed connective tissue
  - Beneath skin/ mucus membranes & between muscles

Loose Connective Tissue

- Adipose
  - Type of tissue that stores fat
  - Insulates the body
  - Cushions organs i.e. Kidney, heart, eyeball
  - Located beneath the skin
  - Gel-like matrix

Loose Connective Tissue

- Reticular connective tissues:
  - Interwoven reticular fibers
  - Fine collagen fibers
  - Forms internal framework for lymphoid tissue
  - Spleen, lymph node & bone marrow

Dense Fibrous Connective Tissue

- Dense Fibrous Connective Tissue:
  - Matrix contains many collagen & elastic fibers
  - Forms supporting structures: **tendons** (muscles to bones), **ligaments**(bones to bones) , **capsules** (covers organs) & **fascia** (bands & sheets cover muscles & nerves)
  - Covers, Supports, Anchors or Binds structures together

Connective Tissue

- Cartilage:
  - Formed by chondrocytes that secrete a protein intercellular matrix that is firm, smooth & flexible
  - Supports, protects & provides framework
  - Most covered by perichondrium, which contains blood vessels to the cartilage
  - Three types:
    - Hyaline—Elastic—Fibrocartilage

Cartilage

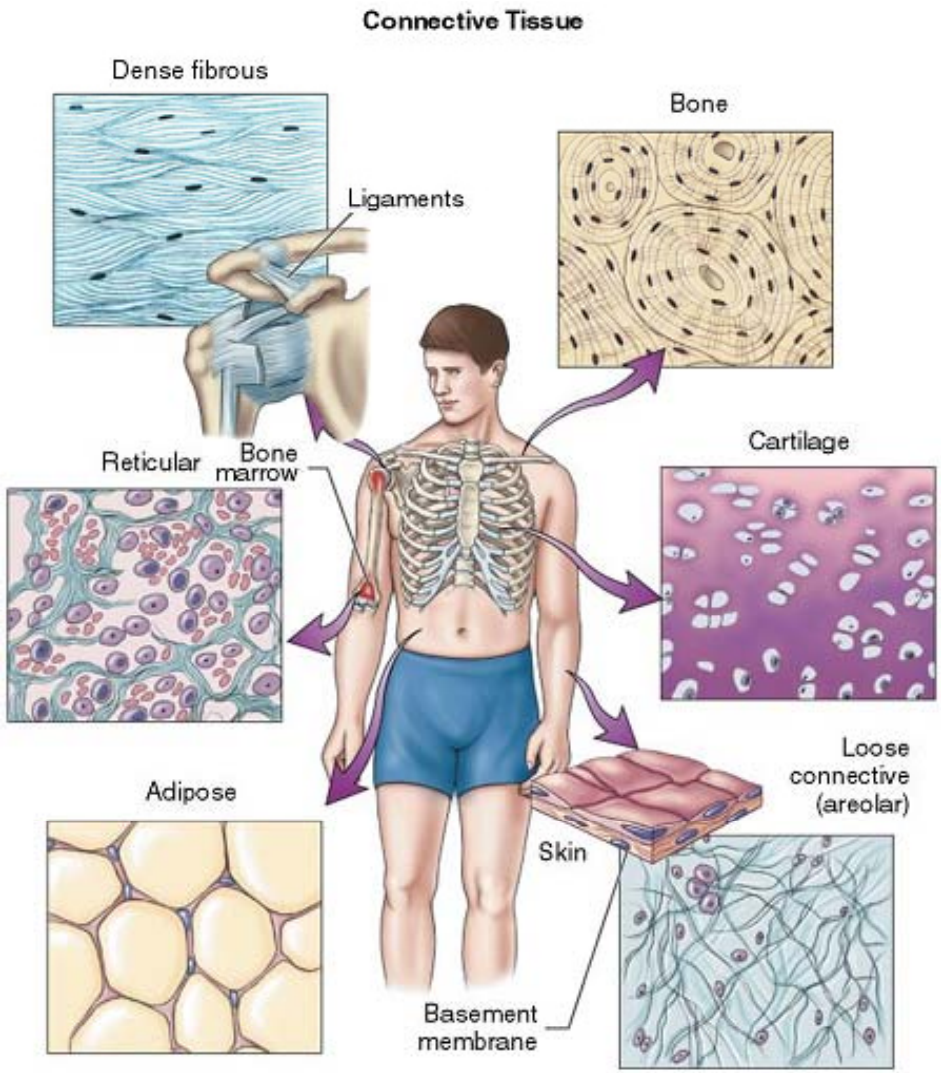
- Hyaline found in:
  - Larynx, ends of long bones, nose, area between breast bones and ribs
- Elastic found in:
  - Intervetebral discs, pads in knees & joints, symphysis pelvis
- Fibrocartilage found in:
  - External ear, larynx

Connective Tissue

- Bone:
  - AKA osseous tissues
  - Intercellular matrix includes collagen, calcium salts & minerals
  - Provides framework, protects organs, supports body, stores minerals.

Connective Tissue

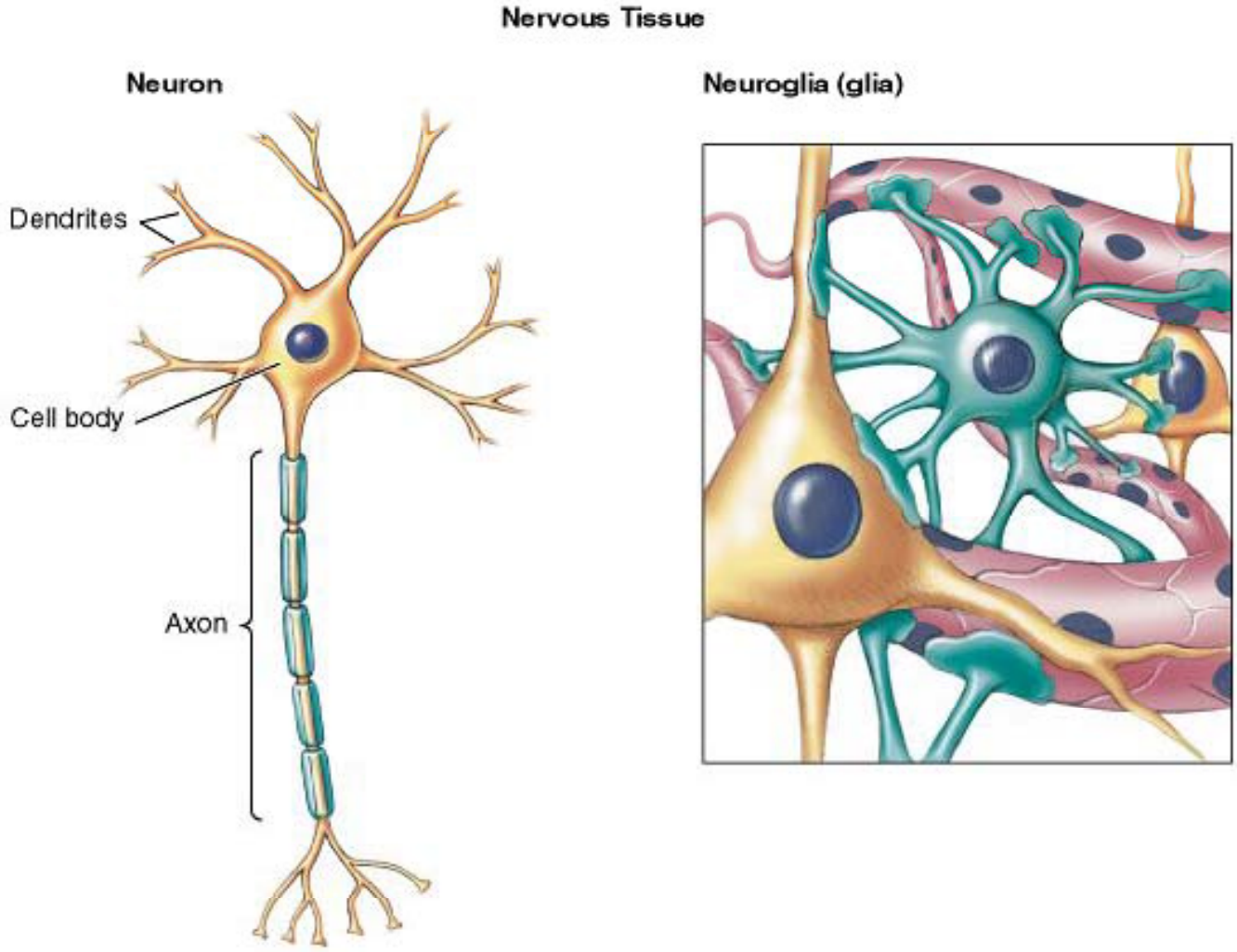
- Blood:
  - Watery intercellular matrix, Plasma
  - “liquid” connective tissue
  - Contains non-fibrous plasma proteins
  - Transports nutrients, hormones, O_2 & CO_2
- Lymph:
  - Found in lymphatic vessels


Connective Tissue
Dense fibrous
Ligaments
Bone
Cartilage
Reticular
Bone marrow
Adipose
Loose connective (areolar)
Skin
Basement membrane

Nervous Tissue

- Nervous Tissue:
  - Makes up brain, spinal cord & nerves
  - Two types of cells: neurons & neuroglia
- Neurons are nerve cells that transmit electrical signals to & from brain & spinal cord.
  - 3 Parts to neuron: Dendrite, Cell body, Axon
- Neuroglia: supports & takes care of neurons.
  - Has no electrical signal

Nervous tissue



Muscle Tissue

- Muscle tissues is composed of cells that shorten or contract.
- Can be voluntary or involuntary
- Can be striated or non-striated
- Three types:
  - Skeletal
  - Smooth
  - Cardiac

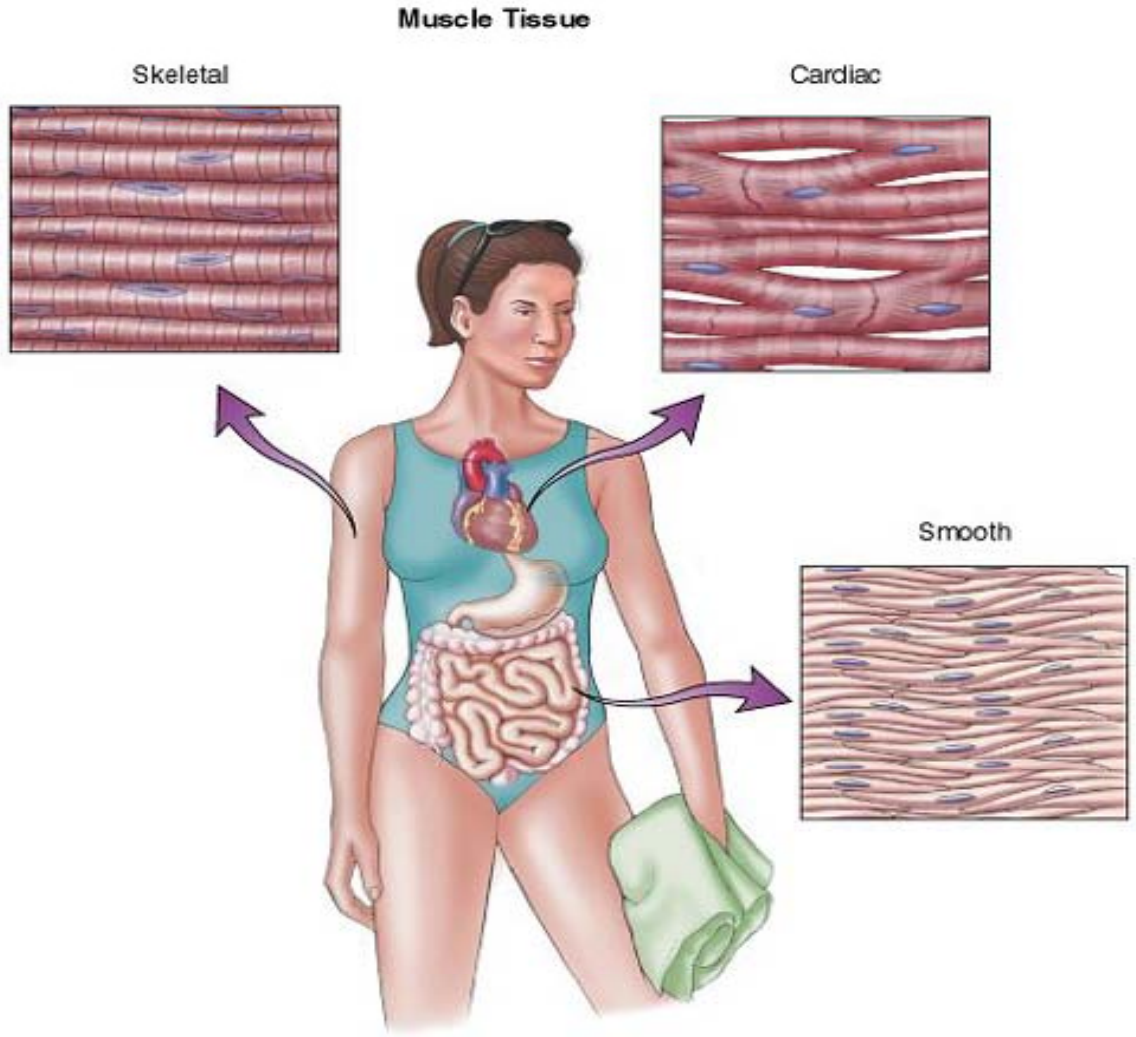
Muscle Tissue

- Skeletal:
  - Generally attached to bone
  - Appears striated or striped
  - Maintains posture & stabilizes joint
  - Voluntary muscles
- Smooth:
  - Walls of the organs such as stomach & bladder
  - Involuntary & Non-striated
  - Function is related to the organ in which it is found

Muscle Tissue

- Cardiac:
  - Only in the heart
  - Involuntary & striated
  - Function is to pump the blood
  - Contains long cells that fit together tightly at junctions called intercalated discs
  - Promote rapid conduction of electrical signals throughout the heart

Muscle tissue



Tissues & Membranes

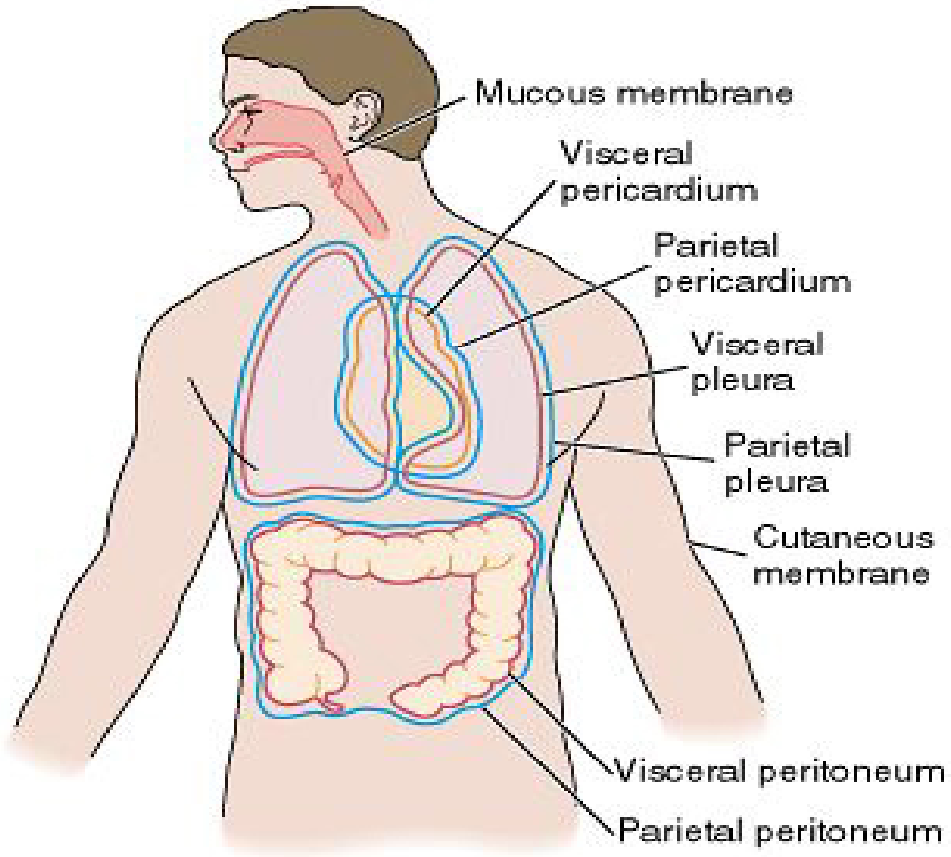
- Tissue repair:
  - Regeneration: replacement of tissues by cells identical to the original, tissue undergo mitosis
  - Fibrosis: replacement of tissue by fibrous connective tissue; scar; tissue does not go through mitosis
  - Damaged skeletal, cardiac & nervous tissue does not undergo mitosis & is replaced by scar tissue

Membranes

- Membranes are thin sheets of tissues that cover surfaces, line body cavities & surround organs.
- Two types of membranes:
  - Epithelial
    - Cutaneous, Mucous, Serous
  - Connective
    - Synovial, Periosteum, Perichondrium, Meninges, Fascia

Membranes

- Epithelial Membranes:
  - Cutaneous membrane is the skin. Outer layer—epidermis
  - Mucous membranes line all body cavities that open to the exterior of the body.
    - Digestive tract, urinary tract, respiratory tract, reproductive tract
  - Serous Membranes line the body cavities that are not open to the exterior of the body
    - Pleura-pericardium-peritoneum


Mucous membrane
Visceral pericardium
Parietal pericardium
Visceral pleura
Parietal pleura
Cutaneous membrane
Visceral peritoneum
Parietal peritoneum

Membranes

- Connective Tissue Membranes:
  - Synovial: lines joint cavities; secretes synovial fluid
  - Periosteum: covers bone; contains blood vessels that supply bone
  - Perichondruim: covers cartilage; contains capillaries that nourish the cartilage
  - Meninges: covers brain & spinal cord; contains CSF
  - Fascia: throughout the body; muscles, blood vessels