

Body Tissue Types

- **Epithelial**

- Covers body surfaces and lines hollow organs, body cavities, duct, and forms glands



Epithelial tissue

- **Connective**

- Protects, supports, and binds organs

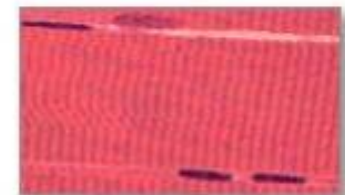
- Stores energy as fat, provides immunity



Connective tissue

- **Muscular**

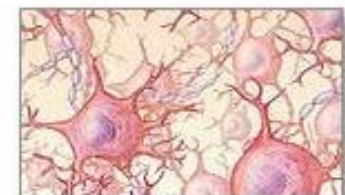
- Generates the physical force needed to make body structures move and generate body heat



Muscle tissue

- **Nervous**

- Detect changes in body and responds by generating nerve impulses



Nervous tissue

Development of Tissues

- Tissues of the body develop from three primary germ layers:

Ectoderm, Endoderm, and Mesoderm

--Epithelial tissues develop from all three germ layers

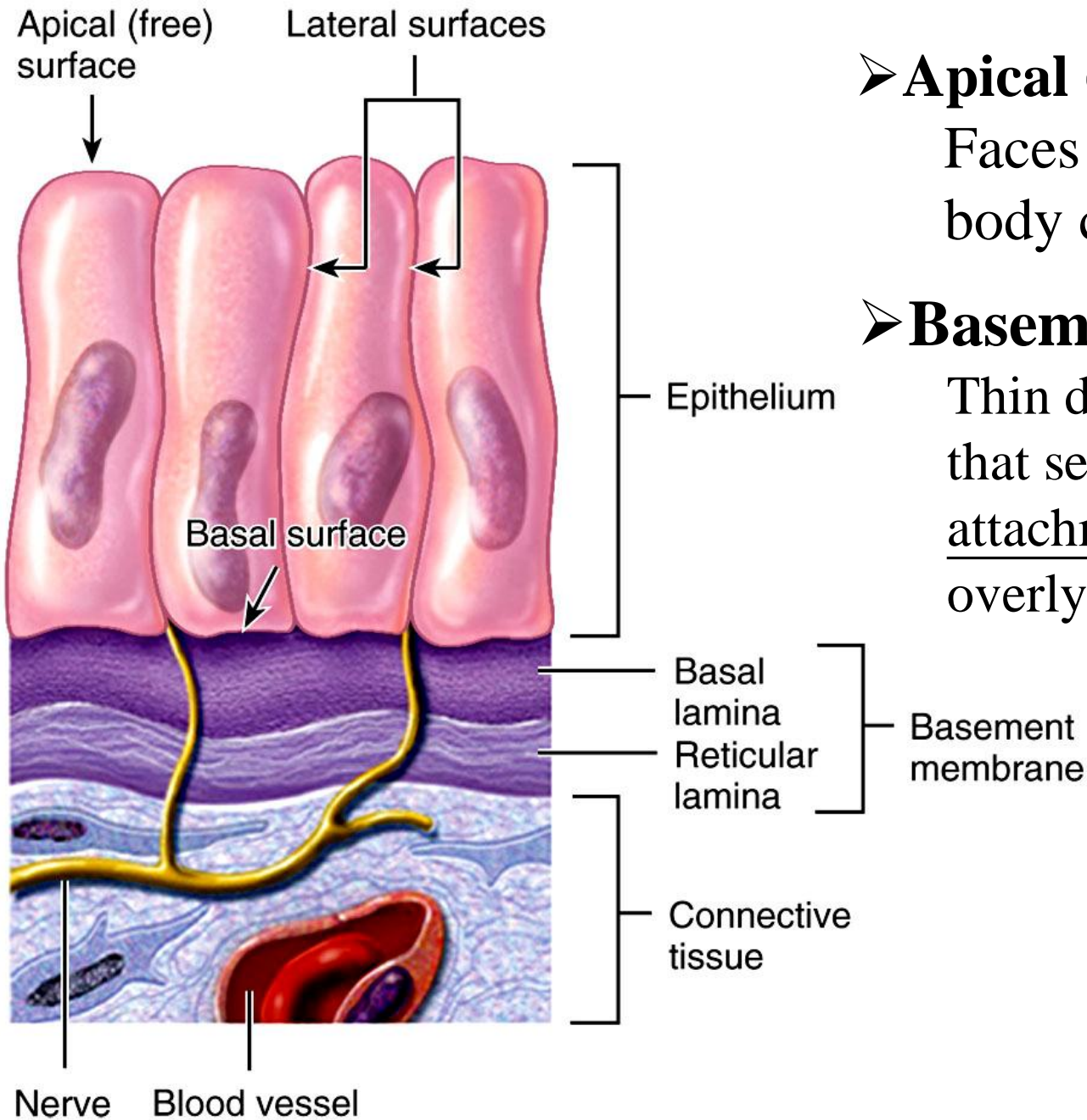
--All connective tissue and most muscle tissues derive from **mesoderm**

--Nervous tissue develops from **ectoderm**

Epithelial Tissues

- **Epithelial tissue** consists of cells arranged in continuous sheets, in either single or multiple layers
 - Closely packed and held tightly together
 - Covering and lining of the body
 - Free surface
- 3 major functions:
 - Selective barrier** that regulates the movement of materials in and out of the body
 - Secretory surfaces** that release products onto the free surface
 - Protective surfaces** against the environment

Epithelial Tissues



➤ Apical (free) surface

Faces the body surface, body cavity, lumen, or duct

➤ Basement membrane

Thin double extracellular layer that serves as the point of attachment and support for overlying epithelial tissue

Types of Epithelium

● Covering and lining epithelium

- epidermis of skin
- lining of blood vessels and ducts
- lining respiratory, reproductive, urinary & GI tract

● Glandular epithelium

- secreting portion of glands
- thyroid, adrenal, and sweat glands

Classification of Epithelium

- Classified by arrangement of cells into layers

- simple** = one cell layer thick

- stratified** = many cell layers thick

- pseudostratified** = single layer of cells where all cells don't reach apical surface

- nuclei are found at different levels so it looks multilayered

- Classified by shape of surface cells

- squamous** = flat

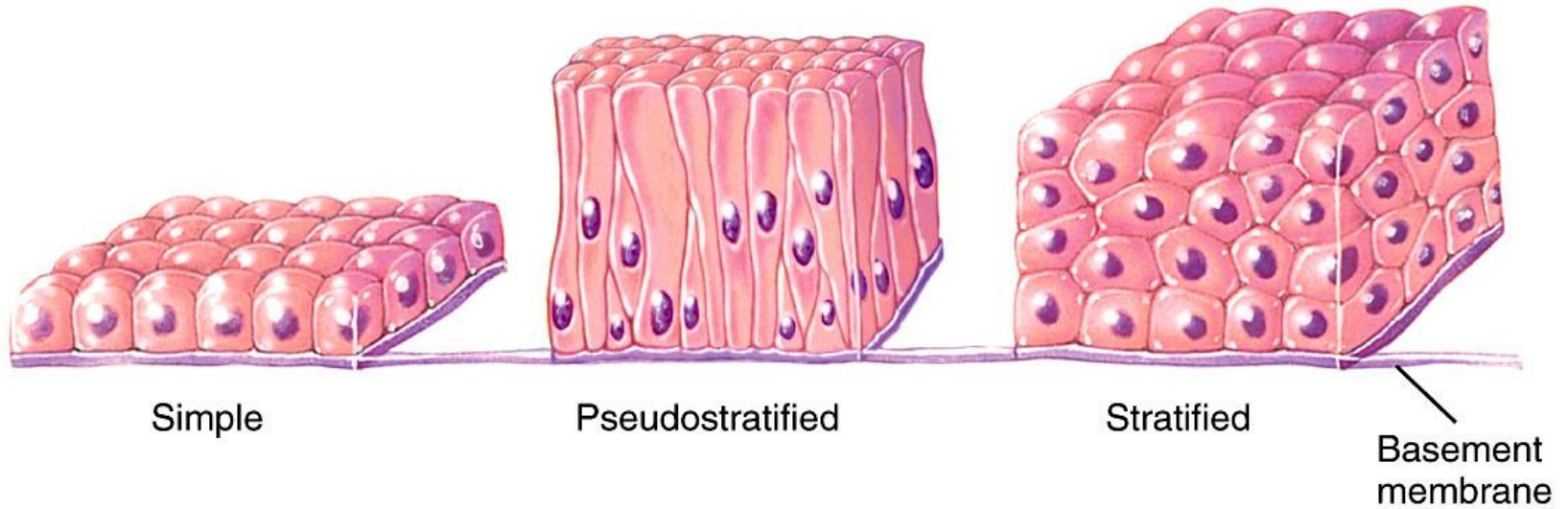
- cuboidal** = cube-shaped

- columnar** = tall column

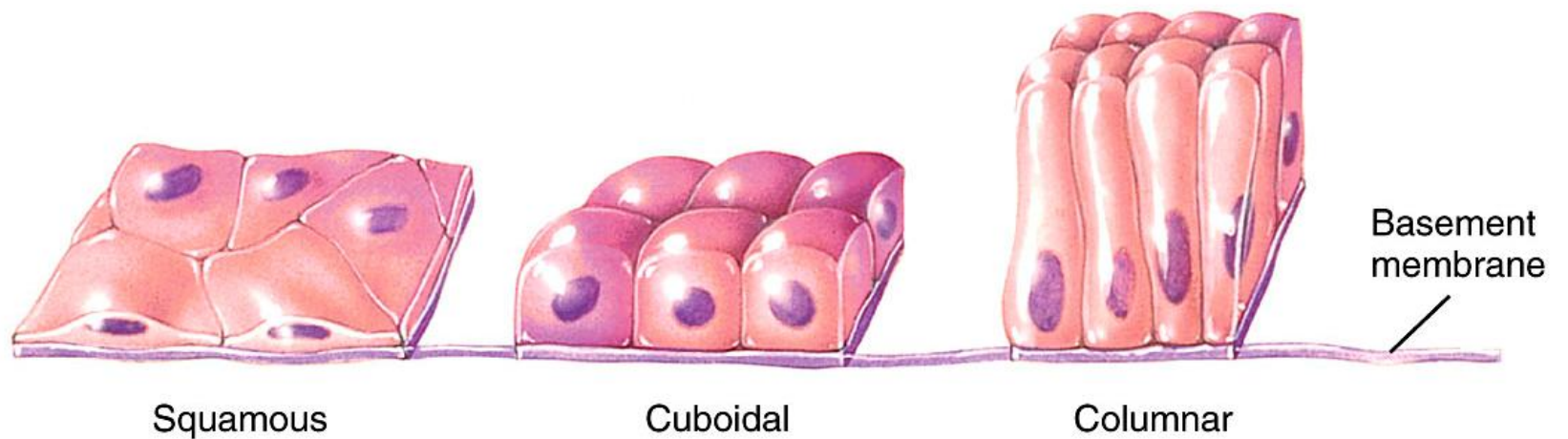
- transitional** = shape varies with tissue stretching

Classification of Epithelium

Arrangement
of layers



Cell shape



Epithelial Tissues: Covering and Lining Epithelia

SIMPLE EPITHELIUM

A. Simple squamous epithelium

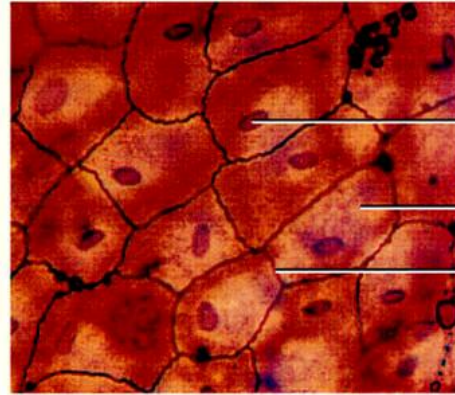
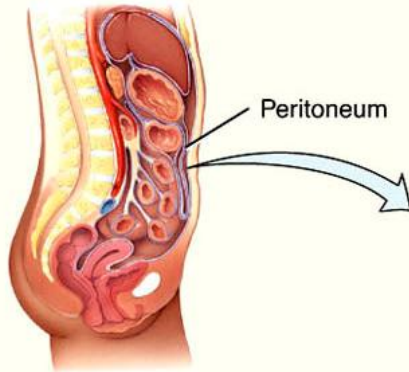
lines blood vessels (endothelium)

Description: Single layer of flat cells; centrally located nucleus.

Location: Lines heart, blood vessels, lymphatic vessels, air sacs of lungs, glomerular (Bowman's) capsule of kidneys, and inner surface of the tympanic membrane (eardrum); forms epithelial layer of serous membranes, such as the peritoneum, pericardium, and pleura.

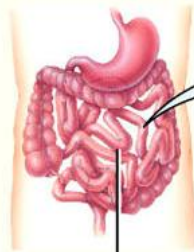
Function: Filtration, diffusion, osmosis, and secretion in serous membranes.

body cavities (mesothelium)

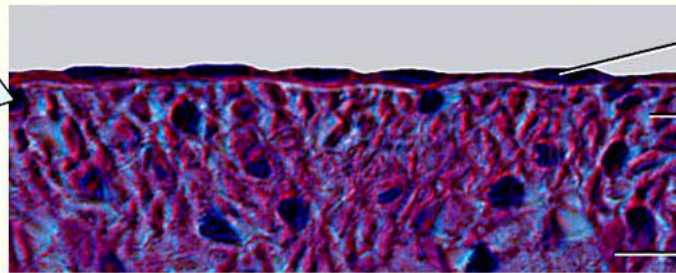


LM 243x

Surface view of simple squamous epithelium of mesothelial lining of peritoneum

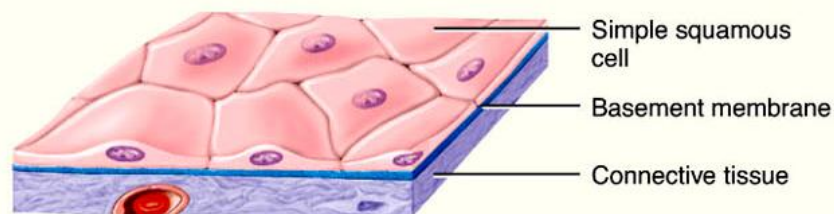


Small intestine



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Sectional view of simple squamous epithelium of small intestine



Simple squamous epithelium

Epithelial Tissues: Covering and Lining Epithelia

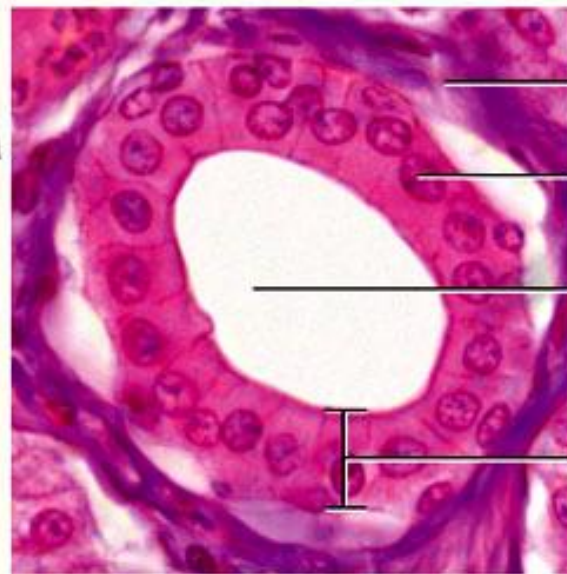
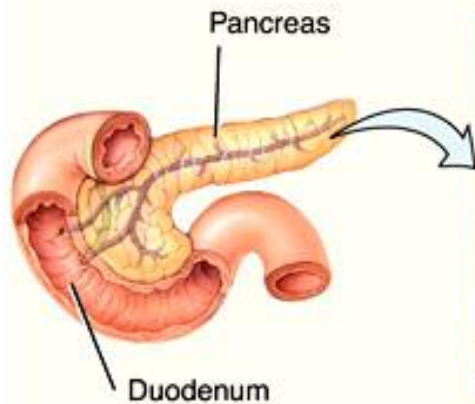
SIMPLE EPITHELIUM

B. Simple cuboidal epithelium

Description: Single layer of cube-shaped cells; centrally located nucleus.

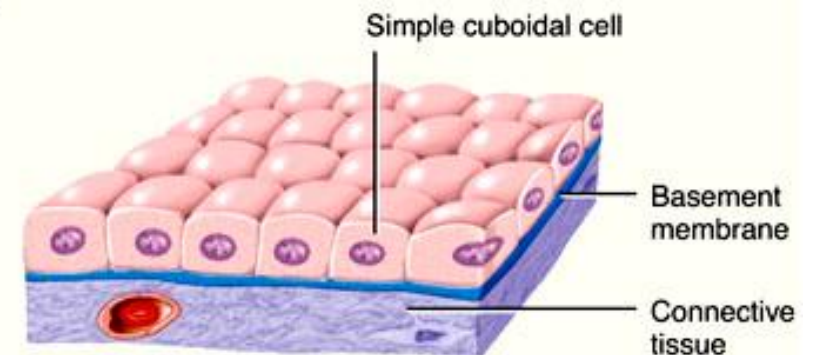
Location: Covers surface of ovary, lines anterior surface of capsule of the lens of the eye, forms the pigmented epithelium at the posterior surface of the eye, lines kidney tubules and smaller ducts of many glands, and makes up the secreting portion of some glands such as the thyroid gland and the ducts of some glands such as the pancreas.

Function: Secretion and absorption.



LM 400x

Sectional view of simple cuboidal epithelium of intralobular duct of pancreas



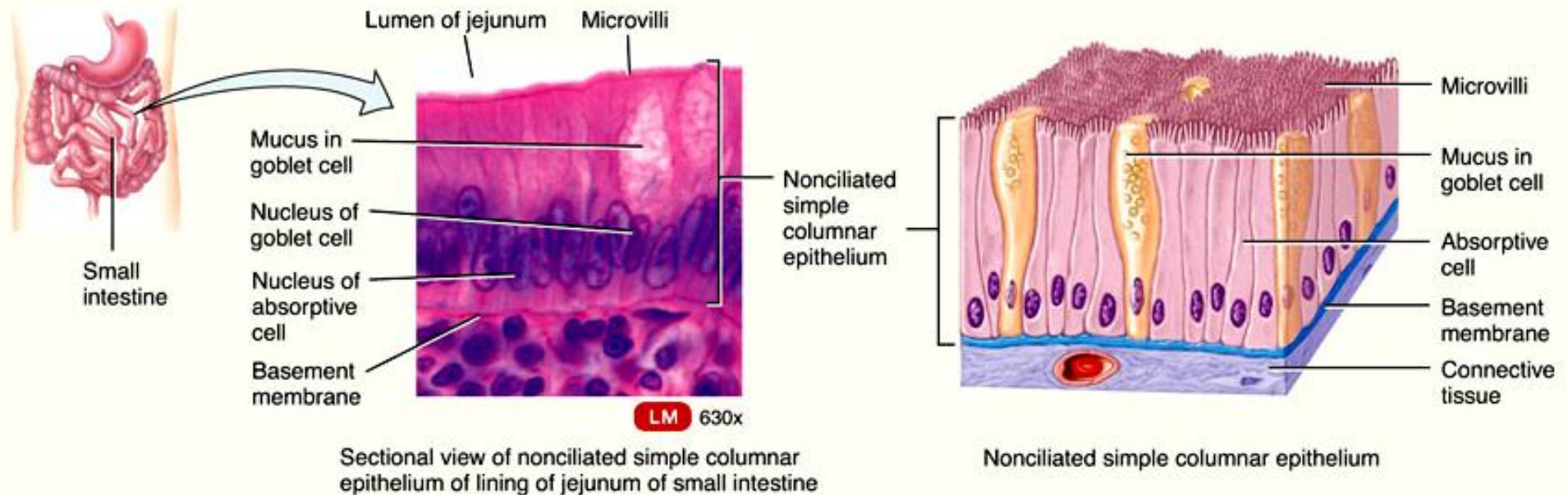
Simple cuboidal epithelium

C. Nonciliated simple columnar epithelium

Description: Single layer of nonciliated column-like cells with nuclei near base of cells; contains goblet cells and cells with microvilli in some locations.

Location: Lines the gastrointestinal tract (from the stomach to the anus), ducts of many glands, and gallbladder.

Function: Secretion and absorption.



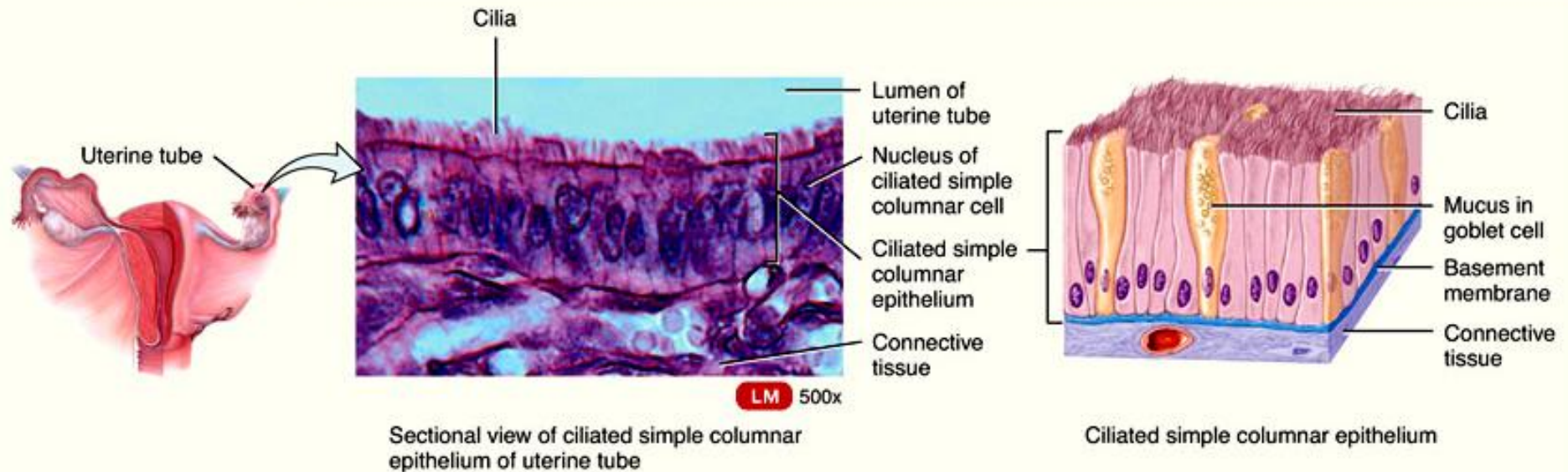
- Unicellular glands = **goblet cells** secrete mucus
 - lubricate GI, respiratory, reproductive and urinary systems
- Microvilli = fingerlike cytoplasmic projections
 - for absorption in **GI tract** (stomach to anus)

D. Ciliated simple columnar epithelium

Description: Single layer of ciliated column-like cells with nuclei near base; contains goblet cells in some locations.

Location: Lines some bronchioles (small tubes) of respiratory tract, uterine (fallopian) tubes, uterus, efferent ducts of the testes, some paranasal sinuses, central canal of spinal cord, and ventricles of the brain.

Function: Moves mucus and other substances by ciliary action.



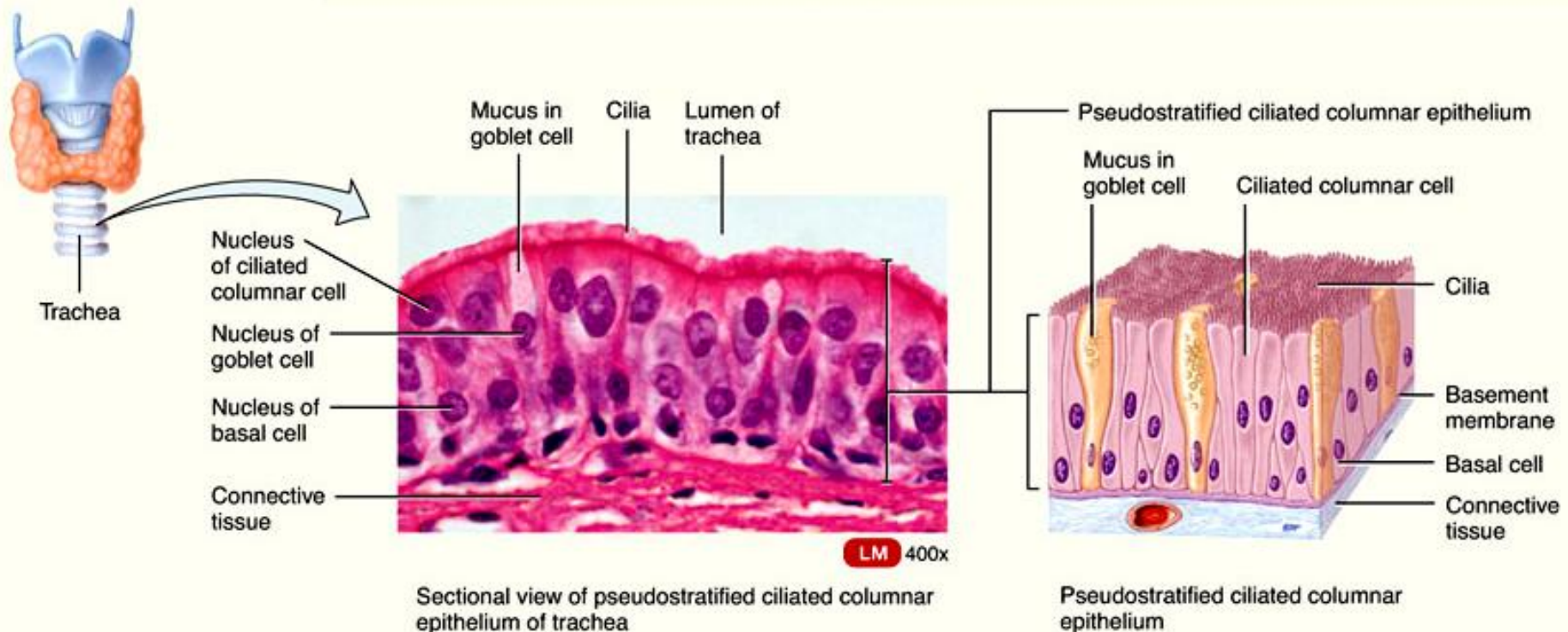
➤ Mucus from goblet cells moved along by cilia
--found in **respiratory system and uterine tubes**

E. Pseudostratified columnar epithelium

Description: Not a true stratified tissue; nuclei of cells are at different levels; all cells are attached to basement membrane, but not all reach the apical surface.

Location: Pseudostratified ciliated columnar epithelium lines the airways of most of upper respiratory tract; pseudostratified nonciliated columnar epithelium lines larger ducts of many glands, epididymis, and part of male urethra.

Function: Secretion and movement of mucus by ciliary action.



- Appears to have several layers due to **nuclei are various depths**
- All cells are attached to the basement membrane in a single layer but some **do not extend to the apical surface**
- Ciliated cells secrete mucus and bear cilia
- Nonciliated cells lack cilia and goblet cells

Epithelial Tissues: Covering and Lining Epithelia

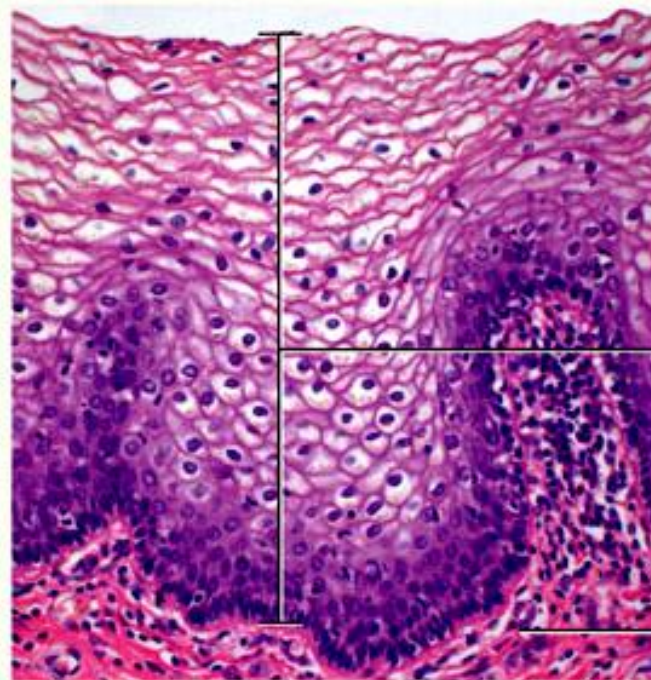
STRATIFIED EPITHELIUM

F. Stratified squamous epithelium

Description: Several layers of cells; cuboidal to columnar shape in deep layers; squamous cells form the apical layer and several layers deep to it; cells from the basal layer replace surface cells as they are lost.

Location: Keratinized variety forms superficial layer of skin; nonkeratinized variety lines wet surfaces, such as lining of the mouth, esophagus, part of larynx, part of pharynx, and vagina, and covers the tongue.

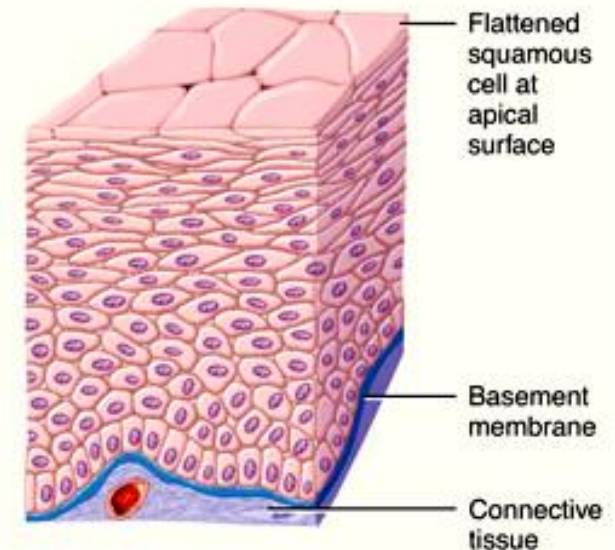
Function: Protection.



Sectional view of stratified squamous epithelium of vagina

Stratified squamous epithelium

Connective tissue



Stratified squamous epithelium

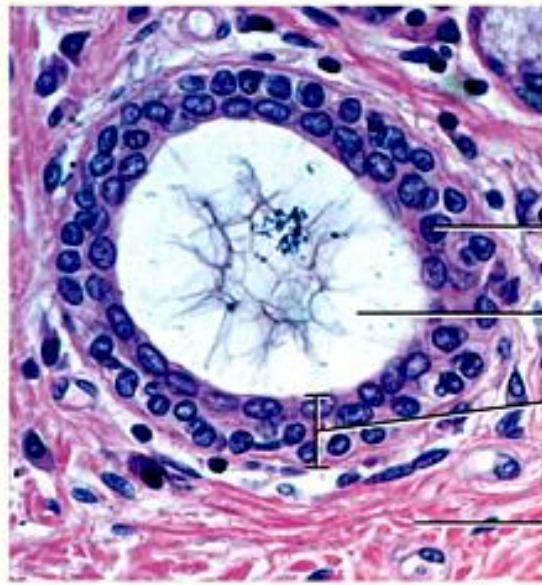
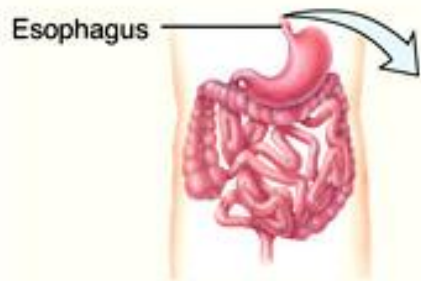
- Keratinized = surface cells dead and filled with keratin
 - skin (epidermis)**
- Nonkeratinized = no keratin in moist living cells at surface
 - mouth, vagina, esophagus, covers the tongue**

G. Stratified cuboidal epithelium

Description: Two or more layers of cells in which the cells in the apical layer are cube-shaped.

Location: Ducts of adult sweat glands and esophageal glands and part of male urethra.

Function: Protection and limited secretion and absorption.



LM 380x

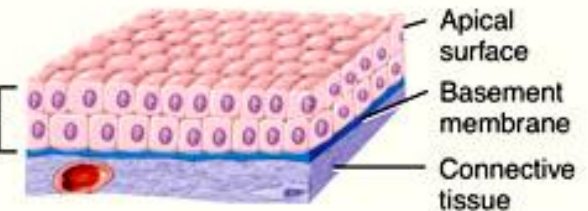
Sectional view of stratified cuboidal epithelium of the duct of an esophageal gland

Nucleus of stratified cuboidal cell

Lumen of duct

Stratified cuboidal epithelium

Connective tissue



Stratified cuboidal epithelium

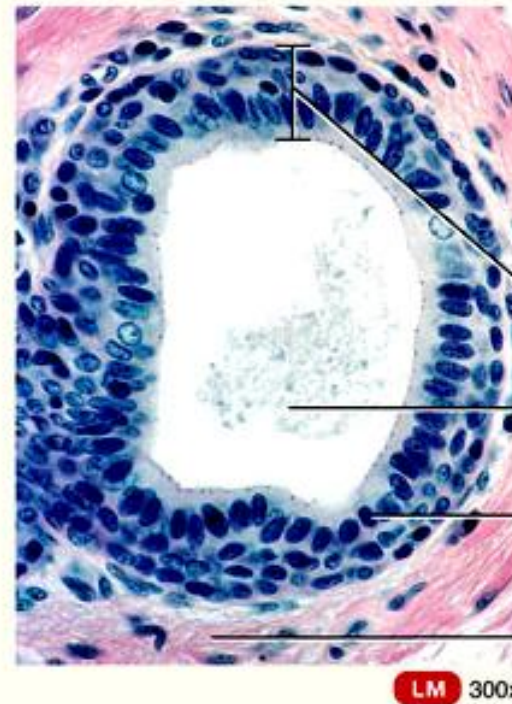
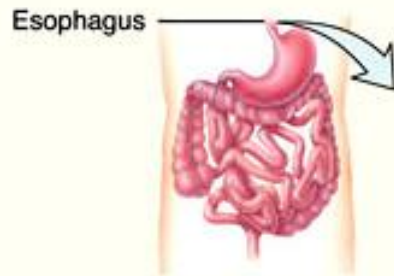
- Multilayered
- Surface cells cuboidal
- rare (only found in **sweat gland ducts & male urethra**)

H. Stratified columnar epithelium

Description: Several layers of irregularly shaped cells; only the apical layer has columnar cells.

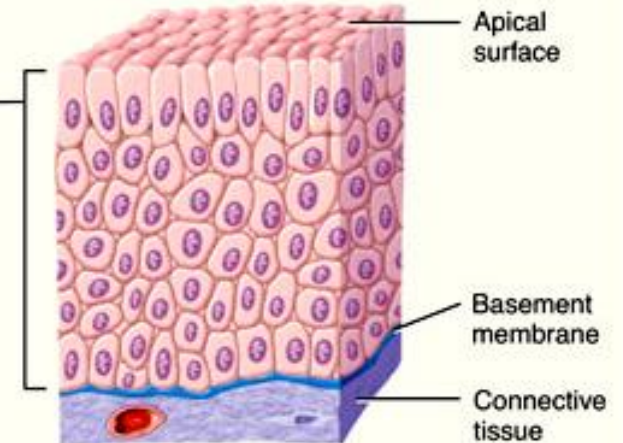
Location: Lines part of urethra, large excretory ducts of some glands, such as esophageal glands, small areas in anal mucous membrane, and part of the conjunctiva of the eye.

Function: Protection and secretion.



Sectional view of stratified columnar epithelium of the duct of an esophageal gland

Stratified columnar epithelium
Lumen of duct
Nucleus of stratified columnar cell
Connective tissue



Stratified columnar epithelium

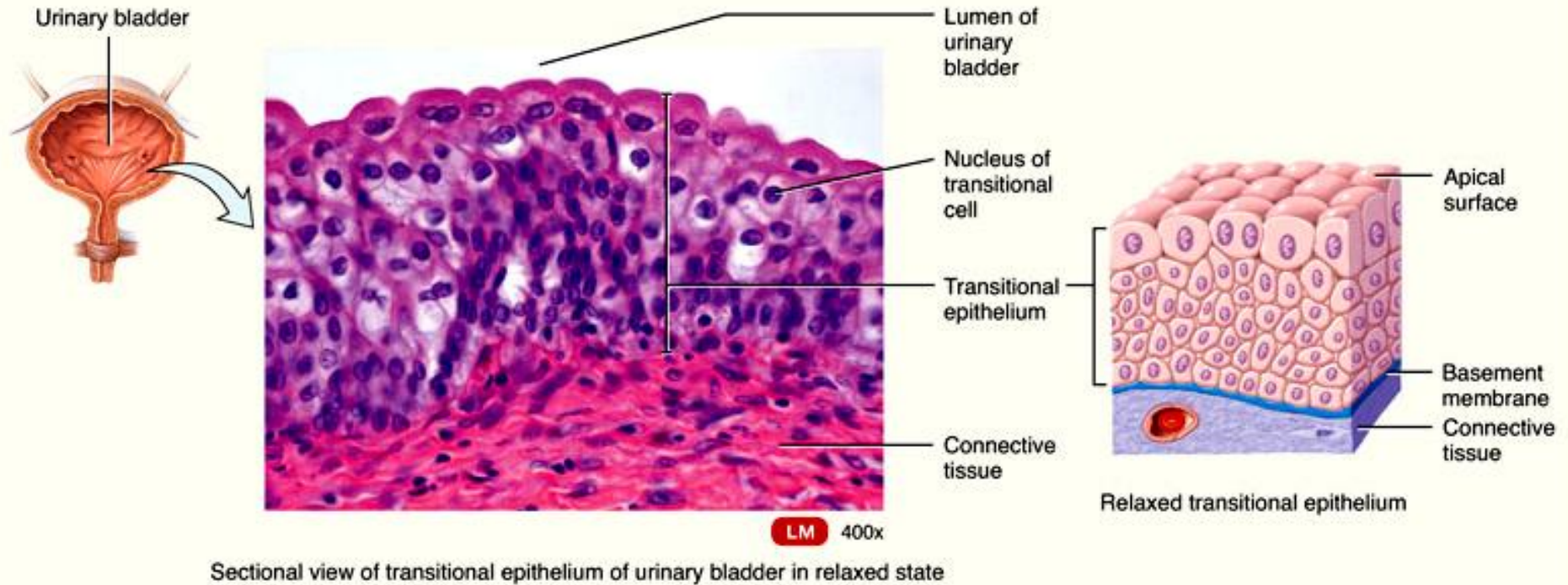
- Also very uncommon
- Columnar cells in apical layer only
- Basal layers has shorten, irregular shaped cells
 - rare (**very large ducts & part of male urethra**)

I. Transitional epithelium

Description: Appearance is variable (transitional); shape of cells in apical layer ranges from squamous (when stretched) to cuboidal (when relaxed).

Location: Lines urinary bladder and portions of ureters and urethra.

Function: Permits distension.



- Found only in the urinary system (**urinary bladder**)
- In relaxed state, cells appear cuboidal
- Upon stretching, cells become flattened and appear squamous
- Ideal for hollow structure subjected to expansion

Glandular Epithelium

- Derived from epithelial cells that sank below the surface during development
- **Exocrine glands**
 - cells that secrete---sweat, ear wax, saliva, digestive enzymes onto free surface of epithelial layer
 - connected to the surface by tubes (ducts)
 - unicellular glands or multicellular glands
- **Endocrine glands**
 - secrete hormones into the bloodstream
 - hormones help maintain homeostasis

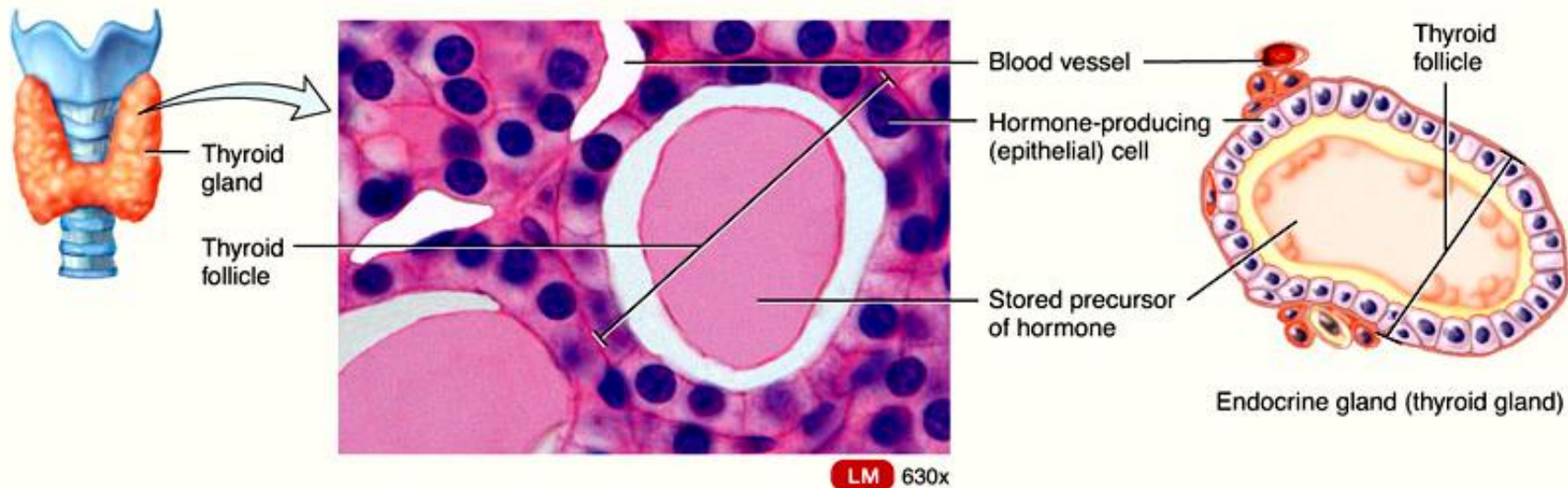
Epithelial Tissue: Glandular Epithelium

A. Endocrine glands

Description: Secretory products (hormones) diffuse into blood after passing through interstitial fluid.

Location: Examples include pituitary gland at base of brain, pineal gland in brain, thyroid and parathyroid glands near larynx (voice box), adrenal glands superior to kidneys, pancreas near stomach, ovaries in pelvic cavity, testes in scrotum, and thymus in thoracic cavity.

Function: Produce hormones that regulate various body activities.



Sectional view of endocrine gland (thyroid gland)

➤ Endocrine glands

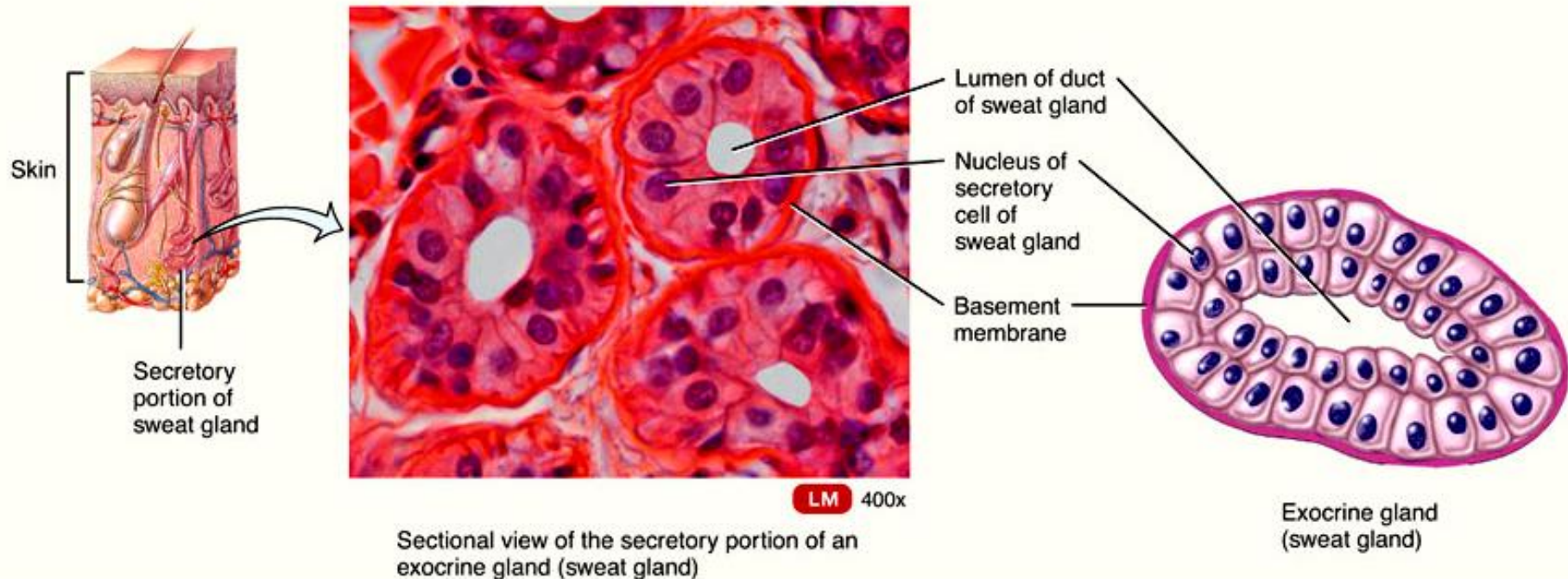
- secrete hormones into the bloodstream
- hormones help maintain homeostasis

B. Exocrine glands

Description: Secretory products released into ducts.

Location: Sweat, oil, and earwax glands of the skin; digestive glands such as salivary glands, which secrete into mouth cavity, and pancreas, which secretes into the small intestine.

Function: Produce substances such as sweat, oil, earwax, saliva, or digestive enzymes.

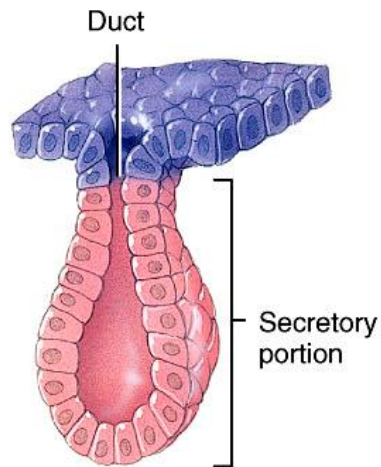


➤ Exocrine glands

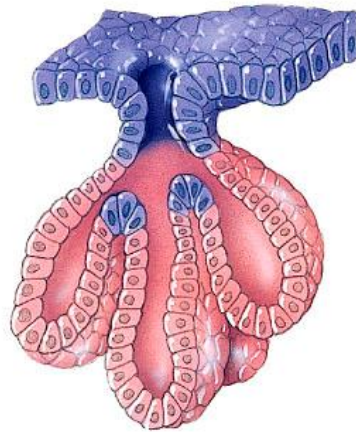
- cells that secrete---sweat, ear wax, saliva, digestive enzymes onto free surface of epithelial layer
- connected to the surface by tubes (**ducts**)
- unicellular glands (**goblet cells**) or multicellular glands

Structural Classification of Exocrine Glands

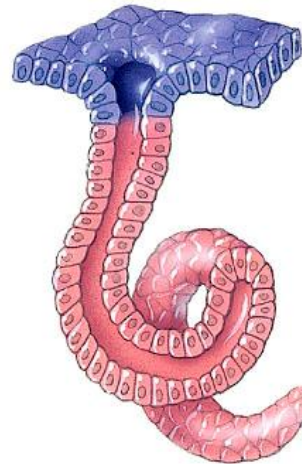
Multicellular Glands



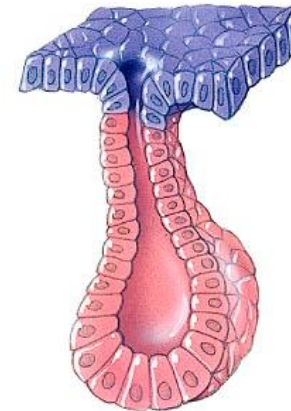
Simple tubular



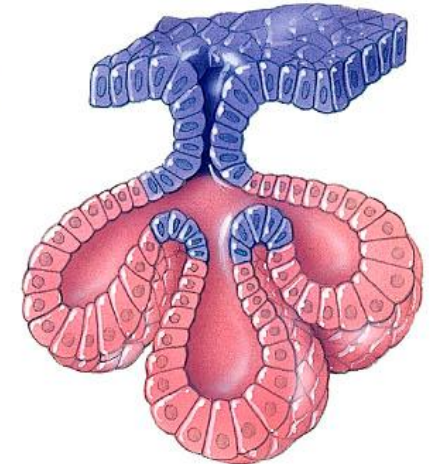
Simple branched tubular



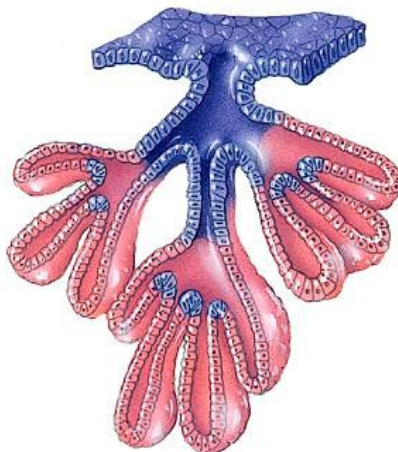
Simple coiled tubular



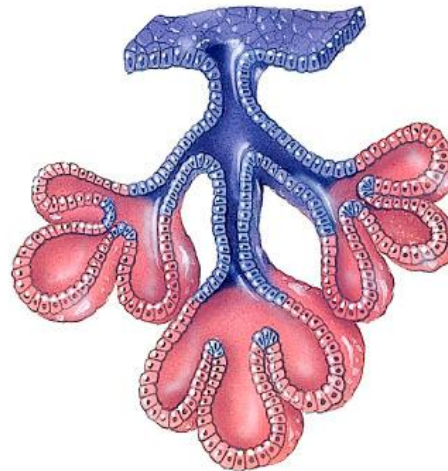
Simple acinar



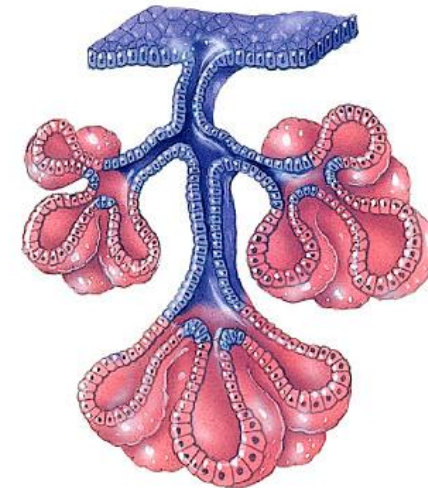
Simple branched acinar



Compound tubular



Compound acinar



Compound tubuloacinar

Functional Classification of Exocrine Glands

● **Merocrine** -- most glands

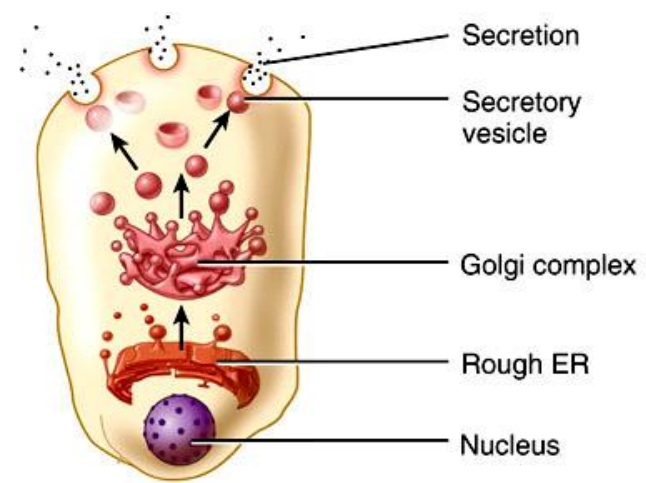
- cells release their products by exocytosis---saliva, digestive enzymes & sweat

● **Apocrine**

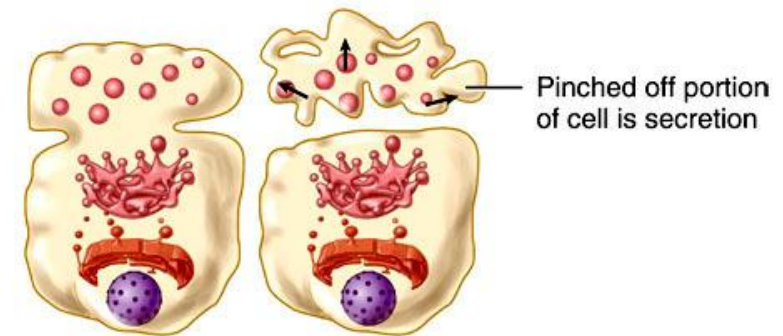
- smelly sweat & milk
- upper part of cell possibly pinches off & dies

● **Holocrine** -- oil gland

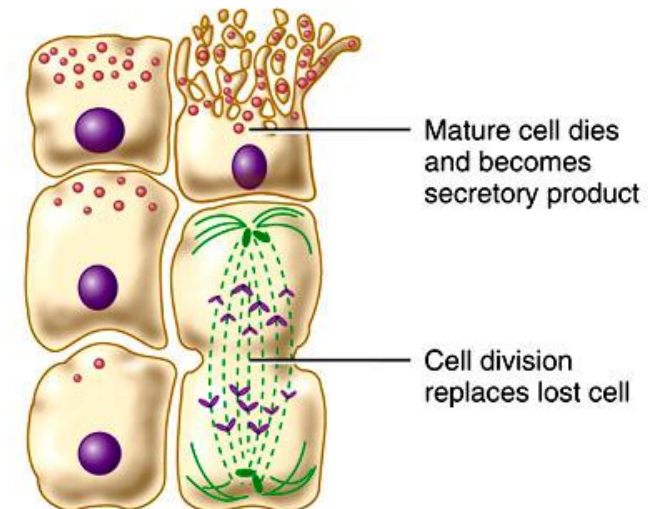
- whole cells die & rupture to release their products



(a) Merocrine secretion



(b) Apocrine secretion

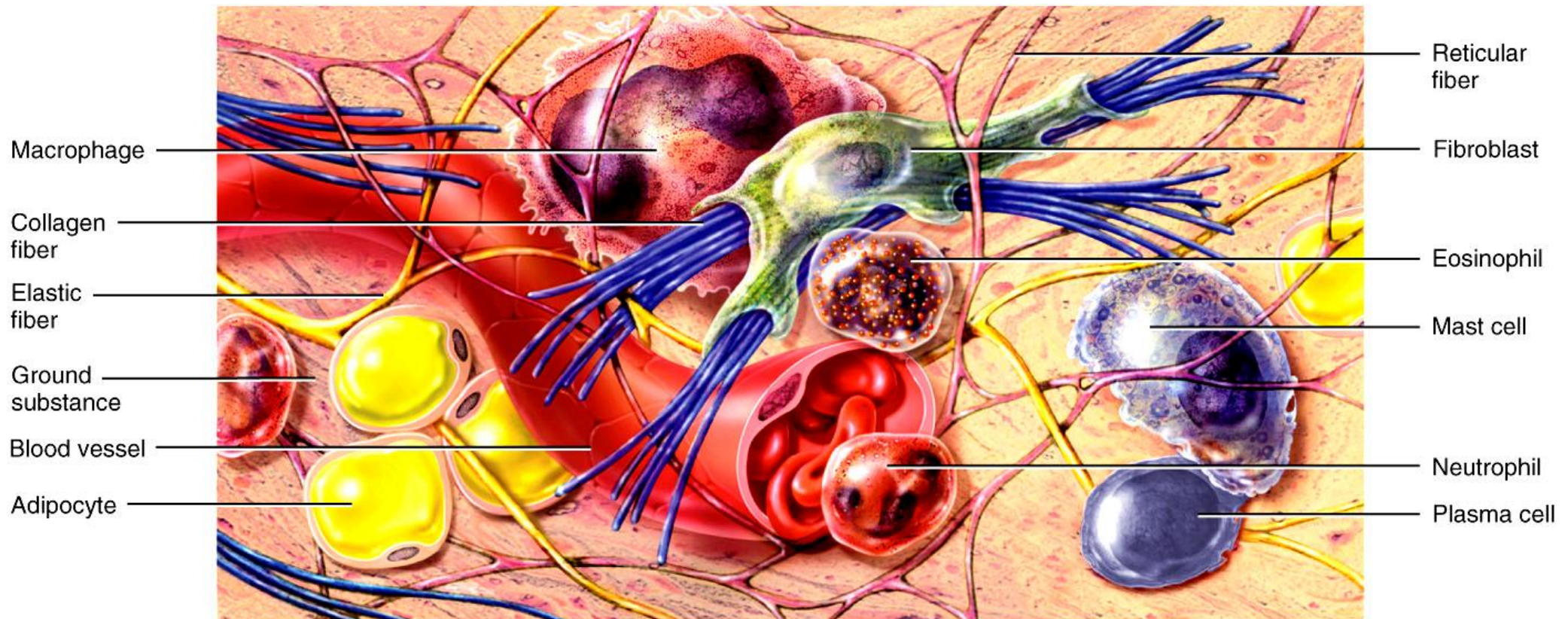


(c) Holocrine secretion

Connective Tissues

- Most abundant and widely distributed tissues in the body
- Numerous functions
 - Binds tissues together
 - Supports and strengthen tissue
 - Protects and insulates internal organs
 - Compartmentalize and transport
 - Energy reserves and immune responses

- Connective tissue is highly vascular
- Supplied with nerves
 - Exception is **cartilage** and **tendon**. Both have little or no blood supply and no nerves



*Cells + Extracellular matrix
(fibers + ground substance)*

Classification of Connective Tissues

- **Embryonic connective tissue**
 - Mesenchyme and mucous connective tissue
- **Mature connective tissue**
 - Loose** connective tissue
 - Areolar, adipose, and reticular
 - Dense** connective tissue
 - Dense regular, dense irregular, and elastic
 - Cartilage**
 - Hyaline, fibrocartilage, and elastic cartilage
 - Bone tissue**
 - Liquid** connective tissue
 - Blood and lymph

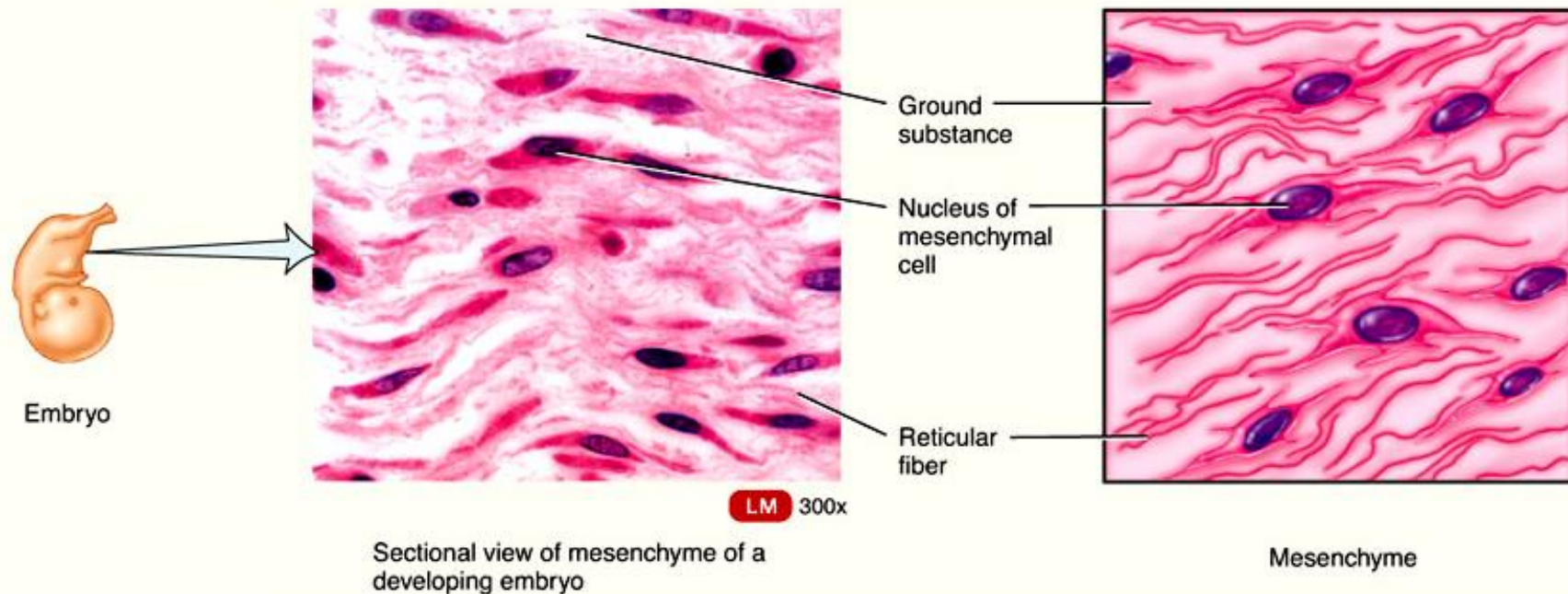
Embryonic Connective Tissues

A. Mesenchyme

Description: Consists of irregularly shaped mesenchymal cells embedded in a semifluid ground substance that contains reticular fibers.

Location: Under skin and along developing bones of embryo; some mesenchymal cells are found in adult connective tissue, especially along blood vessels.

Function: Forms all other types of connective tissue.



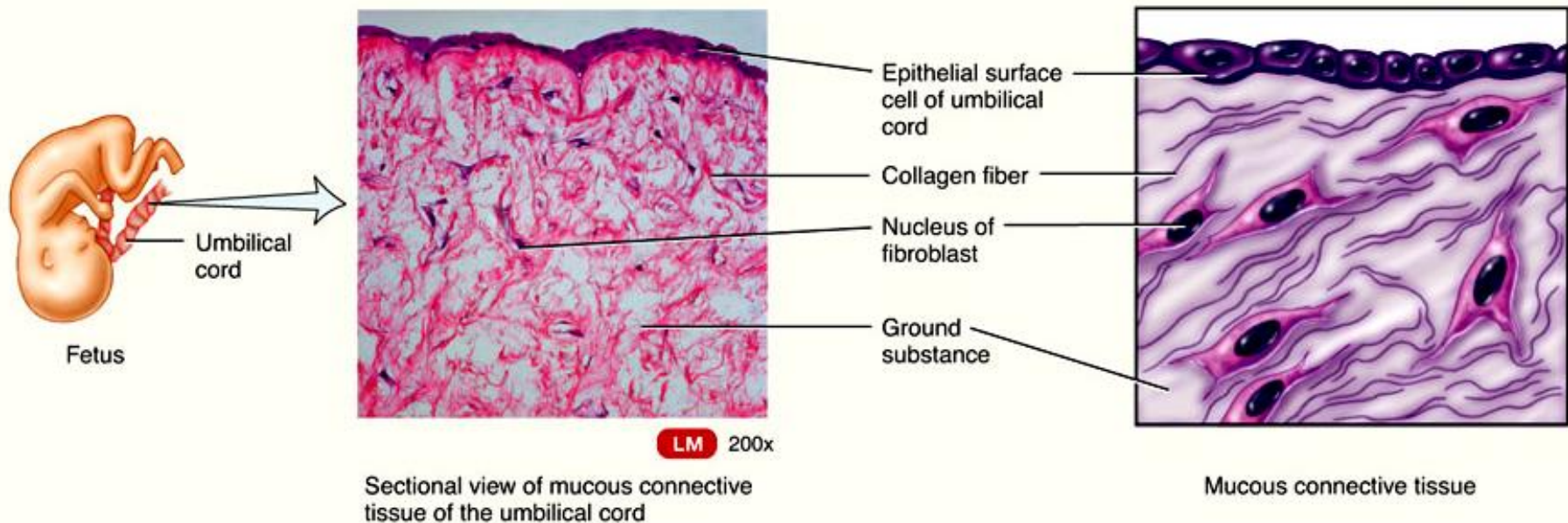
- Irregularly shaped cells
- In semifluid ground substance with reticular fibers
- Gives rise to **all other types of connective tissue**

B. Mucous connective tissue

Description: Consists of widely scattered fibroblasts embedded in a viscous, jellylike ground substance that contains fine collagen fibers.

Location: Umbilical cord of fetus.

Function: Support.



- Star-shaped cells in jelly-like ground substance
- Found only in **umbilical cord**

Mature Connective Tissues

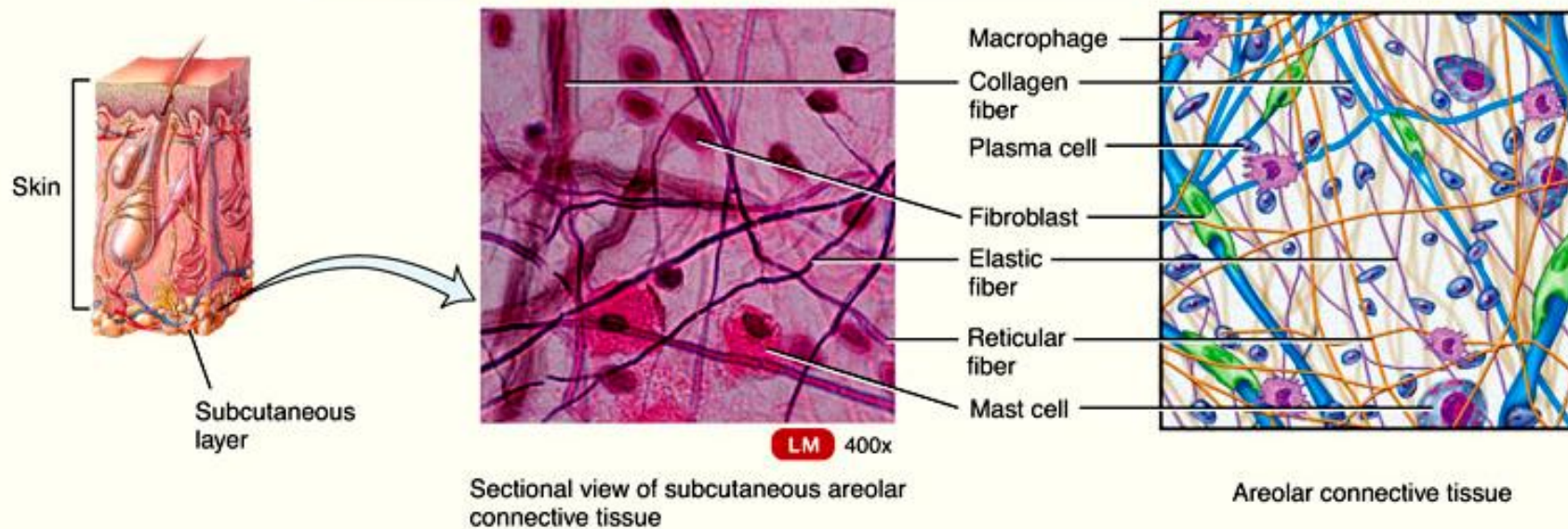
LOOSE CONNECTIVE TISSUE

A. Areolar connective tissue

Description: Consists of fibers (collagen, elastic, and reticular) and several kinds of cells (fibroblasts, macrophages, plasma cells, adipocytes, and mast cells) embedded in a semifluid ground substance.

Location: Subcutaneous layer deep to skin; papillary (superficial) region of dermis of skin; lamina propria of mucous membranes; and around blood vessels, nerves, and body organs.

Function: Strength, elasticity, and support.



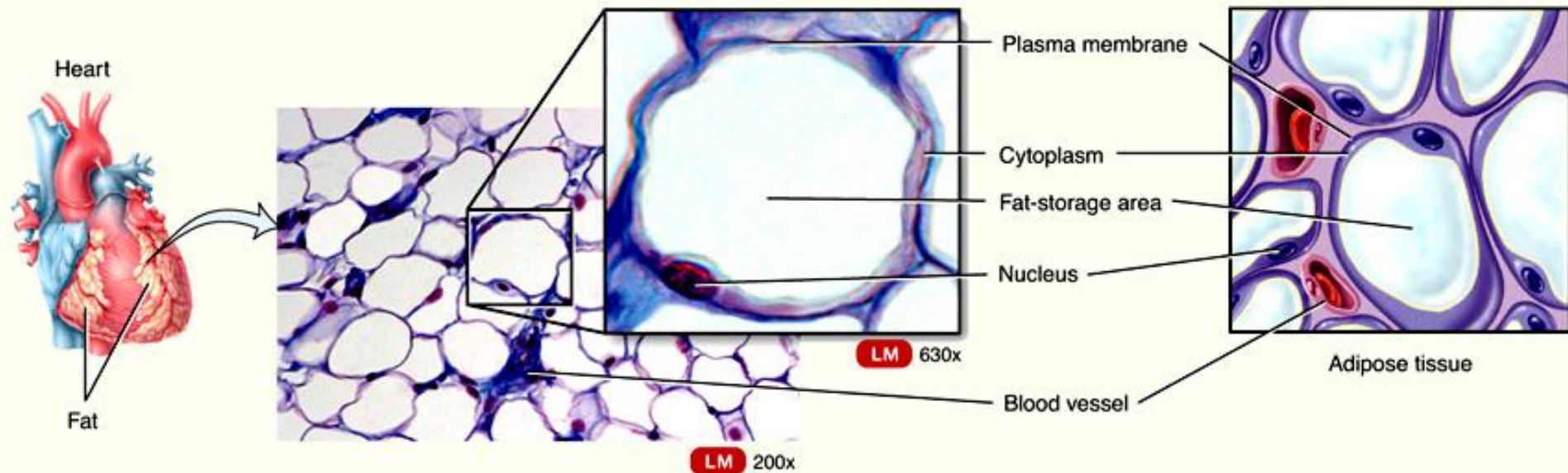
- **Most widely** distributed in the body
- Contains several types of cells and all three fibers

B. Adipose tissue

Description: Consists of adipocytes, cells specialized to store triglycerides (fats) as a large centrally located droplet; nucleus and cytoplasm are peripherally located.

Location: Subcutaneous layer deep to skin, around heart and kidneys, yellow bone marrow, and padding around joints and behind eyeball in eye socket.

Function: Reduces heat loss through skin, serves as an energy reserve, supports, and protects. In newborns, brown adipose tissue generates considerable heat that helps maintain proper body temperature.



- Peripheral nuclei due to large fat storage droplet
- Deeper layer of skin, organ padding, yellow marrow
- Reduces heat loss, energy storage, protection
- Brown fat found in infants has more blood vessels and mitochondria and responsible for heat generation

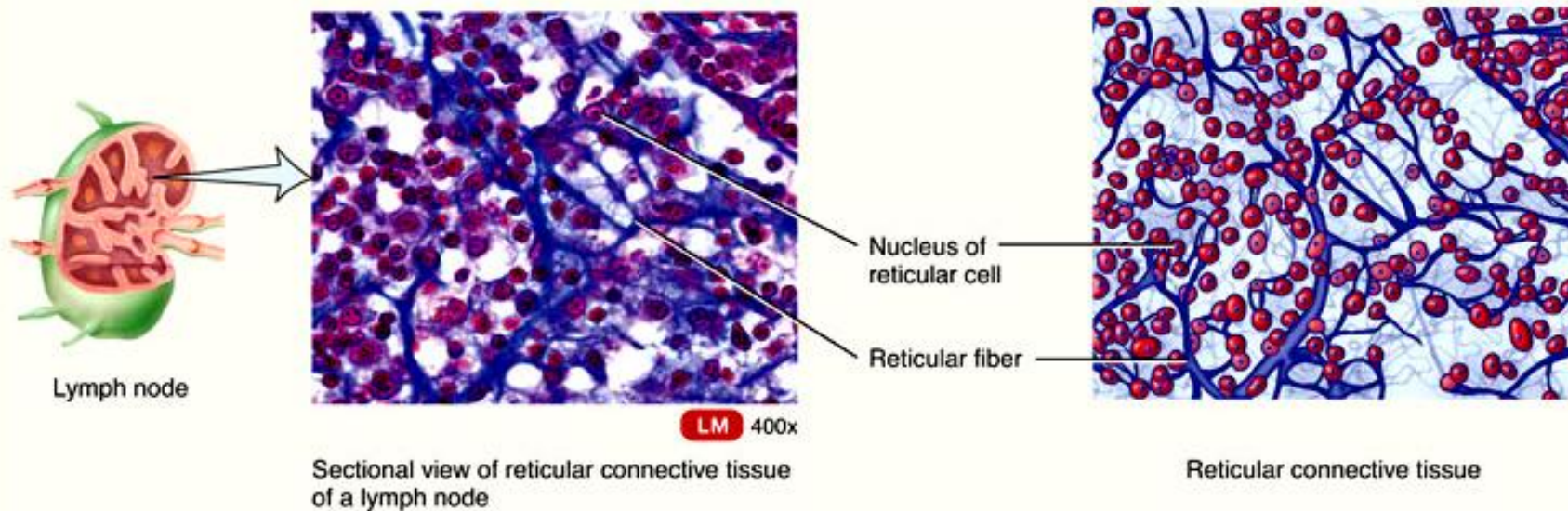
LOOSE CONNECTIVE TISSUE

C. Reticular connective tissue

Description: A network of interlacing reticular fibers and reticular cells.

Location: Stroma (supporting framework) of liver, spleen, lymph nodes; red bone marrow, which gives rise to blood cells; reticular lamina of the basement membrane; and around blood vessels and muscles.

Function: Forms stroma of organs; binds together smooth muscle tissue cells; filters and removes worn-out blood cells in the spleen and microbes in lymph nodes.



- Network of fibers & cells that produce framework of organ
- Holds organ together (**liver, spleen, lymph nodes, bone marrow**)

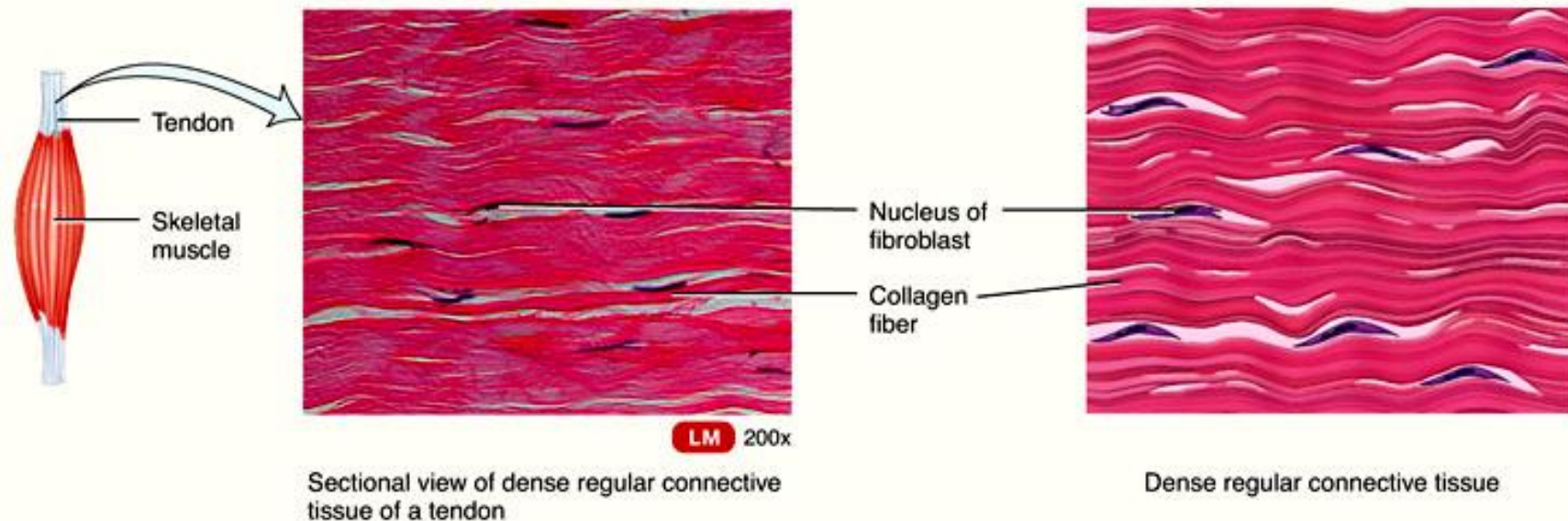
DENSE CONNECTIVE TISSUE

D. Dense regular connective tissue

Description: Extracellular matrix looks shiny white; consists mainly of collagen fibers regularly arranged in bundles; fibroblasts present in rows between bundles.

Location: Forms tendons (attach muscle to bone), most ligaments (attach bone to bone), and aponeuroses (sheetlike tendons that attach muscle to muscle or muscle to bone).

Function: Provides strong attachment between various structures.



- **Collagen fibers** in parallel bundles with fibroblasts between bundles of collagen fibers
- White, tough and pliable when unstained (forms tendons)
- Also known as **white fibrous** connective tissue

Mature Connective Tissues

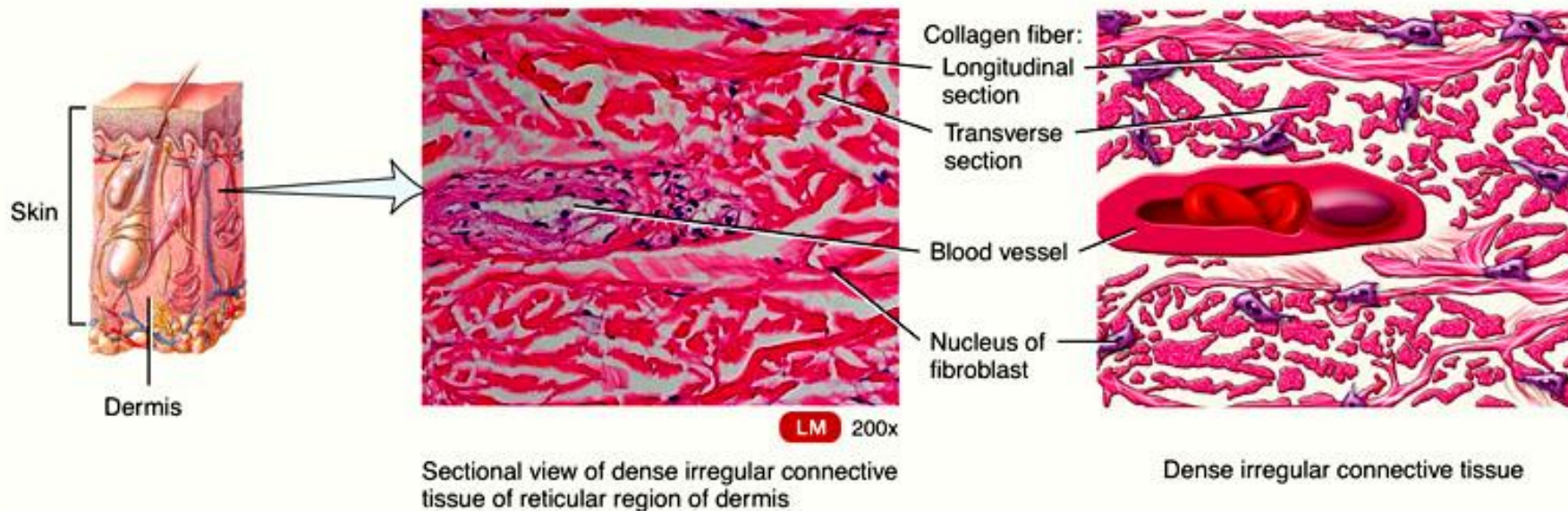
DENSE CONNECTIVE TISSUE

E. Dense irregular connective tissue

Description: Consists predominantly of collagen fibers randomly arranged and a few fibroblasts.

Location: Fasciae (tissue beneath skin and around muscles and other organs), reticular (deeper) region of dermis of skin, periosteum of bone, perichondrium of cartilage, joint capsules, membrane capsules around various organs (kidneys, liver, testes, lymph nodes), pericardium of the heart, and heart valves.

Function: Provides strength.



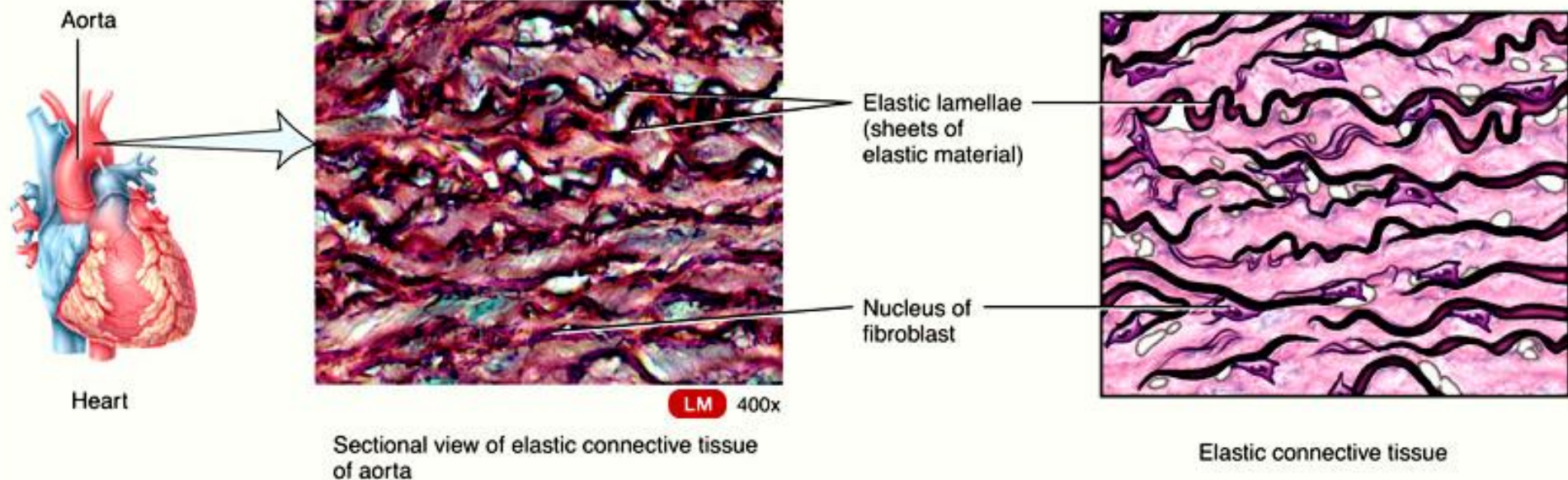
- Collagen fibers are irregularly arranged (interwoven)
- Tissue can resist tension from any direction
- Very tough tissue -- white of eyeball, dermis of skin, heart valves

F. Elastic connective tissue

Description: Consists predominantly of freely branching elastic fibers; fibroblasts are present in spaces between fibers.

Location: Lung tissue, walls of elastic arteries, trachea, bronchial tubes, true vocal cords, suspensory ligament of penis, and some ligaments between vertebrae.

Function: Allows stretching of various organs.



- Branching elastic fibers and fibroblasts
- Can stretch & still return to original shape
- Lung tissue, aorta, ligament between vertebrae

Types of Mature Connective Tissue:

Cartilage

- **Cartilage** is a dense network of collagen fibers and elastic fibers firmly embedded in **chondroitin sulfate**

--Chondrocytes

- Cartilage cells found in the spaces called lacunae

--Perichondrium

- Covering of dense irregular connective tissue that surrounds the cartilage
- Two layers: outer fibrous layer and inner cellular layer

--No blood vessels or nerves, except perichondrium

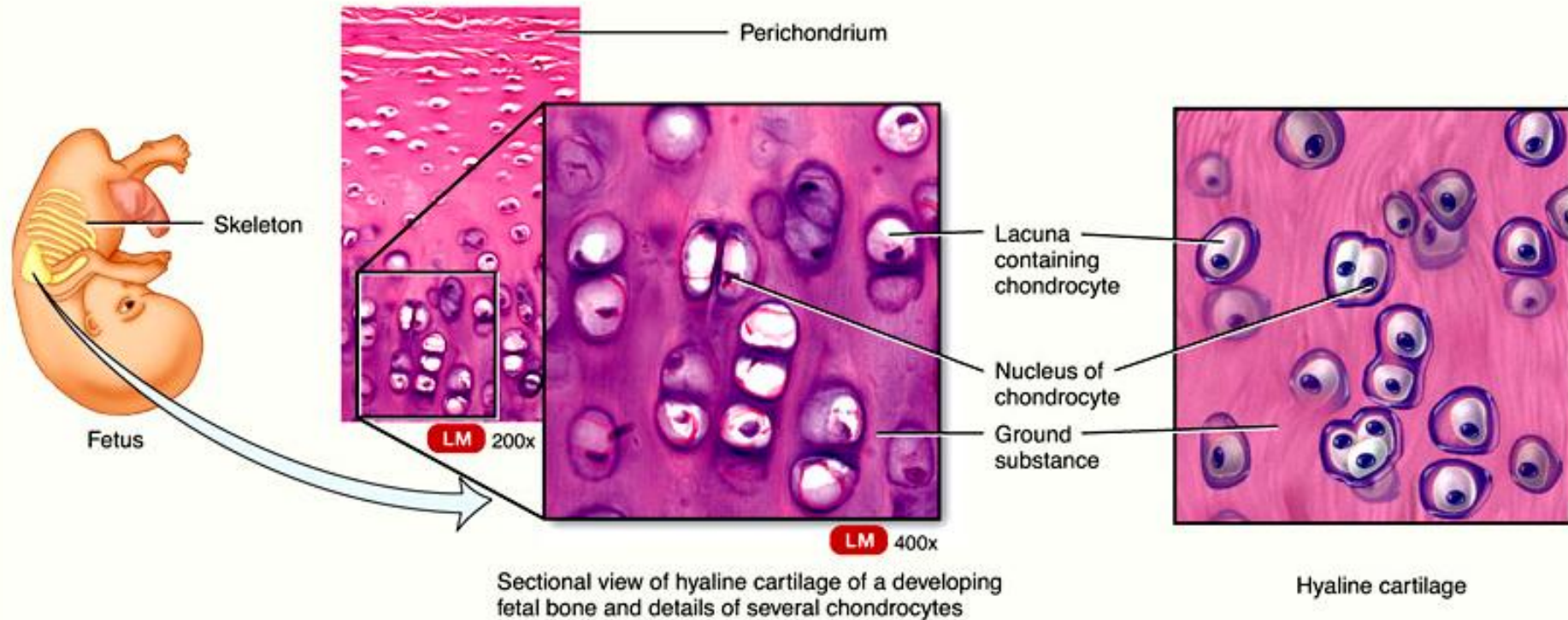
CARTILAGE

G. Hyaline cartilage

Description: Consists of a bluish-white, shiny ground substance with thin, fine collagen fibers and many chondrocytes; most abundant type of cartilage.

Location: Ends of long bones, anterior ends of ribs, nose, parts of larynx, trachea, bronchi, bronchial tubes, and embryonic and fetal skeleton.

Function: Provides smooth surfaces for movement at joints, as well as flexibility and support.



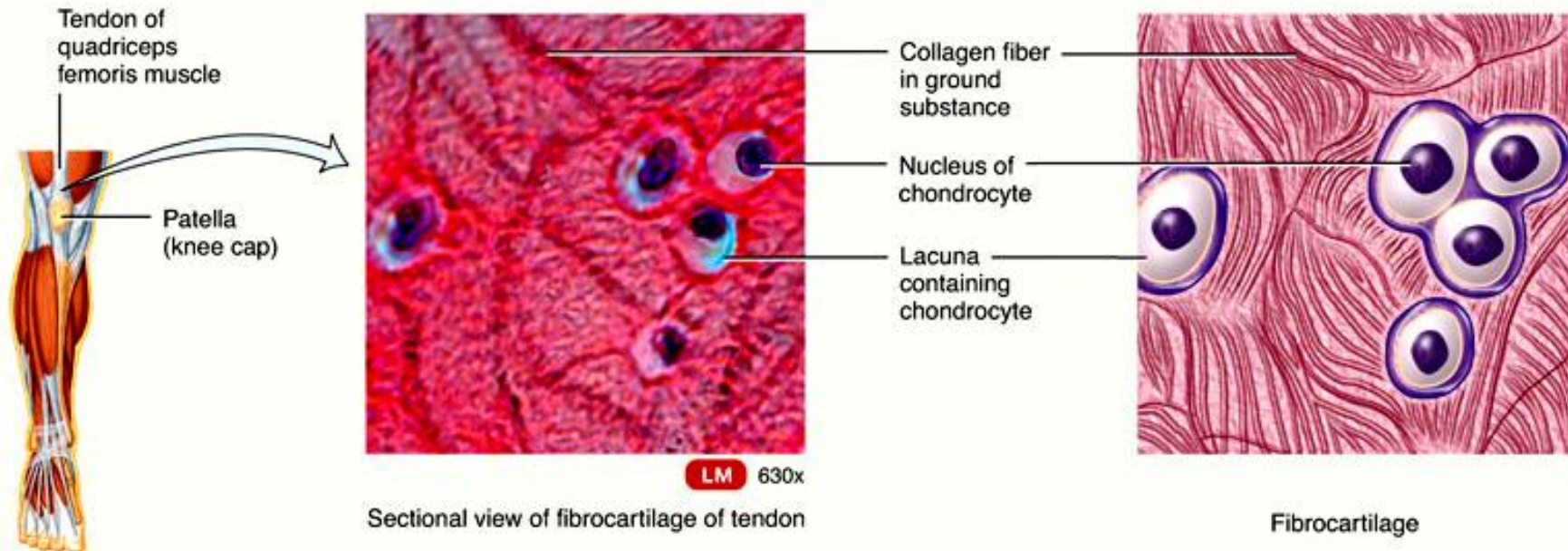
- **Most abundant** cartilage in the body
- Bluish-shiny white rubbery substance
- Chondrocytes sit in spaces called lacunae
- No blood vessels or nerves so repair is very slow
- Reduces friction at joints as **articular cartilage**

H. Fibrocartilage

Description: Consists of chondrocytes scattered among thick bundles of collagen fibers within the extracellular matrix.

Location: Pubic symphysis (point where hip bones join anteriorly), intervertebral discs (discs between vertebrae), menisci (cartilage pads) of knee, and portions of tendons that insert into cartilage.

Function: Support and fusion.



- Chondrocytes are scattered among bundles of collagen fibers within the extracellular matrix
- Lack a perichondrium
- **Strongest type** of cartilage
- Found in **intervertebral disc** (between vertebrae)

Mature Connective Tissues

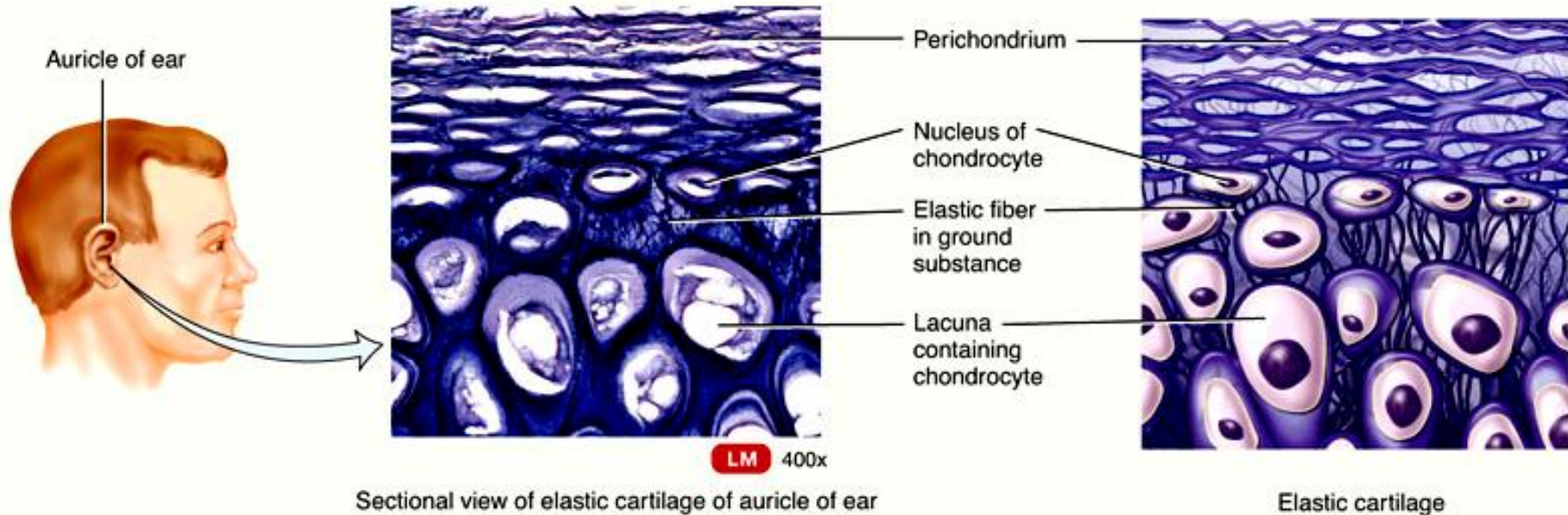
CARTILAGE

I. Elastic cartilage

Description: Consists of chondrocytes located in a threadlike network of elastic fibers within the extracellular matrix.

Location: Lid on top of larynx (epiglottis), part of external ear (auricle), and auditory (eustachian) tubes.

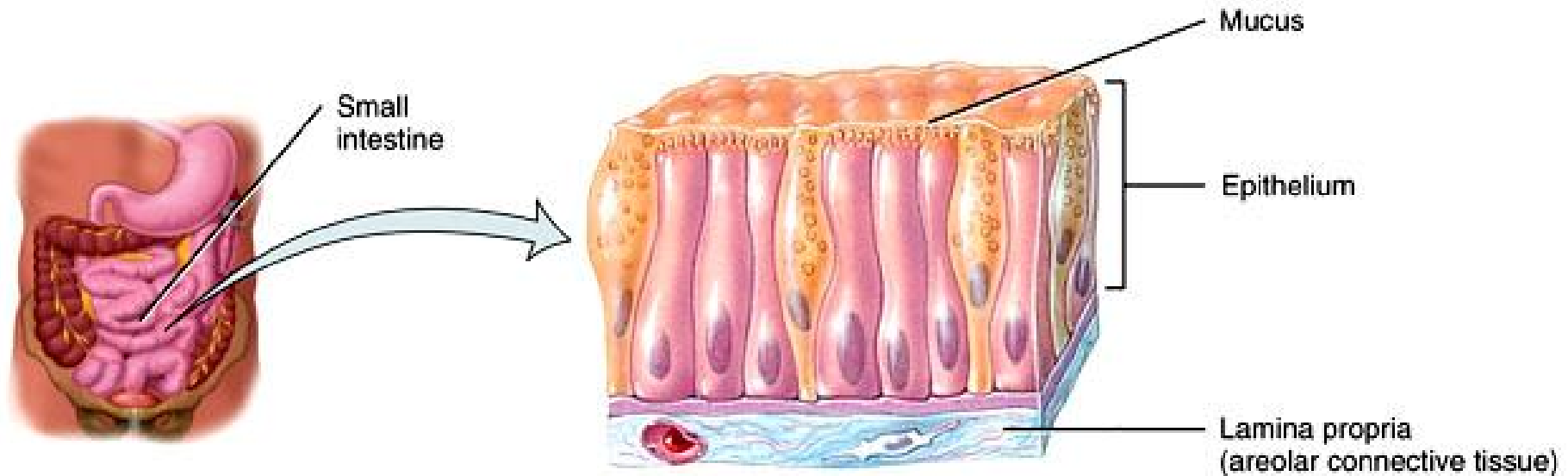
Function: Gives support and maintains shape.



- Elastic fibers help maintain shape after deformations
- Ear, nose, vocal cartilages

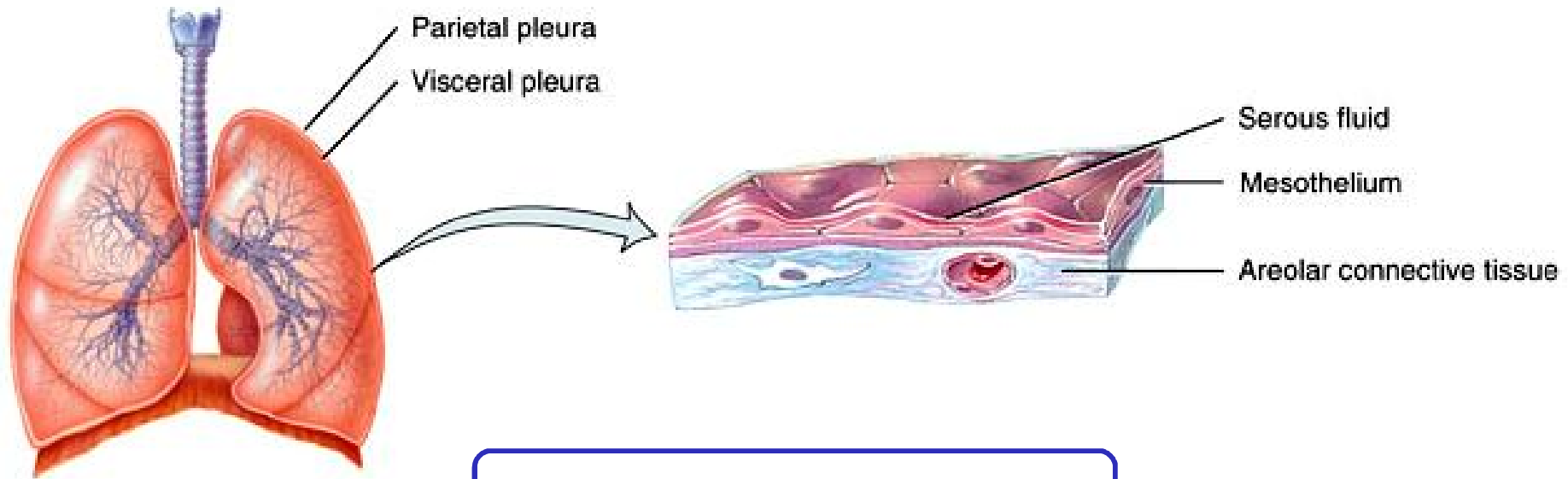
Body Membrane

- **Body membranes** are flat sheets of pliable tissue that cover or line a part of the body
 1. **Epithelial membranes** are a combination of an epithelial layer and an underlying connective tissue layer
 - Mucous, Serous, and Cutaneous membranes (skin)
 2. **Synovial membranes (connective tissue membrane)**
 - Lines joints and contains connective tissue but not epithelium



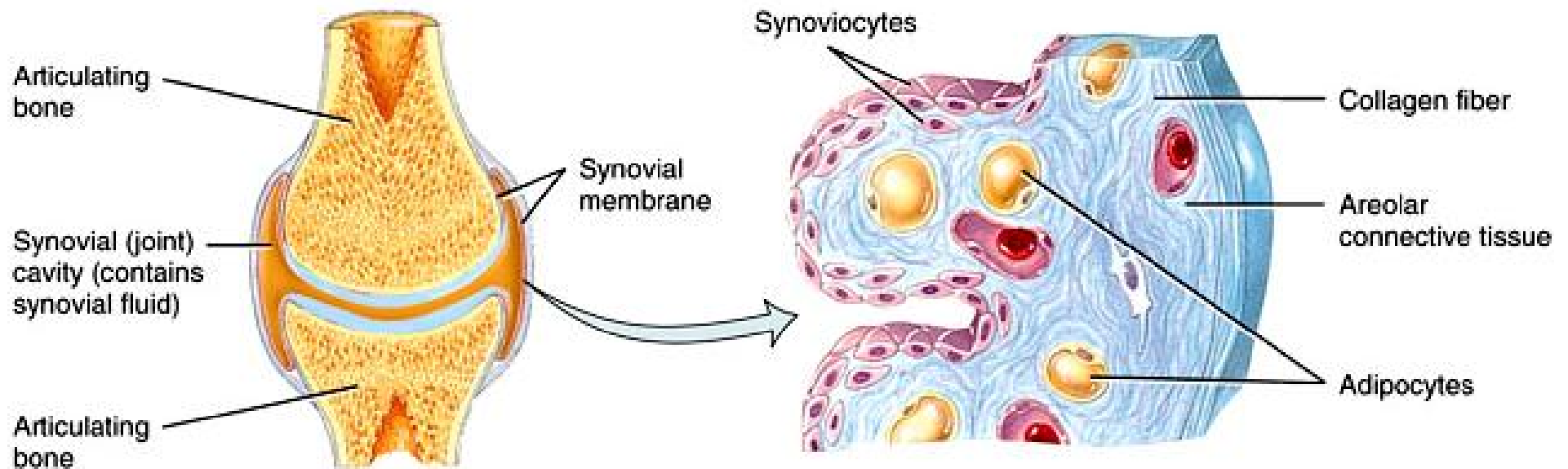
Mucous membranes

- Lines a body cavity that opens to the outside
--mouth, vagina, anus etc.
- Epithelial layer is important for the body's defense **against pathogens**
- Tight junctions between cells
- Mucous is secreted from underlying glands to keep **surface moist**



Serous membranes

- Simple squamous cells overlying loose CT layer
- Squamous cells secrete slippery fluid (serous fluid) for lubrication
- Lines a body cavity that does not open to the outside such as **chest** or **abdominal cavity**
- Examples
 - pleura, peritoneum and pericardium
 - membrane on walls of cavity = **parietal layer**
 - membrane over organs in cavity = **visceral layer**



Synovial membranes

- Line joint cavities of all freely movable joints
- No epithelial cells---just special cells (**synoviocytes**) that secrete slippery fluid (**synovial fluid**)

Integumentary System

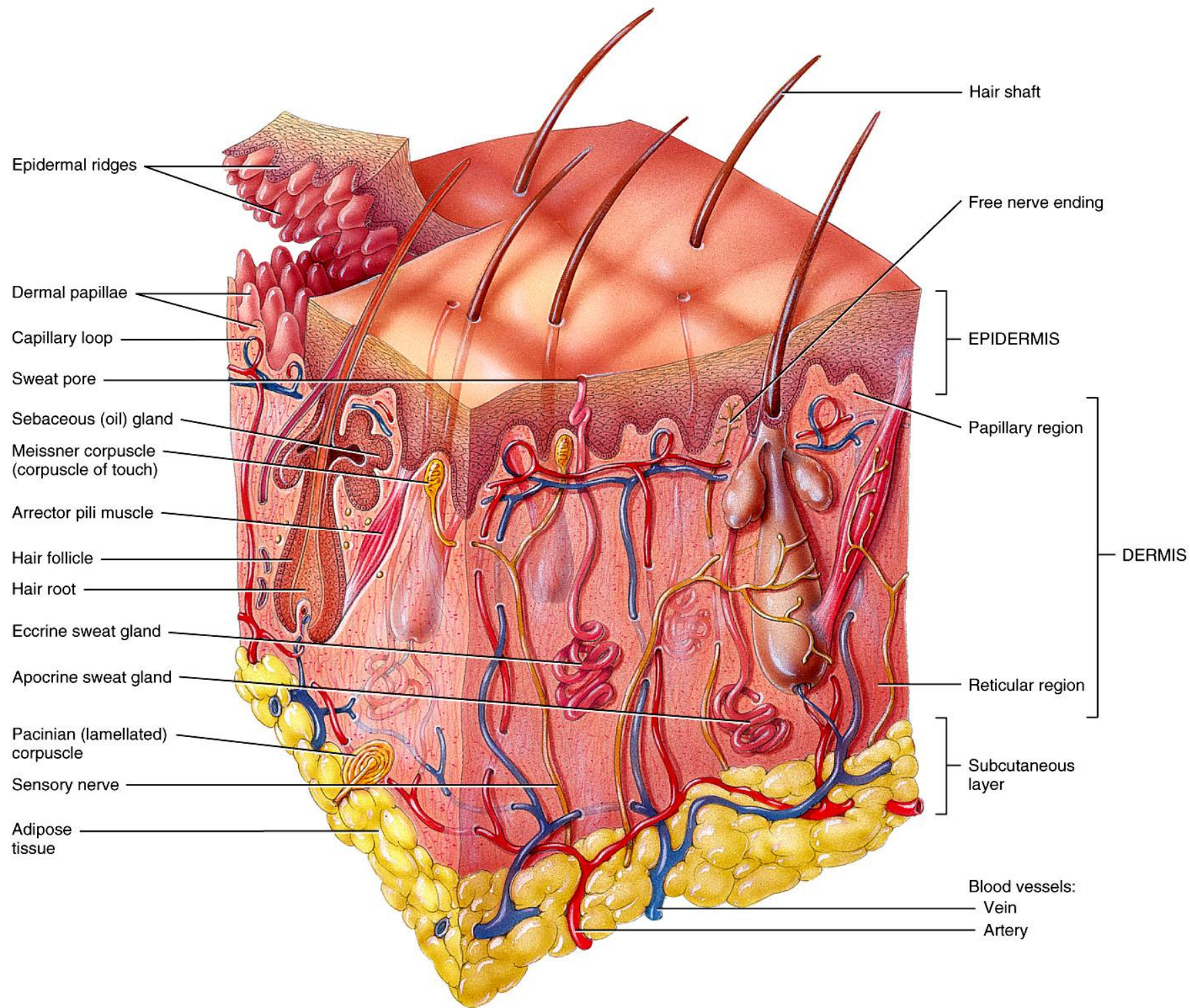
- The organs of the **inte(whole)gument(body covering)ary system** include the **skin** and **its accessory structures** including hair, nails, and glands, as well as blood vessels, muscles and nerves
- The integumentary system functions to guard the body's physical and biochemical integrity, maintain a constant body temperature, and provide sensory information about the surrounding environment.
- **Dermatology** is the medical specialty for the diagnosis and treatment of disorders of the integumentary system.

Structure of the Skin

- The skin (**cutaneous membrane**) covers the body and is **the largest organ** of the body by surface area and weight
- Its area is about **1.5-2 m²** and weighs 4.5-5kg, about **16%** of body weight
- It is 0.5-4 mm thick, thinnest on the eyelids, thickest on the heels; the average thickness is **1-2 mm**

Structure of the Skin

- It consists of two major layers:
 - outer, thinner layer called the **epidermis**, consists of epithelial tissue
 - inner, thicker layer called the **dermis**
- Beneath the dermis is **a subcutaneous (subQ) layer** (also called **hypodermis**) which attaches the skin to the underlying tissues and organs



(a) Sectional view of skin and subcutaneous layer

Epidermis

Four major types of cells:

- **Keratinocytes** (90% of the cells)

produce keratin which is a tough fibrous protein that provides protection

- **Melanocytes**

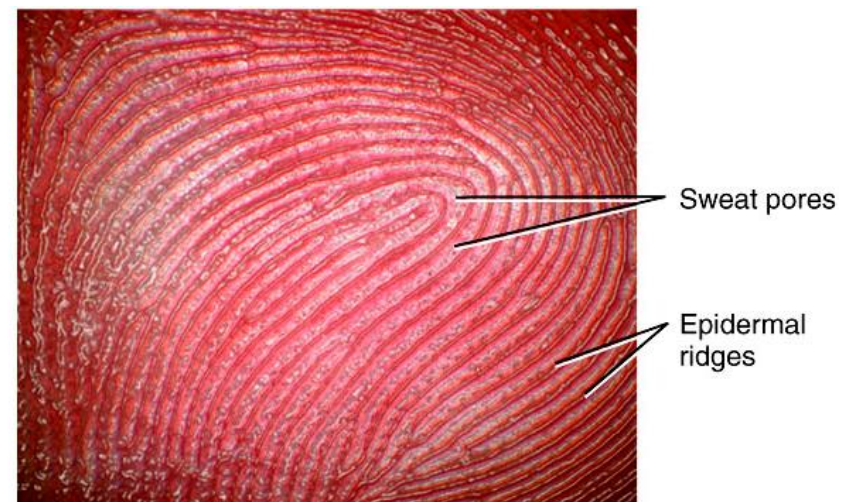
produce the pigment **melanin** that protects against damage by ultraviolet radiation

- **Langerhans cells**

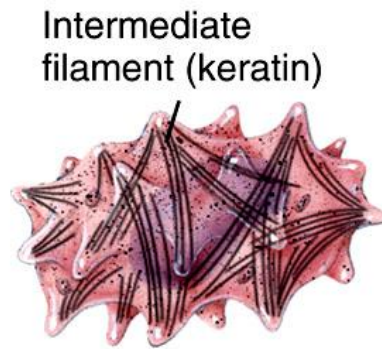
involved in immune responses, arise from red bone marrow

- **Merkel cells**

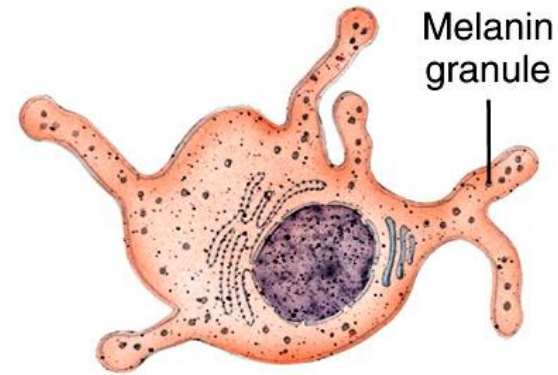
function in the sensation of touch along with the adjacent **tactile discs**



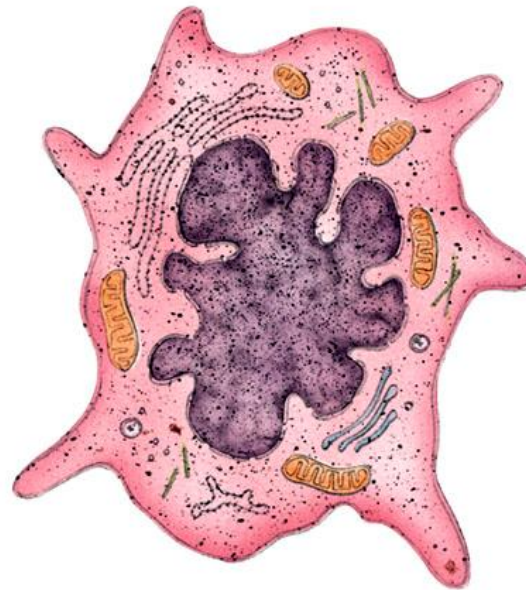
Types of Cells in Epidermis



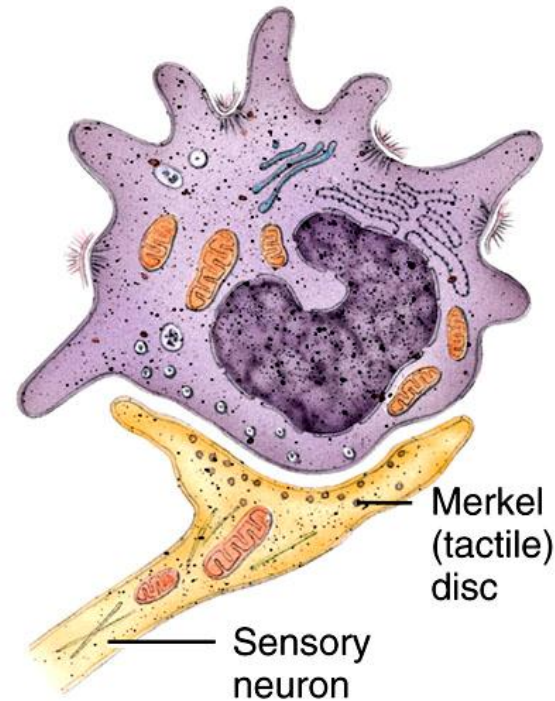
(a) Keratinocyte



(b) Melanocyte

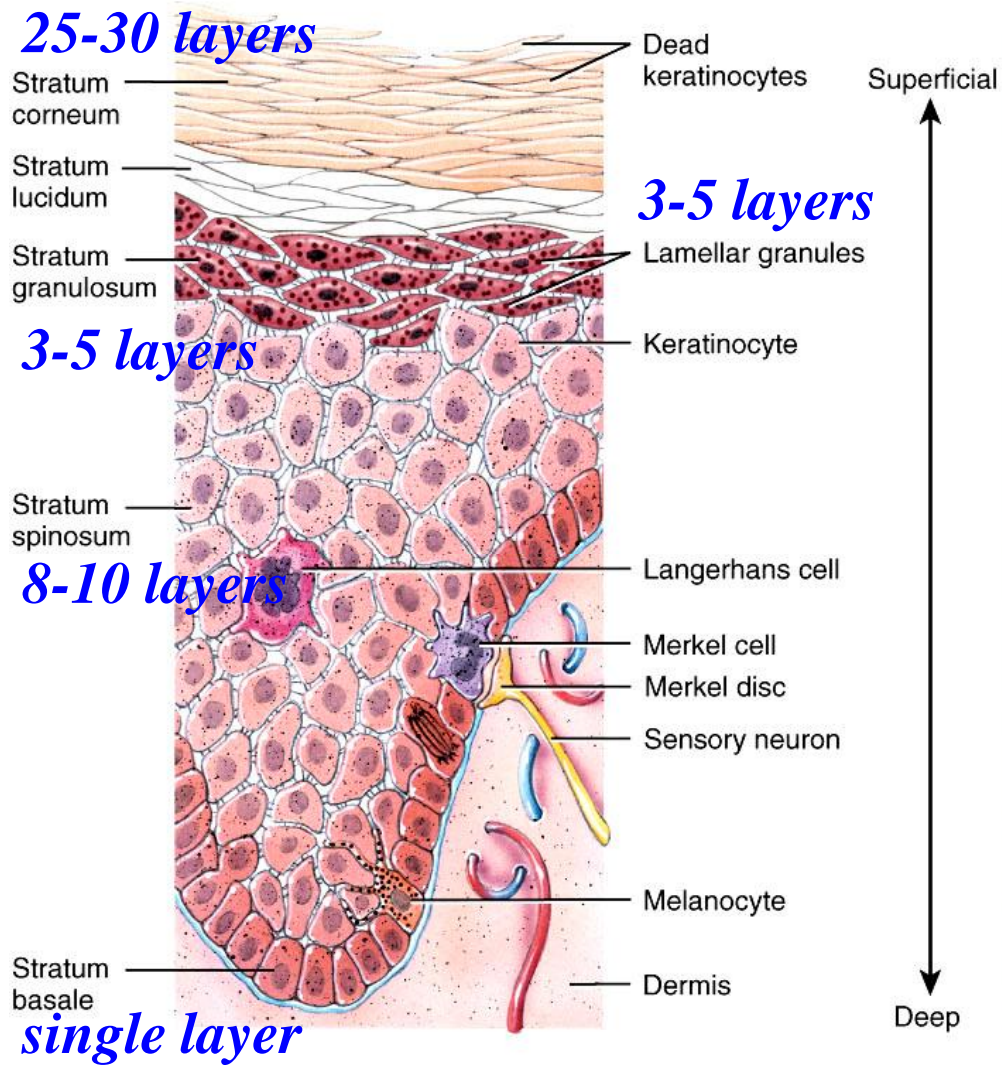


(c) Langerhans cell

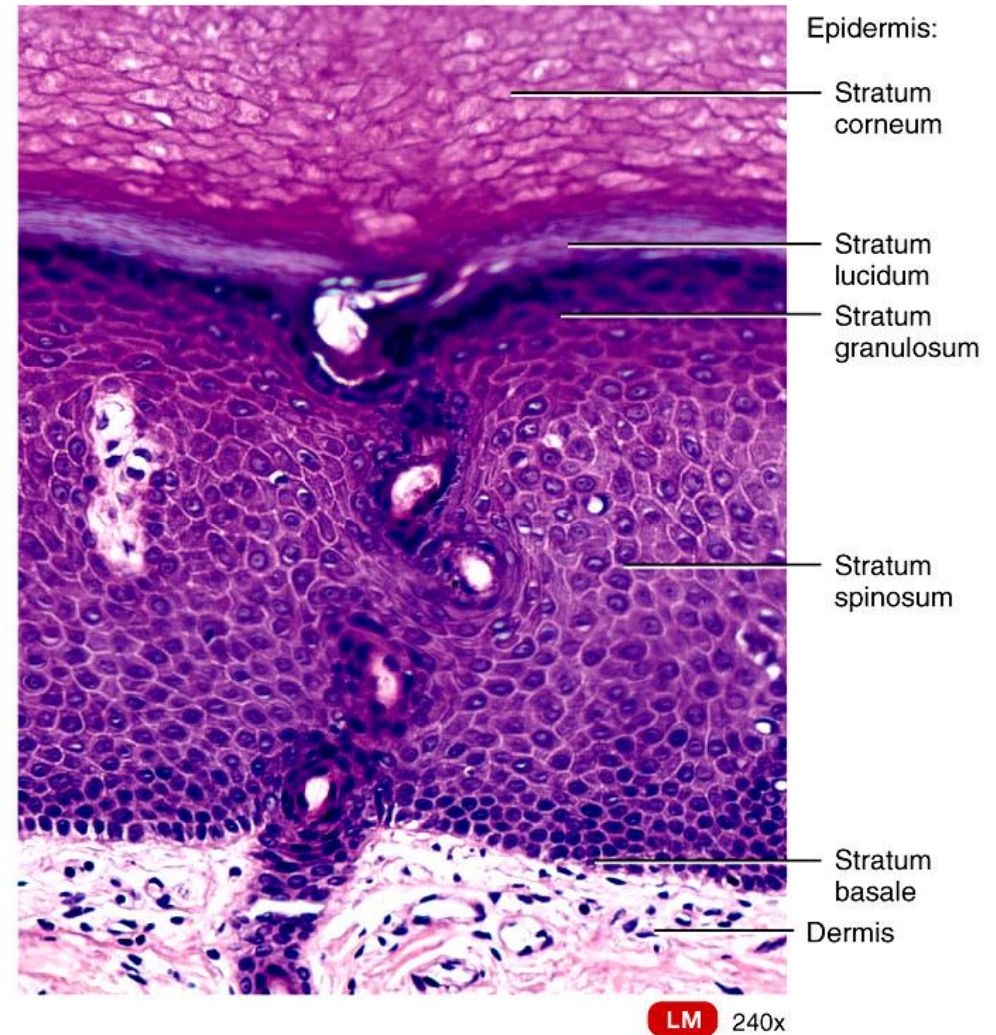


(d) Merkel cell

Layers of the Epidermis



(a) Four principal cell types in epidermis



(b) Photomicrograph of a portion of thick skin

Summary of Epidermal Strata

STRATUM	DESCRIPTION
Basale	Deepest layer, composed of a single row of cuboidal or columnar keratinocytes that contain scattered tonofilaments (intermediate filaments); stem cells undergo cell division to produce new keratinocytes; melanocytes and Merkel cells associated with Merkel discs are scattered among the keratinocytes.
Spinosum	Eight to ten rows of many-sided keratinocytes with bundles of tonofilaments; includes armlike processes of melanocytes and Langerhans cells.
Granulosum	Three to five rows of flattened keratinocytes, in which organelles are beginning to degenerate; cells contain the protein keratohyalin, which converts tonofilaments into keratin, and lamellar granules, which release a lipid-rich, water-repellent secretion.
Lucidum	Present only in skin of fingertips, palms, and soles; consists of three to five rows of clear, flat, dead keratinocytes with large amounts of keratin.
Corneum	Twenty-five to thirty rows of dead, flat keratinocytes that contain mostly keratin.

Summary of Papillary and Reticular Regions of the Dermis

REGION

DESCRIPTION

Papillary

The superficial portion of the dermis (about one-fifth); consists of areolar connective tissue with thin collagen and fine elastic fibers; contains dermal ridges that house capillaries, Meissner corpuscles, and free nerve endings.

Reticular

The deeper portion of the dermis (about four-fifths); consists of dense irregular connective tissue with bundles of thick collagen and some coarse elastic fibers. Spaces between fibers contain some adipose cells, hair follicles, nerves, sebaceous glands, and sudoriferous glands.

➤ ***Tattooing*** is a permanent coloration of the skin in which a foreign pigment is injected into the ***dermis***

(Merocrine) 局泌汗腺

泌離性汗腺

Comparison of Eccrine and Apocrine Sweat Glands

FEATURE	ECCRINE SWEAT GLANDS	APOCRINE SWEAT GLANDS
Distribution	Throughout skin of most regions of the body, especially in skin of forehead, palms, and soles.	Skin of the axilla, groin, areolae, bearded regions of the face, clitoris, and labia minora.
Location of secretory portion	Mostly in deep dermis.	Mostly in subcutaneous layer.
Termination of excretory duct	Surface of epidermis.	Hair follicle.
Secretion	Less viscous; consists of water, ions (Na^+ , Cl^-), urea, uric acid, ammonia, amino acids, glucose, and lactic acid.	More viscous; consists of the same components as eccrine sweat glands plus lipids and proteins.
Functions	Regulation of body temperature, waste removal, and stimulated during emotional stress.	Stimulated during emotional stress and sexual excitement.
Onset of function	Soon after birth.	Puberty.

Comparison of Thin and Thick Skin

FEATURE	THIN SKIN	THICK SKIN
Distribution	All parts of the body except areas such as palms and palmar surface of digits, and soles.	Areas such as the palms, palmar surface of digits, and soles.
Epidermal thickness	0.10–0.15 mm (0.004–0.006 in.).	0.6–4.5 mm (0.024–0.18 in.).
Epidermal strata	Stratum lucidum essentially lacking; thinner strata spinosum and corneum.	Thick strata lucidum, spinosum, and corneum.
Epidermal ridges	Lacking due to poorly developed and fewer and less-well-organized dermal papillae.	Present due to well-developed and more numerous dermal papillae organized in parallel rows.
Hair follicles and arrector pili muscles	Present.	Absent.
Sebaceous glands	Present.	Absent.
Sudoriferous glands	Fewer.	More numerous.
Sensory receptors	Sparser.	Denser.

Clinical Application: Psoriasis & Skin Grafts

- *Psoriasis* (*psora* "itch" + *-sis* "action, condition") is a chronic skin disorder (**autoimmune disease**) characterized by a more rapid division and movement of **keratinocytes** through the stratum basale in the **epidermis**

- cells shed in 7 to 10 days as flaky silvery scales

- abnormal keratin produced

- *Skin Grafts*

- New skin can not regenerate if stratum basale and its stem cells are destroyed

- autograft**: covering of wound with piece of healthy skin from self

- isograft** is from twin

- autologous skin**: transplantation of patient's skin after it has grown in culture



Clinical Application: Burns

- Destruction of **proteins** of the skin
 - chemicals, electricity, heat
- Problems that result
 - **shock** due to water, plasma and plasma protein loss
 - **circulatory & kidney** problems from loss of plasma
 - **bacterial infection**
- Two methods for determining the extent of a burn are the **rule of nines** and the **Lund-Bowder method**

Clinical Application: Pressure Sores

- *Pressure ulcers = decubitus ulcers*
 - caused by a constant deficiency of blood to tissues
 - Areas affected is skin over bony prominence in bedridden patients
 - the deficiency of blood flow results in tissue ulceration.
- Preventable with proper care



Pressure ulcer on heel

Functions of Skin

- Regulation of body temperature
- Blood reservoir
- Protection
- Cutaneous sensations
- Excretion (400 ml of water/day) and absorption (lipid soluble substances)
- Synthesis of **vitamin D₃ (calcitriol)**