

Hole's Human Anatomy and Physiology

www.fisiokinesiterapia.biz

Chapter 5

Tissues

Four major tissue types

- 1. Epithelial**
- 2. Connective**
- 3. Muscle**
- 4. Nervous**

Epithelial Tissues

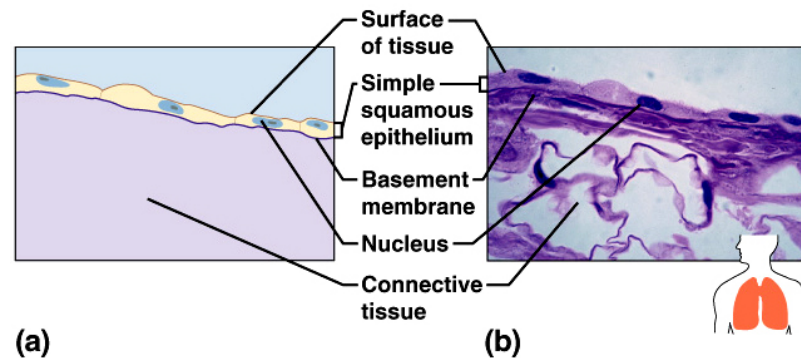
General characteristics -

- **cover organs and the body**
- **line body cavities**
- **line hollow organs**
- **have a free surface**
- **have a basement membrane**
- **avascular**
- **cells readily divide**
- **cells tightly packed**
- **cells often have desmosomes**
- **function in protection, secretion, absorption, and excretion**
- **classified according to cell shape and number of cell layers**

Epithelial Tissues

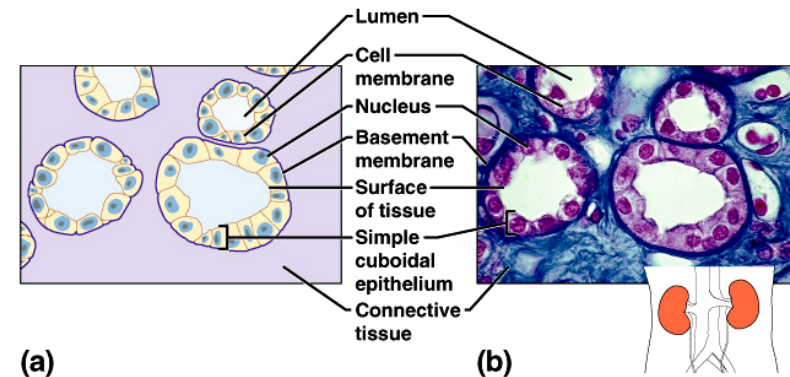
Simple squamous –

- single layer of flat cells
- substances pass easily through
- line air sacs
- line blood vessels
- line lymphatic vessels



Simple cuboidal –

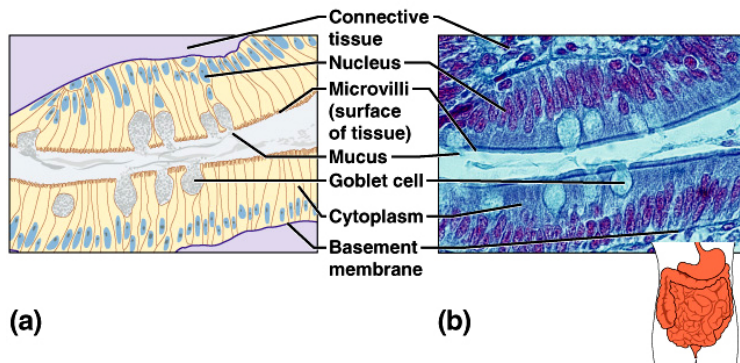
- single layer of cube-shaped cells
- line kidney tubules
- cover ovaries
- line ducts of some glands



Epithelial Tissues

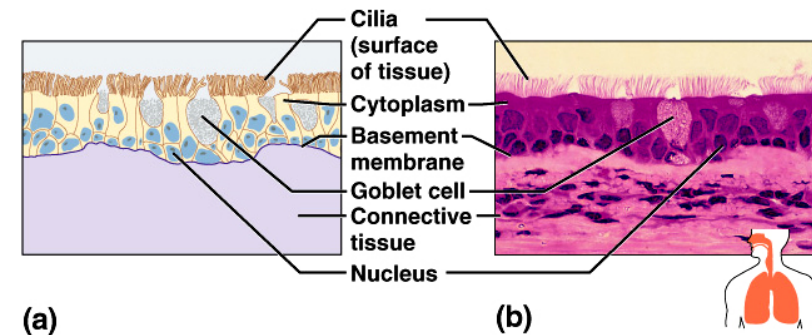
Simple columnar –

- single layer of elongated cells
- nuclei usually near the basement membrane at same level
- sometimes possess cilia
- sometimes possess microvilli
- often have goblet cells
- line uterus, stomach, intestines



Pseudostratified columnar –

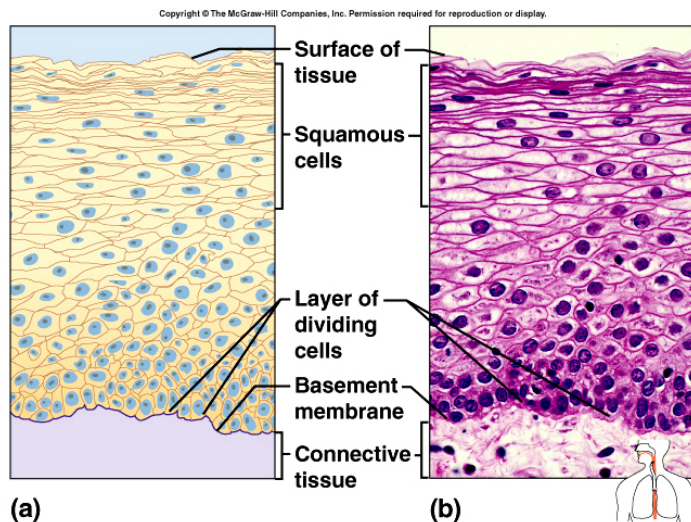
- single layer of elongated cells
- nuclei at two or more levels
- appear striated
- often have cilia
- often have goblet cells
- line respiratory passageways



Epithelial Tissues

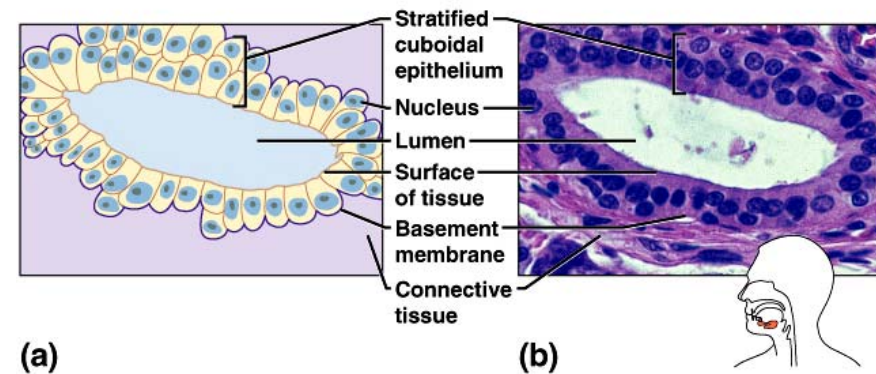
Stratified squamous –

- many cell layers
- top cells are flat
- can accumulate keratin
- outer layer of skin
- line oral cavity, vagina, and anal canal



Stratified cuboidal –

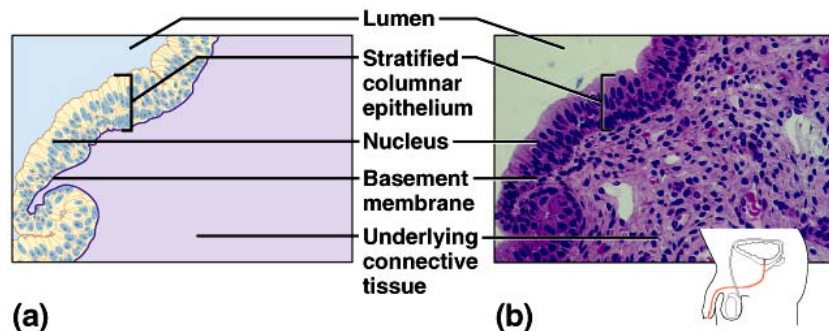
- 2-3 layers
- cube-shaped cells
- line ducts of mammary glands, sweat glands, salivary glands, and the pancreas



Epithelial Tissues

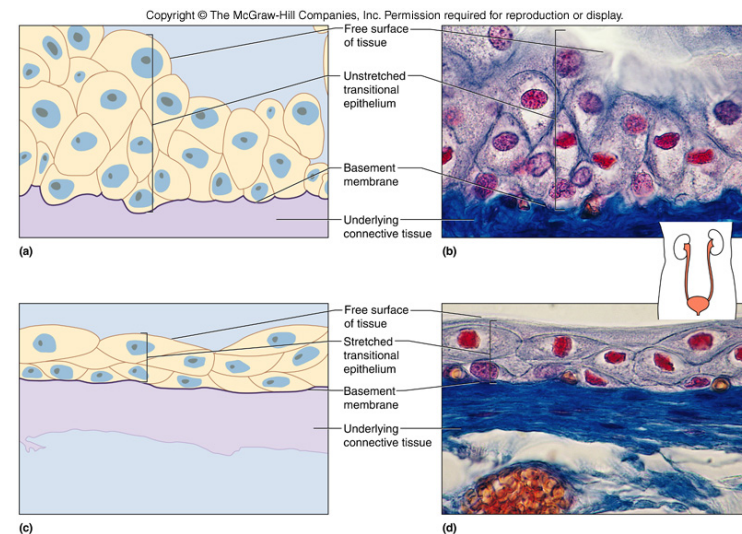
Stratified columnar –

- top layer of elongated cells
- cube-shaped cells in deeper layers
- line part of male urethra and part of pharynx



Transitional –

- many cell layers
- cube-shaped and elongated cells
- line urinary bladder, ureters, and part of urethra



Glandular Epithelium

Composed of cells that are specialized to produce and secrete substances

Endocrine glands are ductless

Exocrine glands have ducts

Unicellular exocrine gland

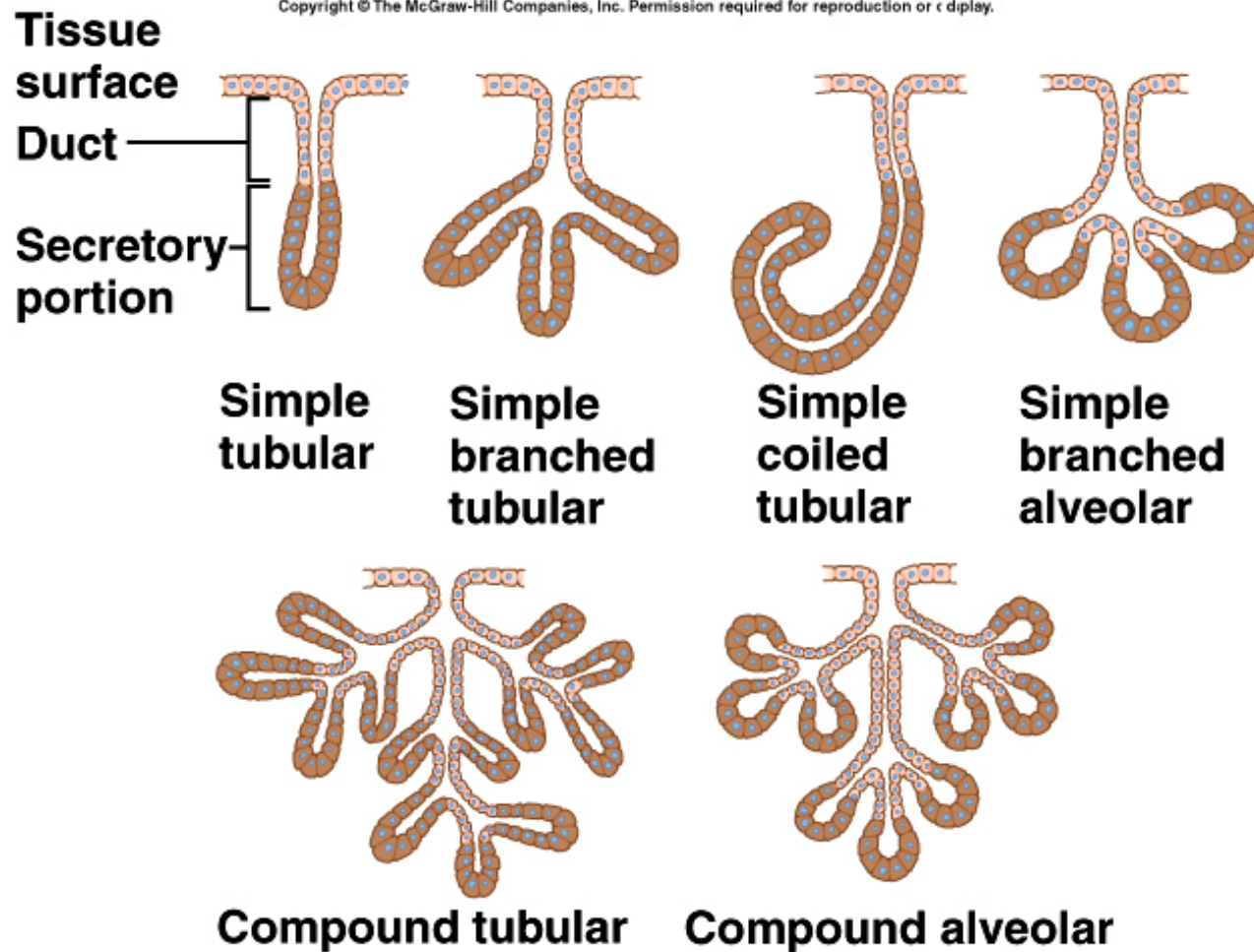
- composed of one cell
- goblet cell

Multicellular exocrine gland

- composed of many cells
- sweat glands, salivary glands, etc.
- simple and compound

Structural Types of Exocrine Glands

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Types of Glandular Secretions

Merocrine glands

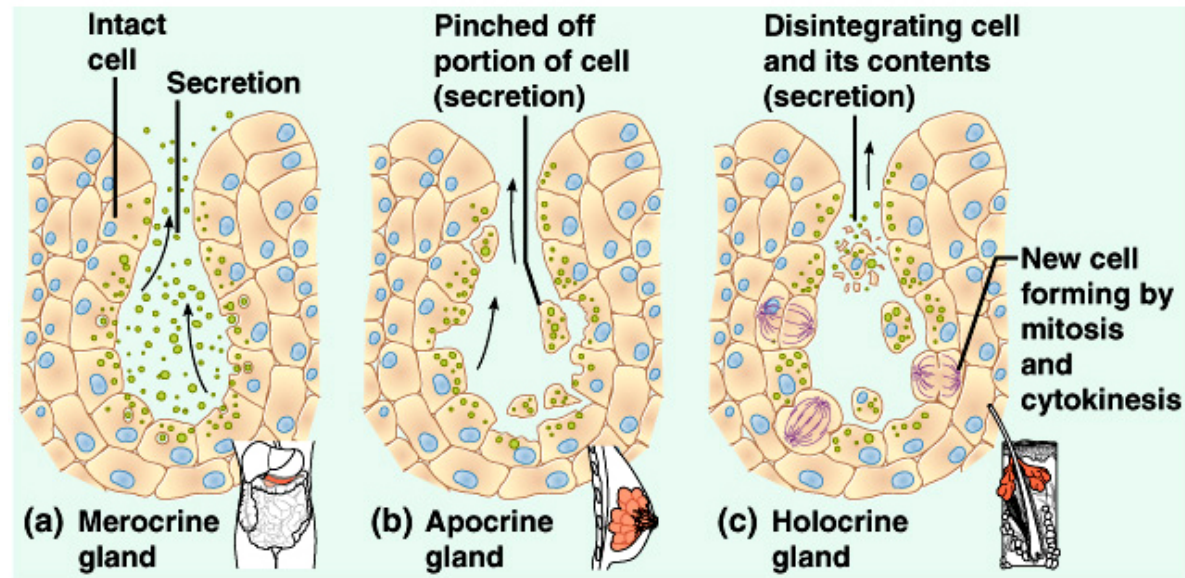
- fluid product
- salivary glands
- pancreas
- sweat glands

Apocrine glands

- cellular product
- portions of cells
- mammary glands
- ceruminous glands

Holocrine glands

- secretory products
- whole cells
- sebaceous glands



Connective Tissues

General characteristics -

- **most abundant tissue type**
- **many functions**
 - **bind structures**
 - **provide support and protection**
 - **serve as frameworks**
 - **fill spaces**
 - **store fat**
 - **produce blood cells**
 - **protect against infections**
 - **help repair tissue damage**
- **have a matrix**
- **have varying degrees of vascularity**
- **have cells that usually divide**

Connective Tissue

Major Cell Types

Fibroblasts

- **fixed cell**
- **most common cell**
- **large, star-shaped**
- **produce fibers**

Macrophages

- **wandering cell**
- **phagocytic**
- **important in injury or infection**

Mast cells

- **fixed cell**
- **release heparin**
- **release histamine**

Connective Tissue Fibers

Collagenous fibers

- thick
- composed of collagen
- great tensile strength
- abundant in dense CT
- hold structures together
- tendons, ligaments

Reticular fibers

- very thin collagenous fibers
- highly branched
- form supportive networks

Elastic fibers

- bundles of microfibrils embedded in elastin
- fibers branch
- elastic
- vocal cords, air passages

Connective Tissues

Connective tissue proper

- loose connective tissue
- adipose tissue
- reticular connective tissue
- dense connective tissue
- elastic connective tissue

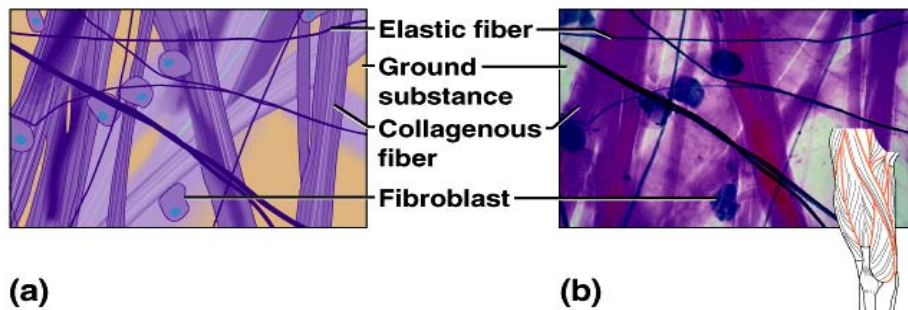
Specialized connective tissue

- cartilage
- bone
- blood

Connective Tissues

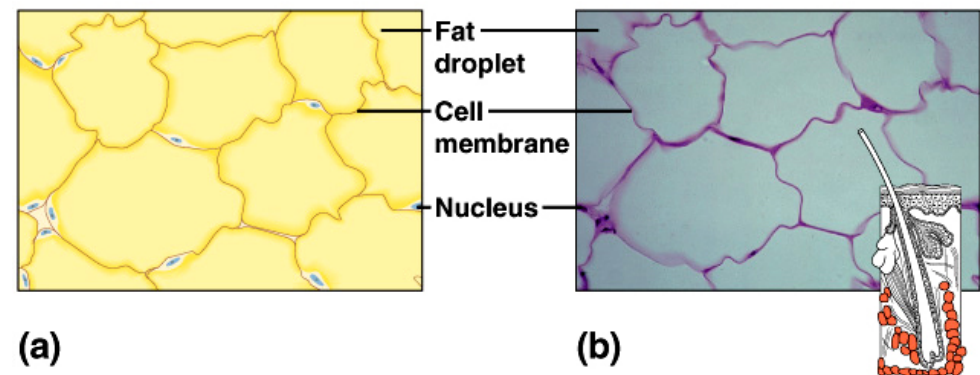
Loose connective tissue

- mainly fibroblasts
- fluid to gel-like matrix
- collagenous fibers
- elastic fibers
- bind skin to structures
- beneath most epithelia
- blood vessels nourish nearby epithelial cells
- between muscles



Adipose tissue

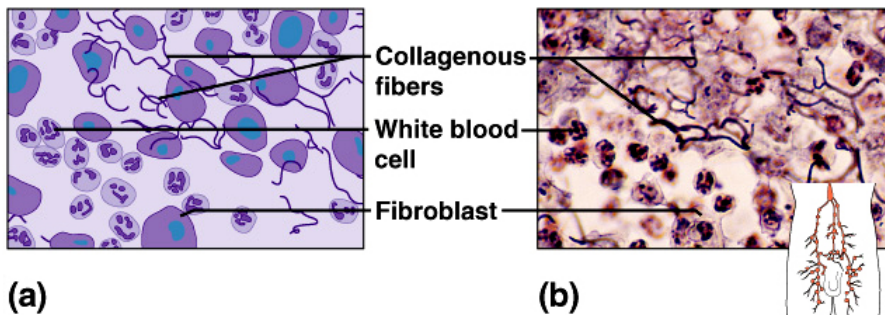
- adipocytes
- cushions
- insulates
- store fats
- beneath skin
- behind eyeballs
- around kidneys and heart



Connective Tissues

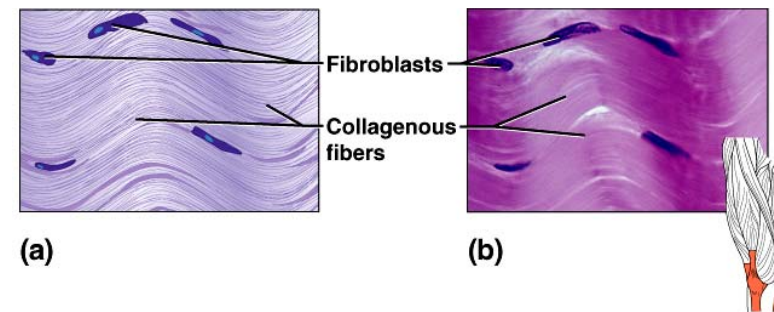
Reticular connective tissue

- composed of reticular fibers
- supports internal organ walls
- walls of liver, spleen, lymphatic organs



Dense connective tissue

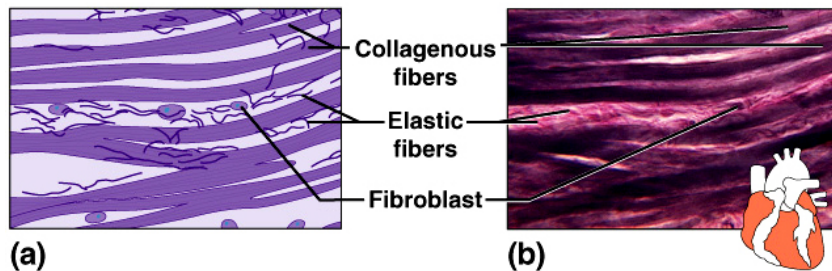
- packed collagenous fibers
- elastic fibers
- few fibroblasts
- bind body parts together
- tendons, ligaments, dermis
- poor blood supply



Connective Tissues

Elastic connective tissue

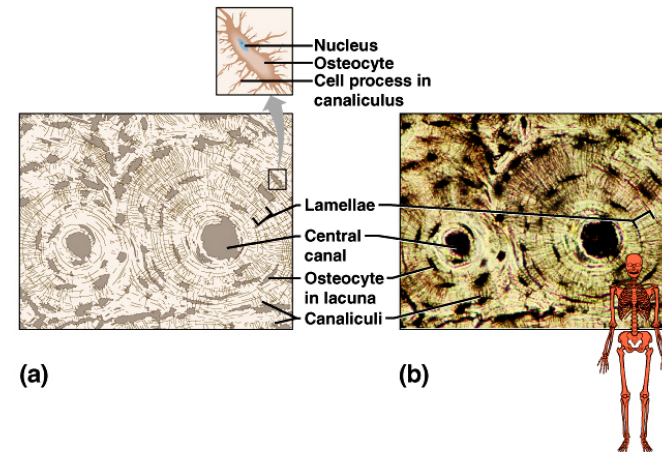
- abundant in elastic fibers
- some collagenous fibers
- fibroblasts
- attachments between bones
- walls of large arteries, airways, heart



Bone (Osseous Tissue)

- solid matrix
- supports
- protects
- forms blood cells
- attachment for muscles
- skeleton

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Connective Tissues

Cartilage

- rigid matrix
- chondrocytes in lacunae
- poor blood supply
- three types
 - hyaline
 - elastic
 - fibrocartilage

Hyaline cartilage

- most abundant
- ends of bones
- nose, respiratory passages
- embryonic skeleton

Elastic cartilage

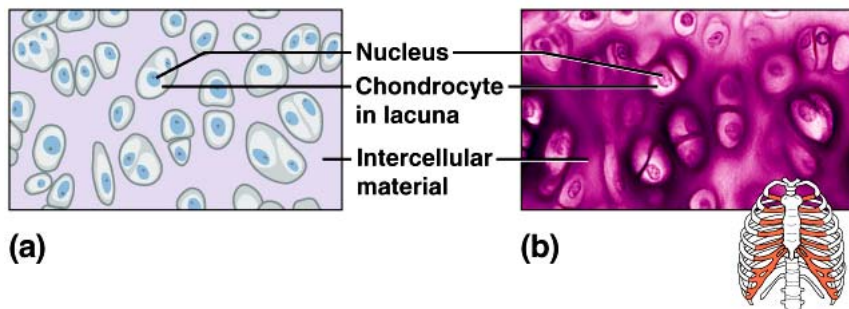
- flexible
- external ear, larynx

Fibrocartilage

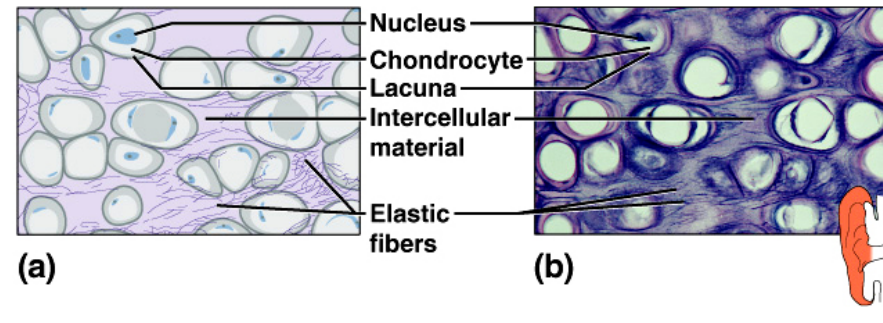
- very tough
- shock absorber
- intervertebral discs
- pads of knee and pelvic girdle

Connective Tissues

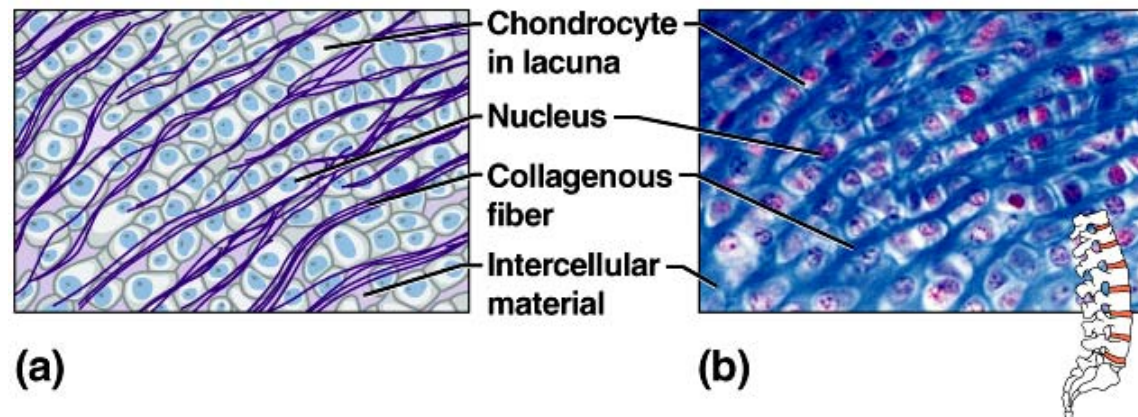
Three types of cartilage



Hyaline Cartilage



Elastic Cartilage



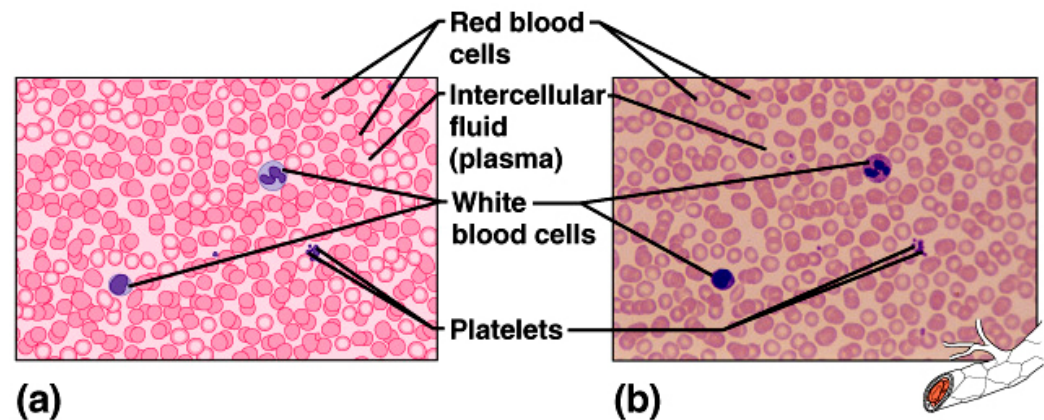
Fibrocartilage

Connective Tissues

Blood

- fluid matrix called plasma
- red blood cells
- white blood cells
- platelets
- transports
- defends
- involved in clotting
- throughout body in blood vessels
- heart

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Muscle Tissues

General characteristics

- muscle cells called muscle fibers
- contractile
- three types
 - skeletal
 - smooth
 - cardiac

Skeletal muscle

- attached to bones
- striated
- voluntary

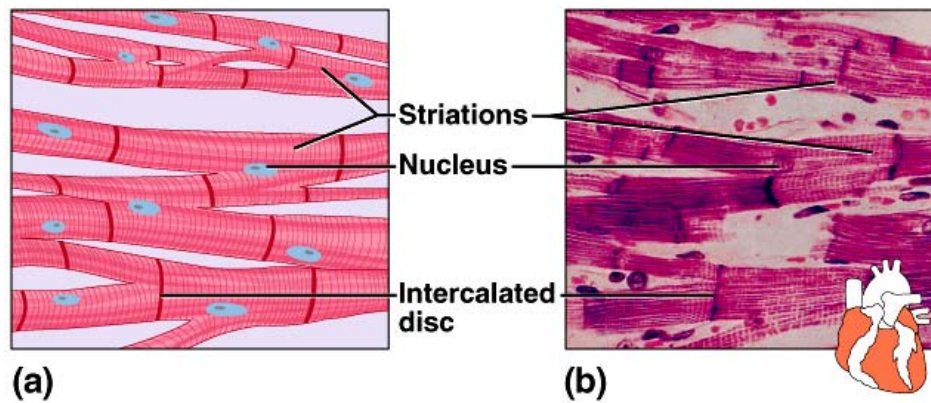
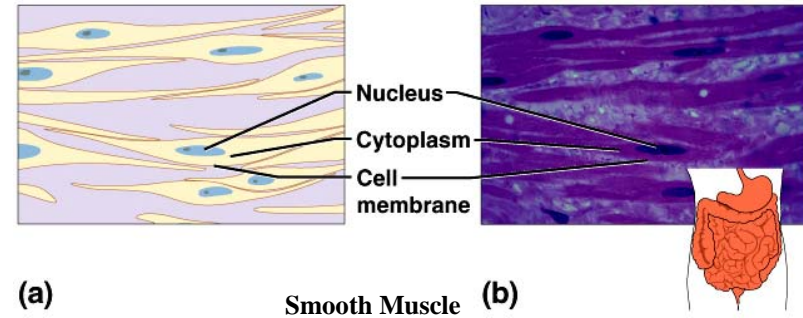
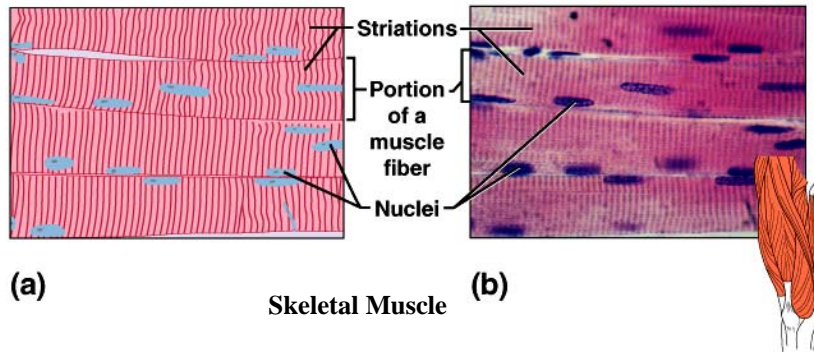
Smooth muscle

- walls of organs
- skin
- walls of blood vessels
- involuntary
- not striated

Cardiac muscle

- heart wall
- involuntary
- striated
- intercalated discs

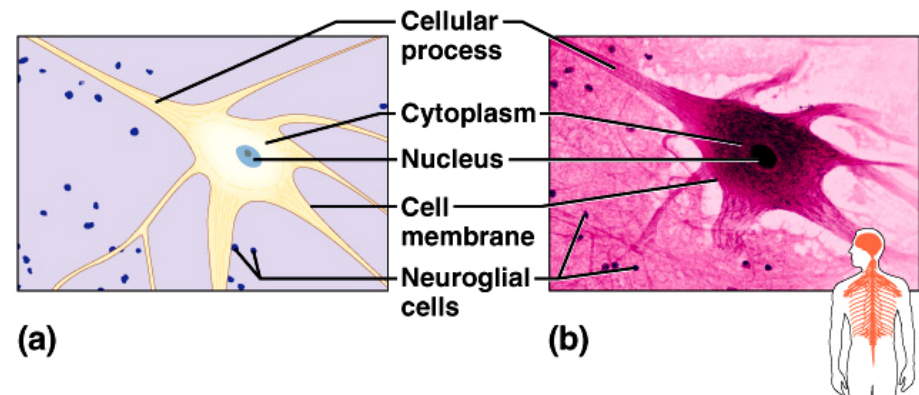
Muscle Tissues



Nervous Tissues

- found in brain, spinal cord, and peripheral nerves
- basic cells are neurons
- neuroglial cells support and bind nervous tissue components
- sensory reception
- conduction of nerve impulses

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Types of Epithelial Membranes

Serous

- line body cavities that do not open to the outside
- reduce friction
- inner lining of thorax and abdomen
- cover organs of thorax and abdomen
- secrete serous fluid

Mucous

- line tubes and organs that open to outside world
- lining of mouth, nose, throat, etc.
- secrete mucus

Cutaneous

- covers body
- skin

Synovial

- composed entirely of connective tissue
- lines joints

Clinical Application

The Extracellular Matrix: The Body's Glue

Cancer

- fibroblasts become more contractile, take on cancer cell characteristics and secrete abundant collagen

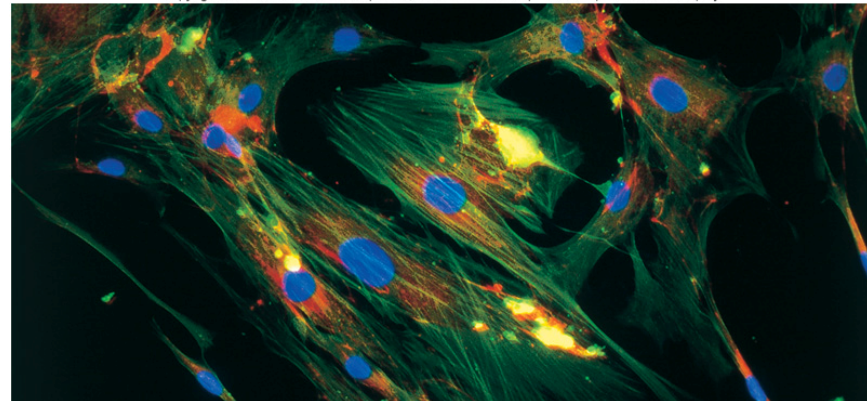
Liver Fibrosis

- collagen deposit increases
- ECM exceeds normal 3% value and may block blood flow

Heart Failure and Atherosclerosis

- imbalances of collagen production and degradation
- ECM buildup may block blood flow in the arteries and the heart

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Clinical Application

Collagen Disorders

Chondrodysplasia

- collagen chains too wide
- stunted growth
- deformed joints

Hereditary osteoarthritis

- change in amino acid in collagen
- painful joints

Dystrophic epidermolysis bullosa

- breakdown of collagen that attaches skin layers
- stretchy skin
- lax joints

