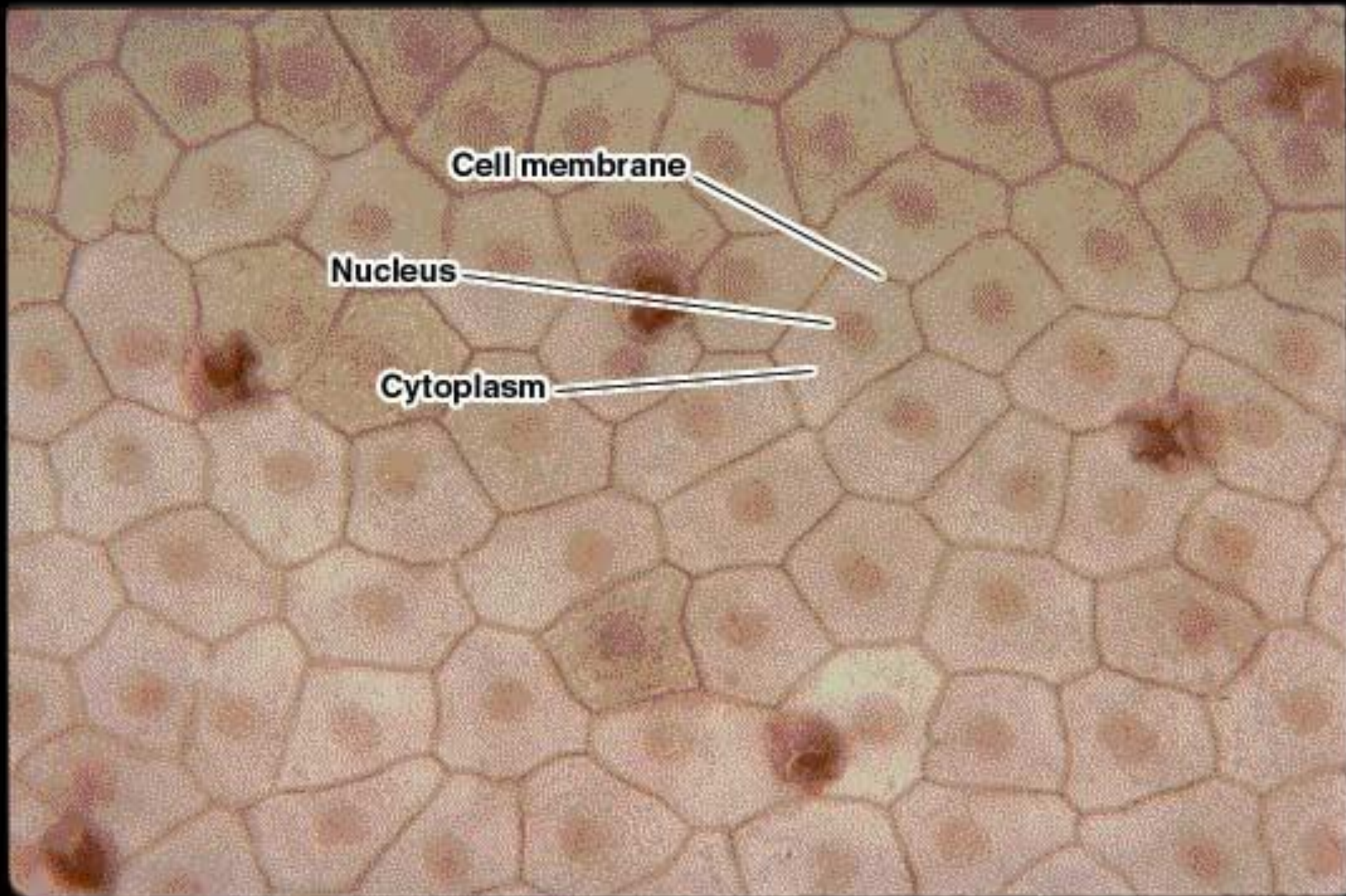


Tissues

- tissue = many cells w/ same structure and function
- cell shape aids function
- tissue shape aids function
- Histology = study of tissues



4 types of tissues

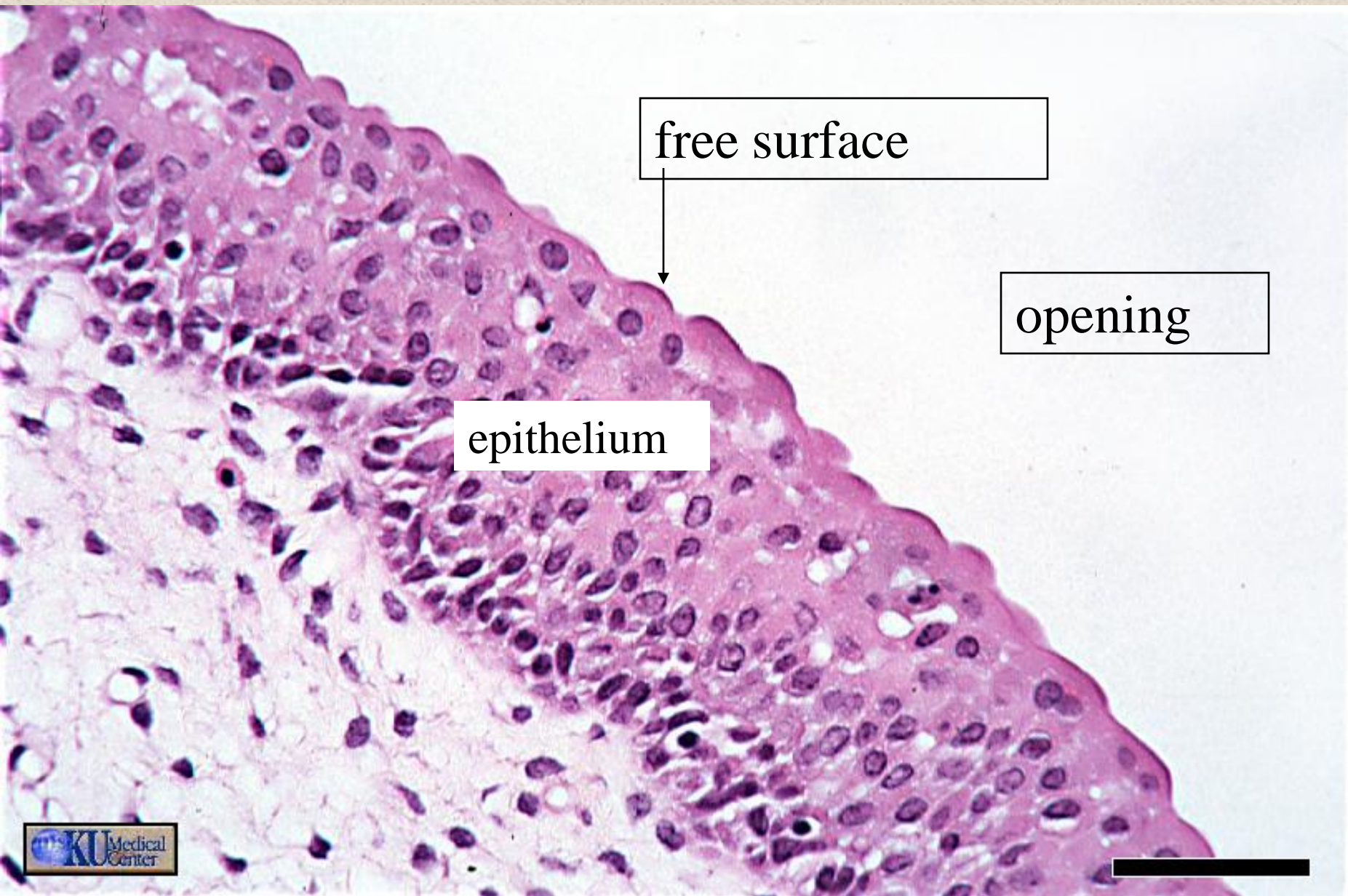
- Epithelial coverings contact openings
- Connective support connect other tissues
- Muscle movement contraction
- Nerve control conduct impulse

functions of epithelial tissues :

- protection
 - prevent passage across epithelia
- permeability
 - allows passage across epithelia
- lubrication of surfaces

characteristics of epithelia:

- contact opening
 - free surface contacts the lumen
 - lumen open space
- covers surfaces skin
- lines hollow tubes respiratory tract
 digestive tract
 urinary tract
 blood vessels
- forms glands



free surface

opening

epithelium

lumen

epithelial tissue



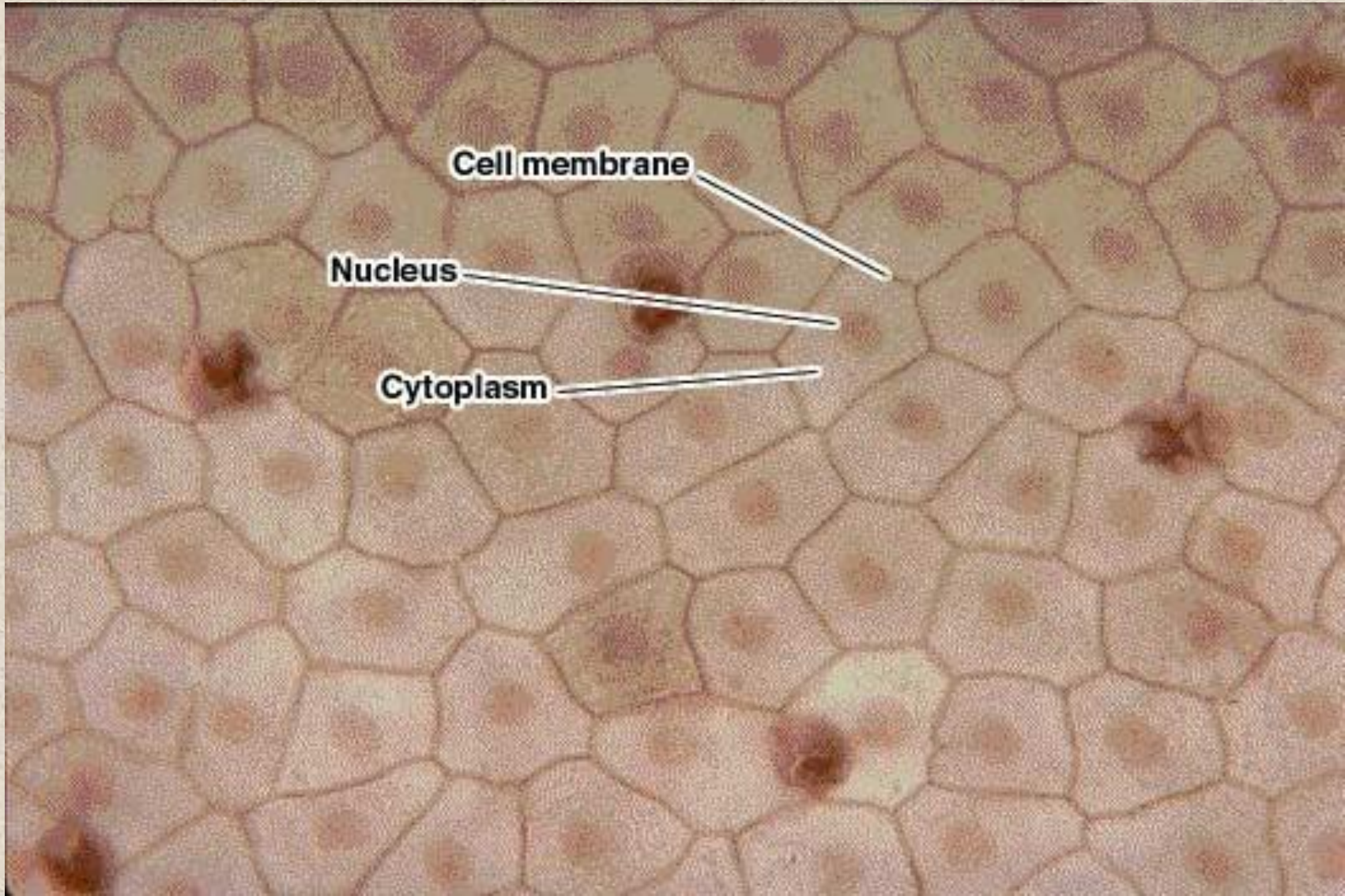
lumen

epithelial tissue



characteristics of epithelia:

- cellularity

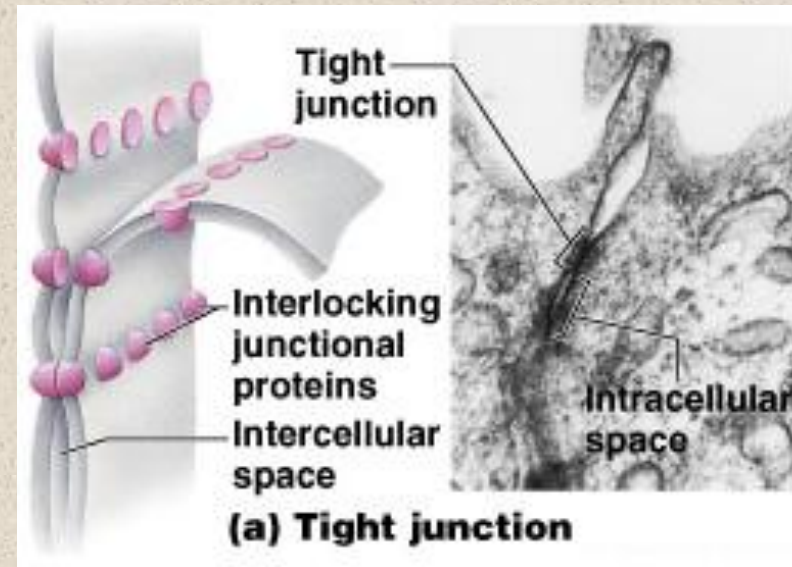
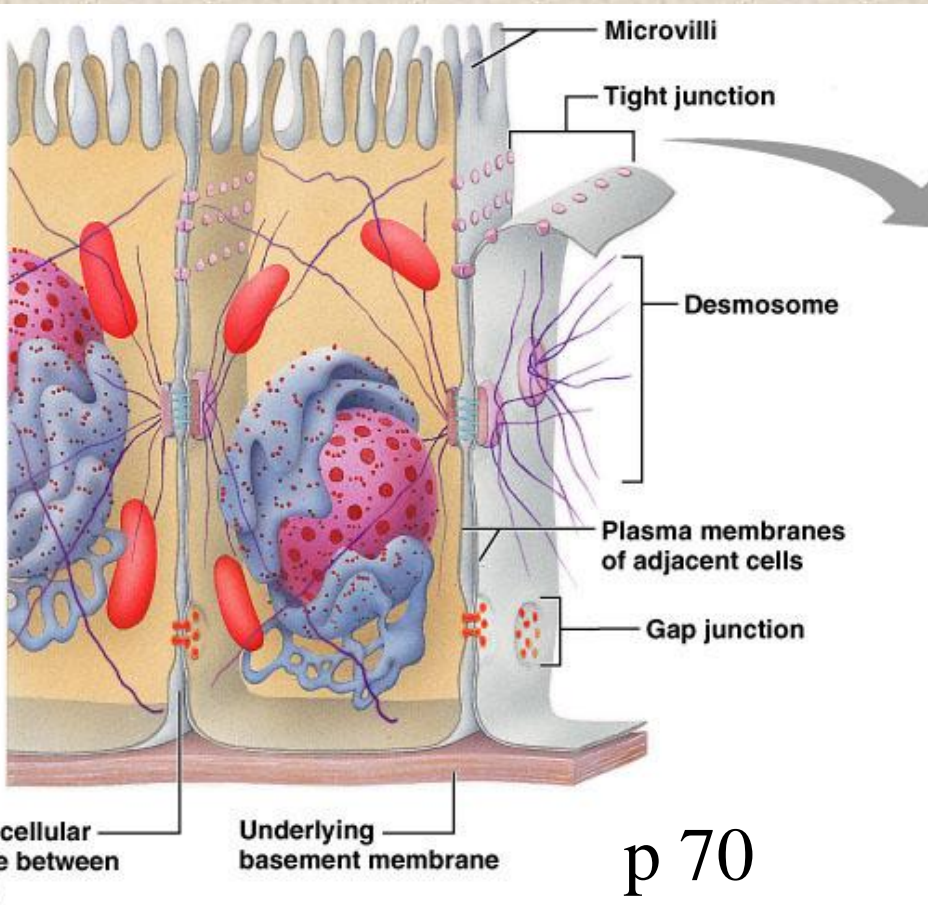


cellularity



characteristics of epithelia:

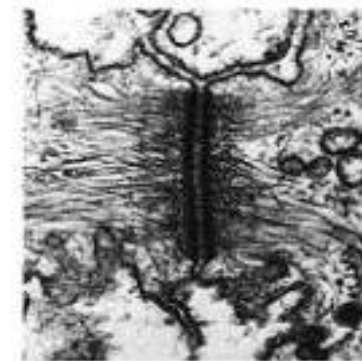
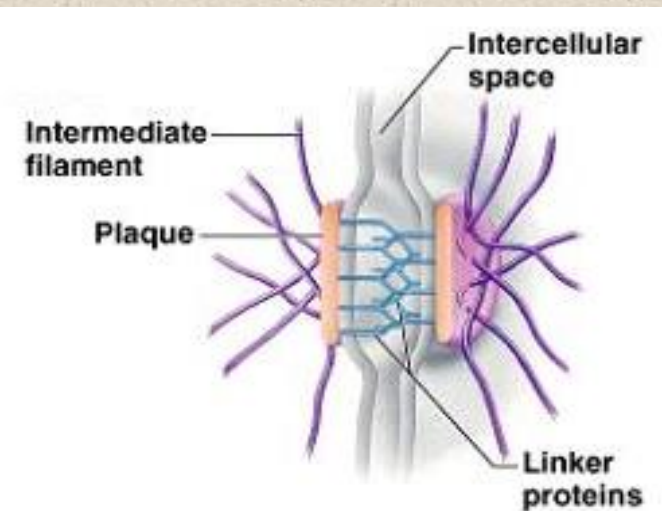
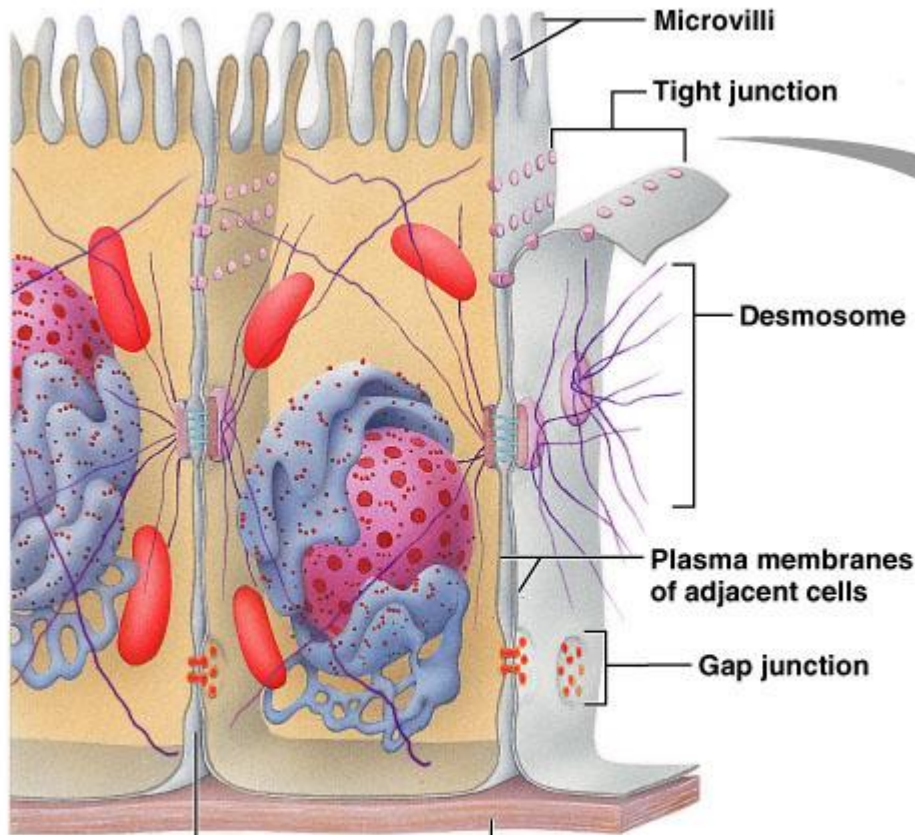
- specialized contacts between cells
 - tight junctions *zona occludens*
 - seal between cell membranes



– desmosomes

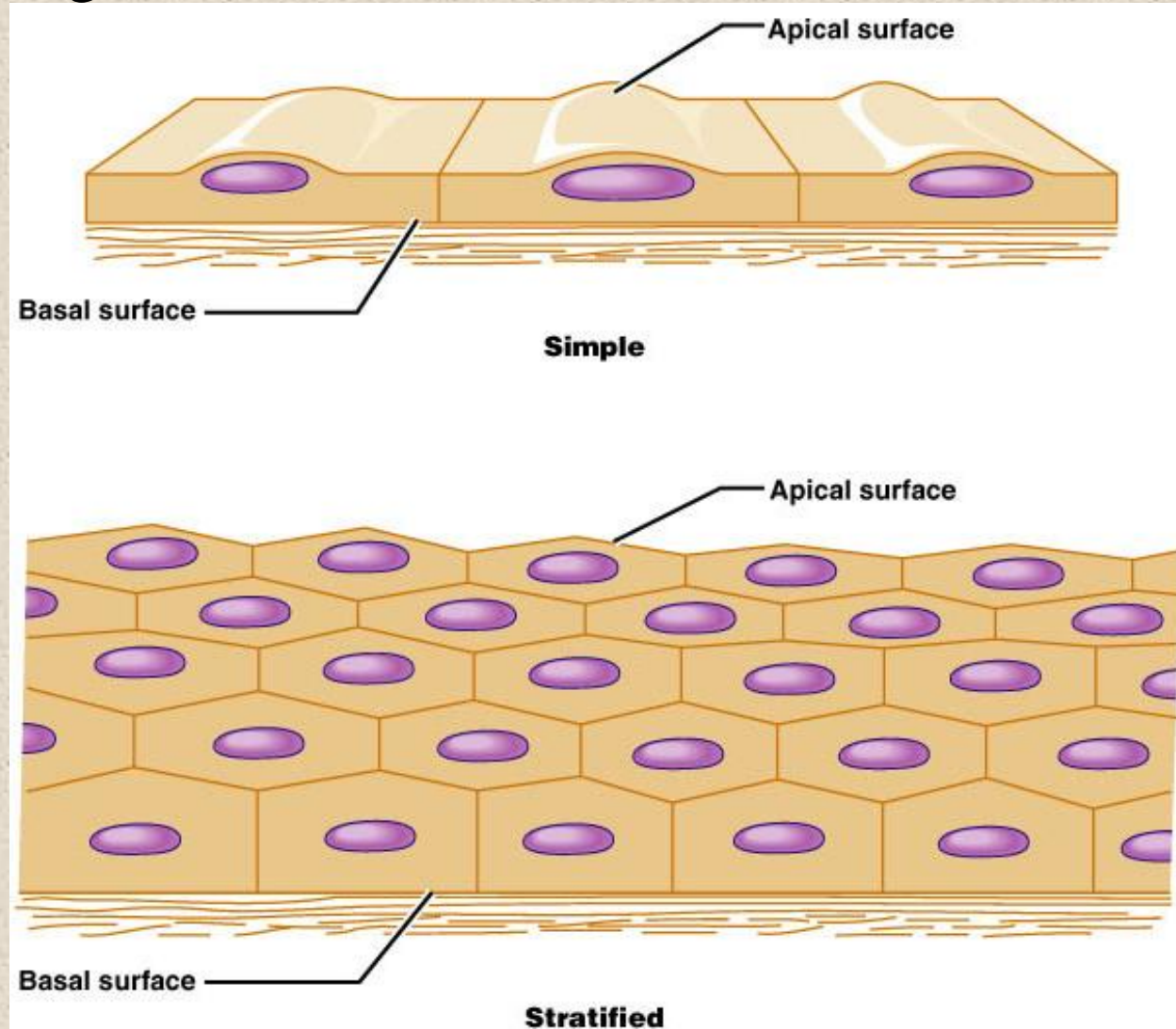
- hold cells together

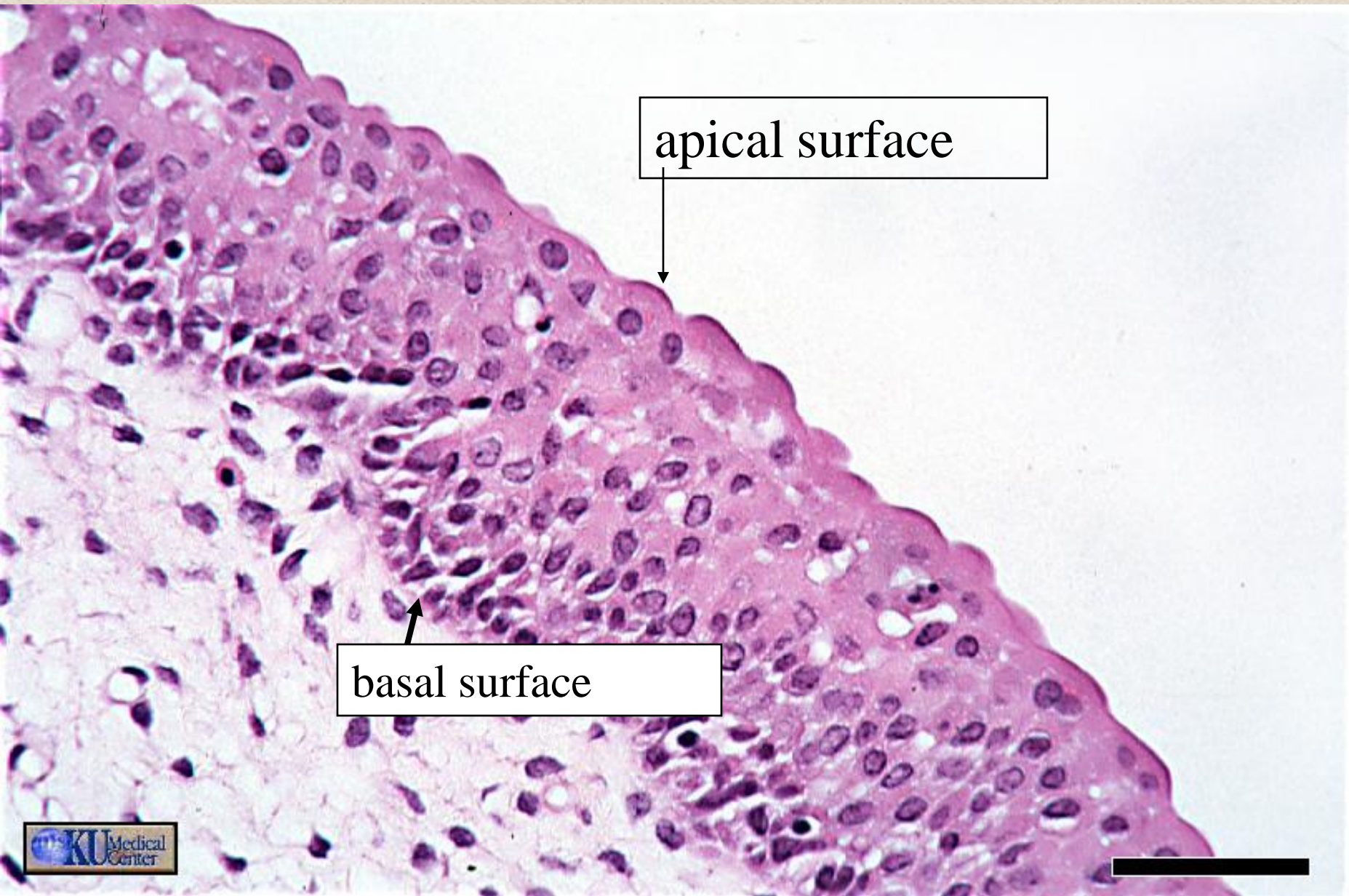
anchoring junctions



characteristics of epithelia:

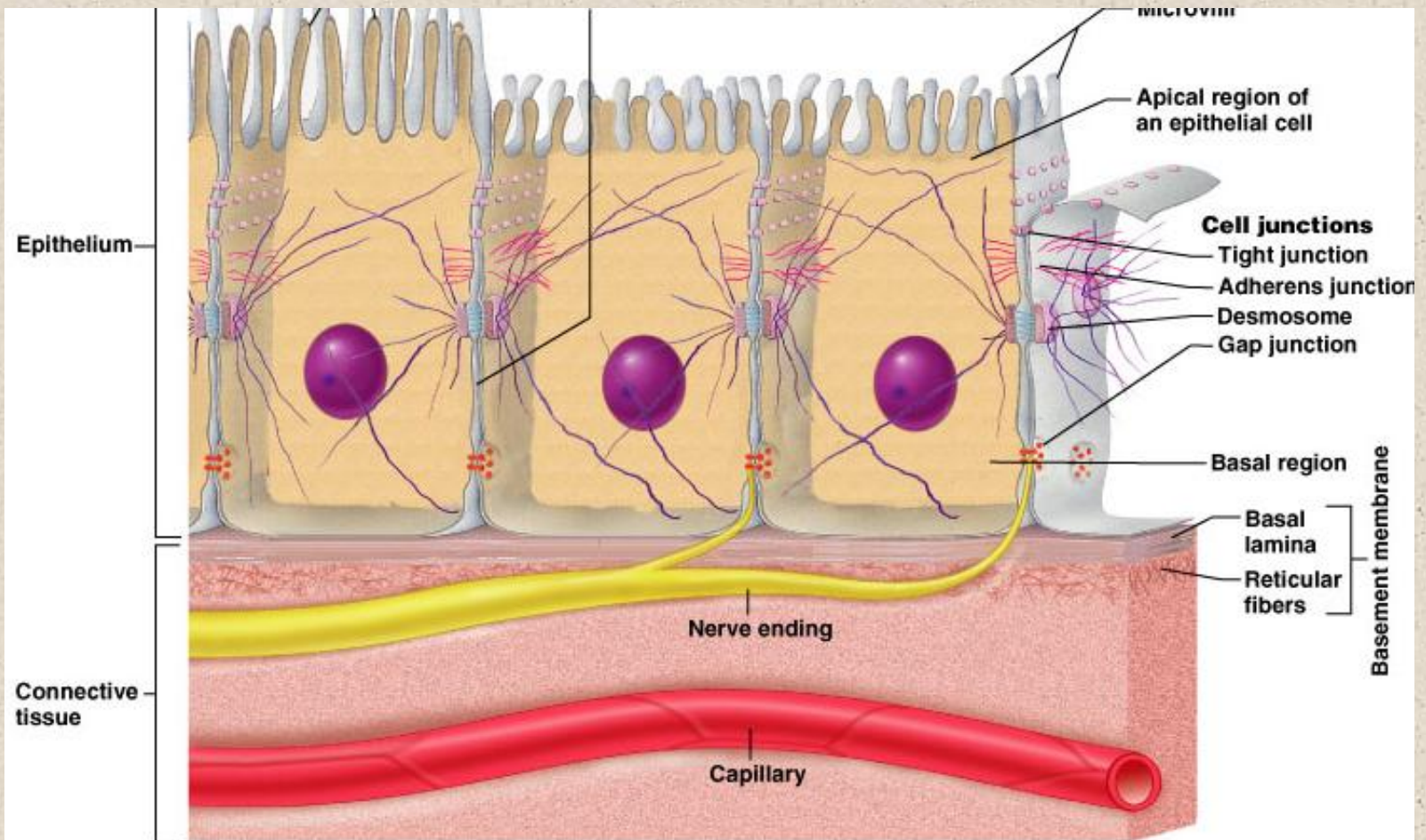
- polarity
 - apical vs basal regions

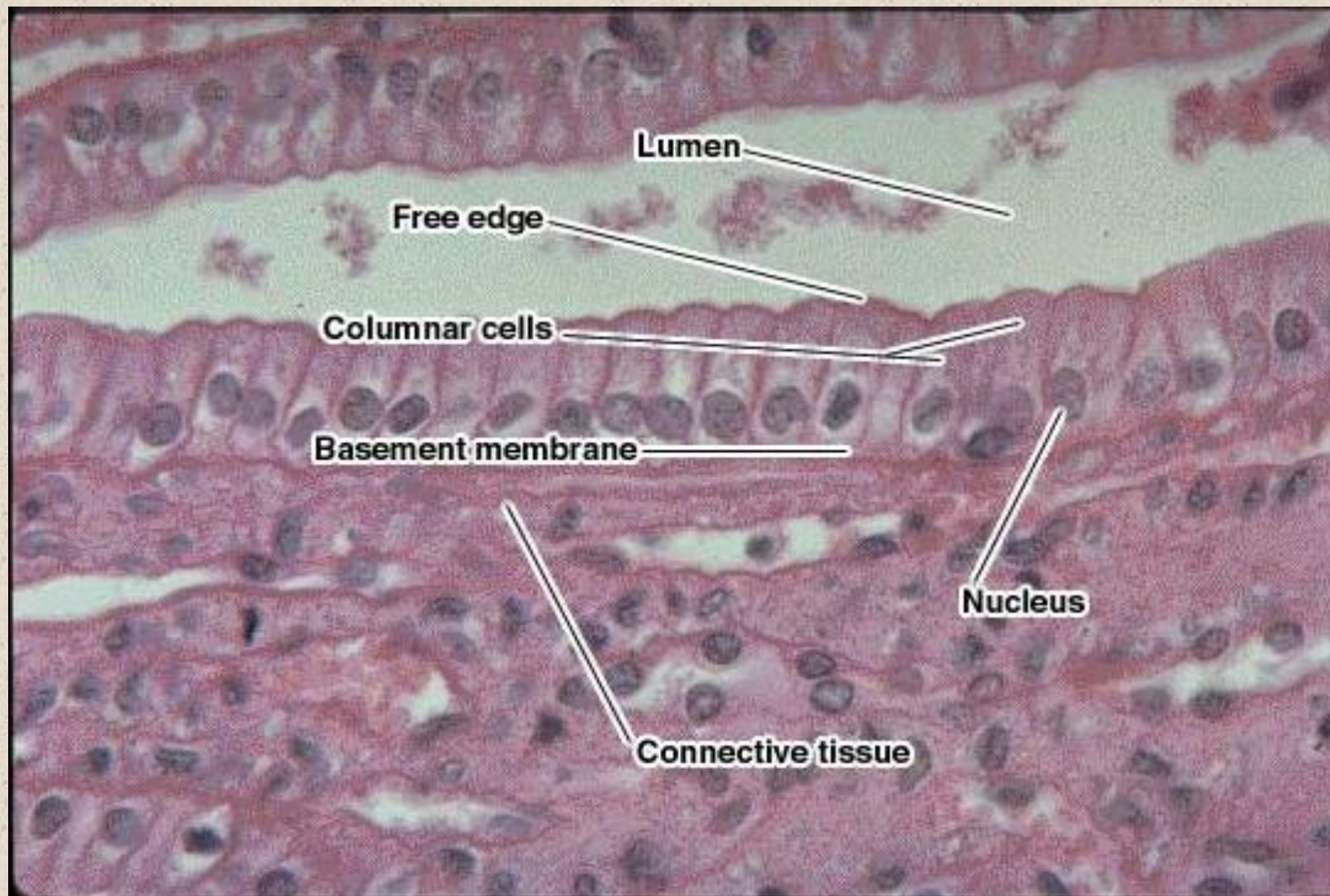




characteristics of epithelia:

- support by connective tissue
- basement membrane
 - basal lamina + reticular fibers



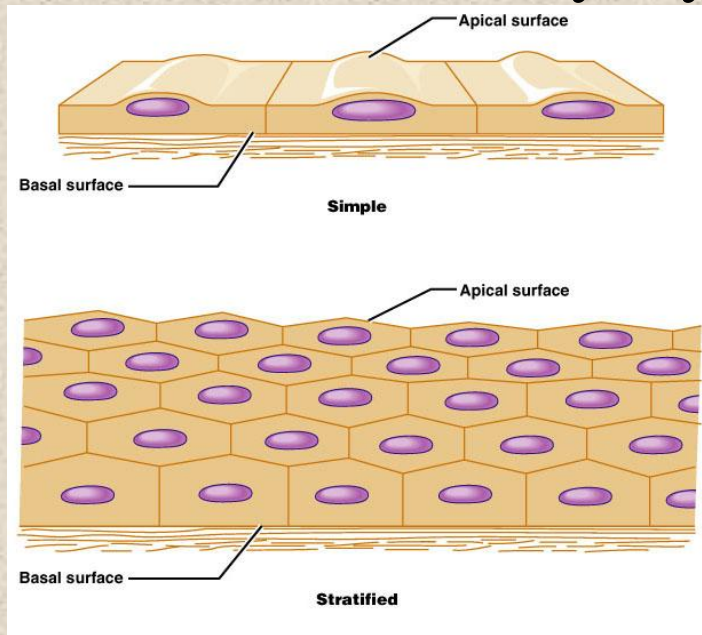


characteristics of epithelia:

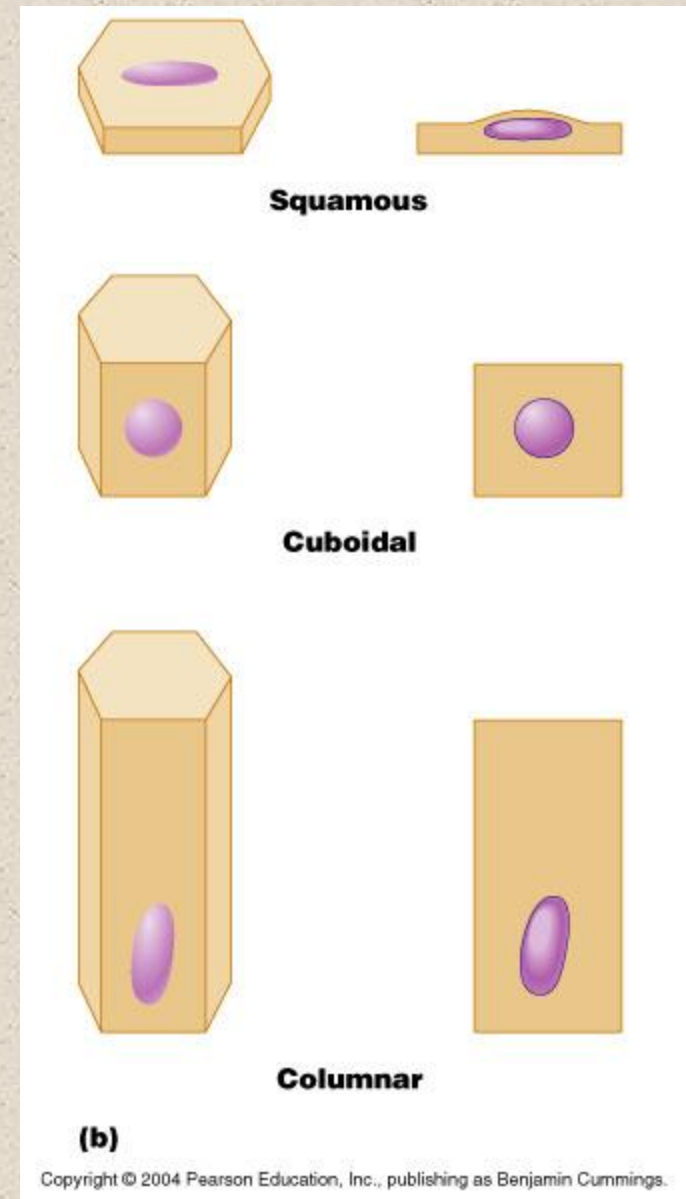
- avascular
 - no blood vessels
- regeneration
 - active mitosis of stem cells

definitions

- simple = one layer
- stratified = many layers

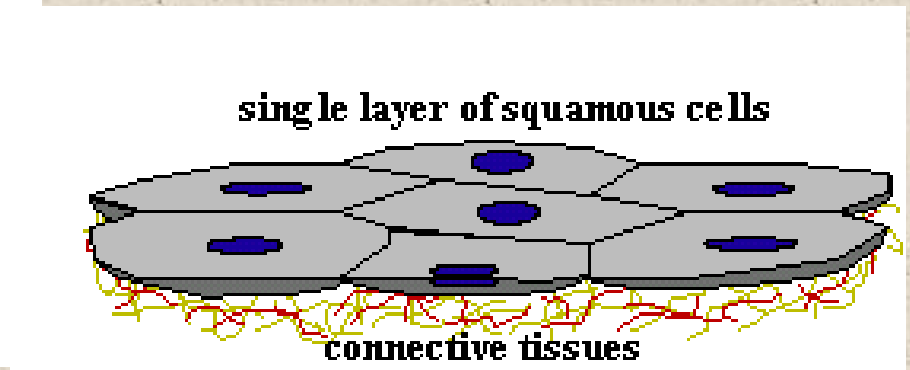
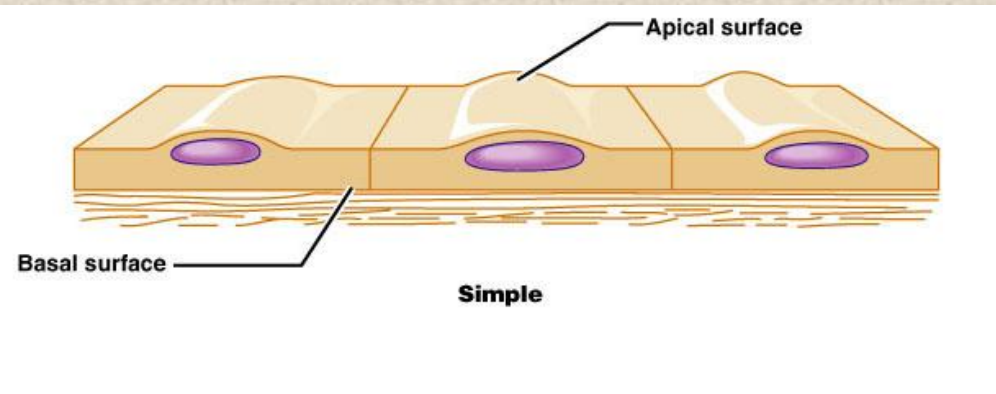


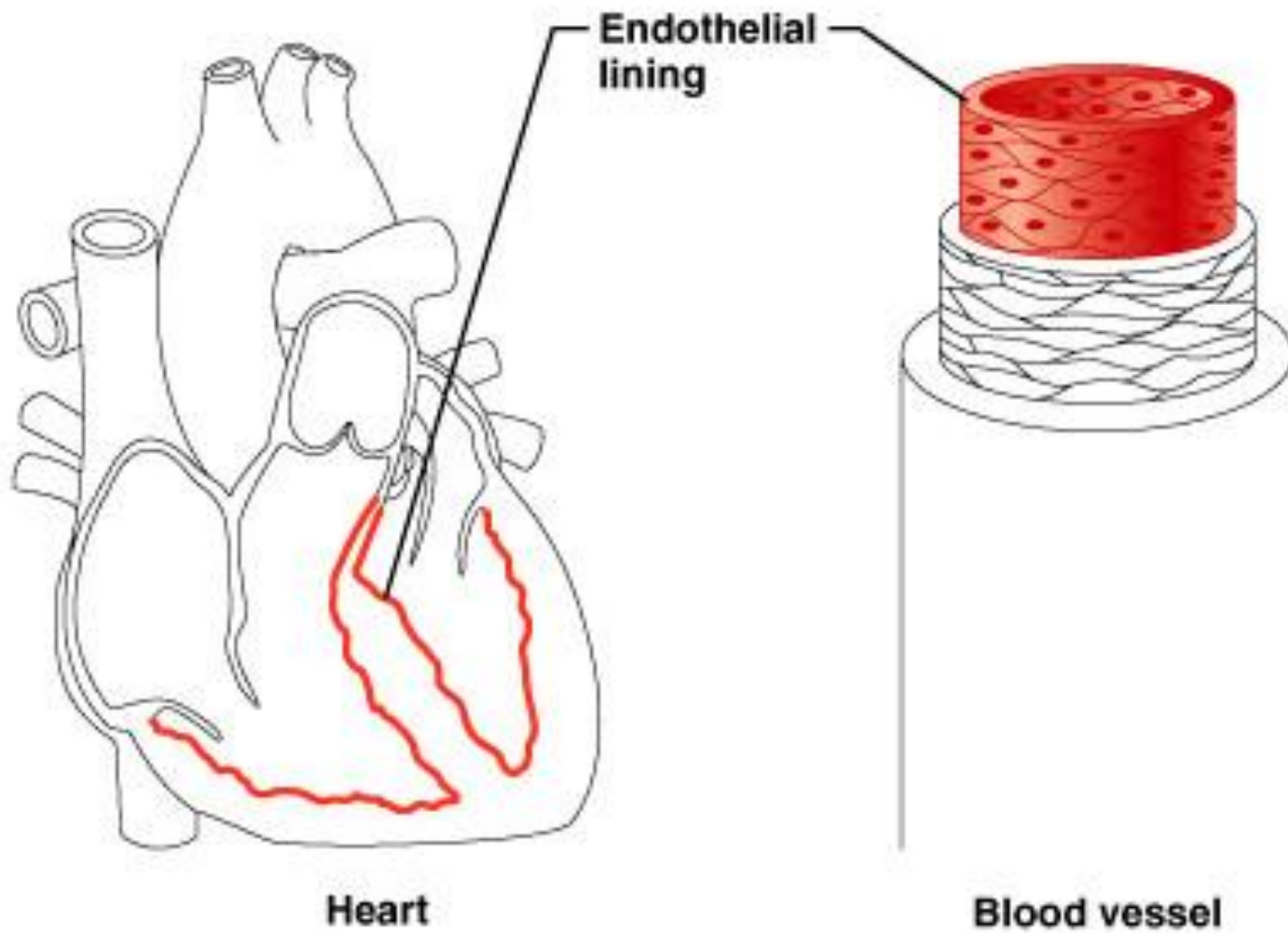
- squamous = flat
- cuboid = box like
- columnar = tall



need a smooth tissue ?

- simple squamous epithelium
- where ?
 - blood vessels = endothelium
 - serous membranes



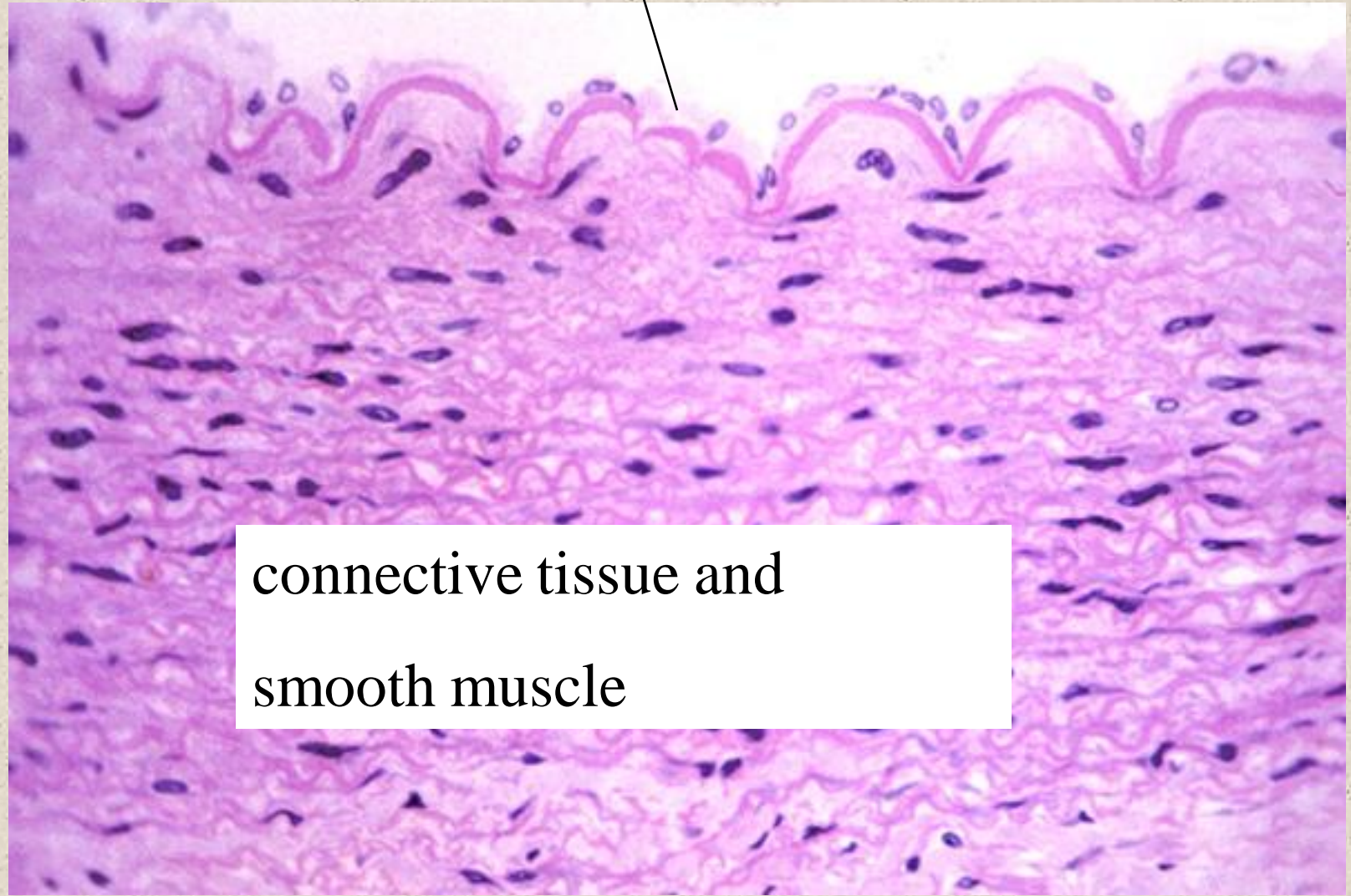


artery wall

simple squamous epithelium



artery wall : simple squamous (endothelium)

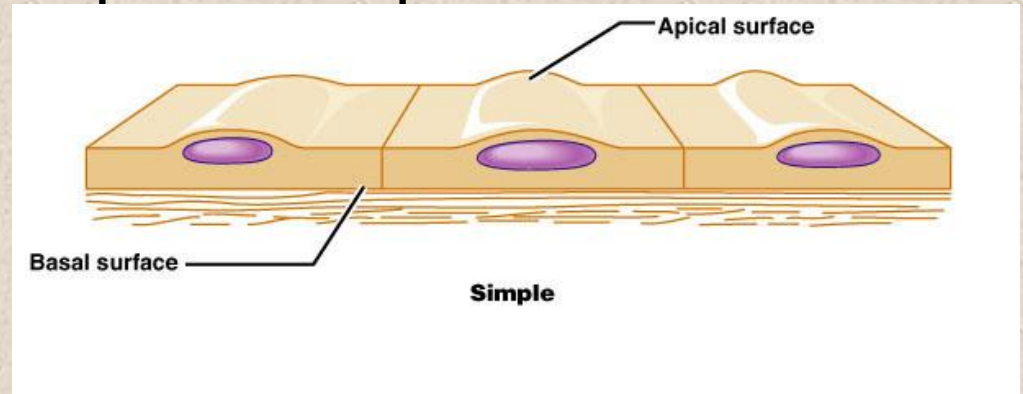


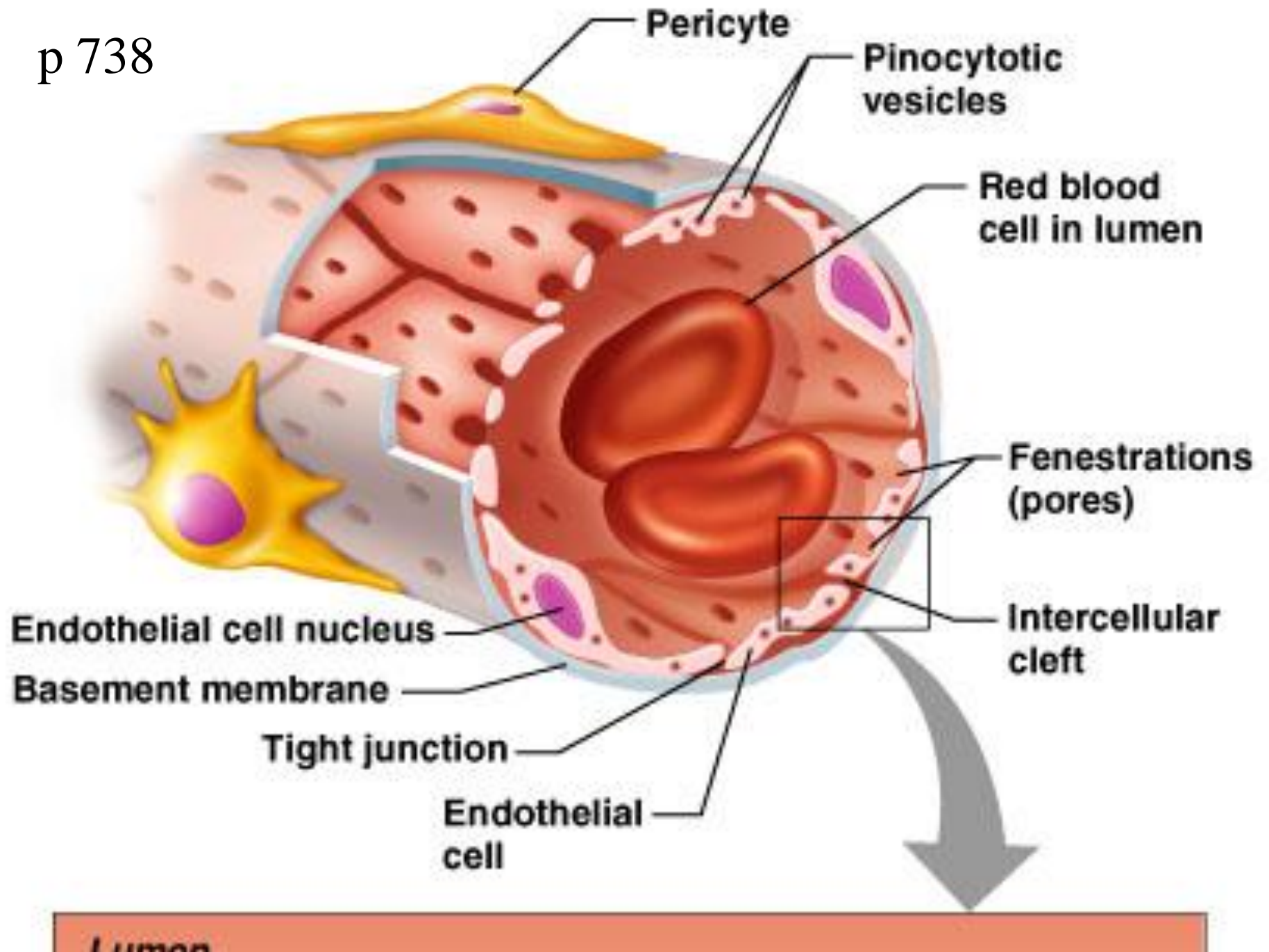
connective tissue and
smooth muscle

need to exchange stuff ?

- move stuff through the entire tissue
- thick or thin ?
- thinnest tissue = simple squamous epithelium

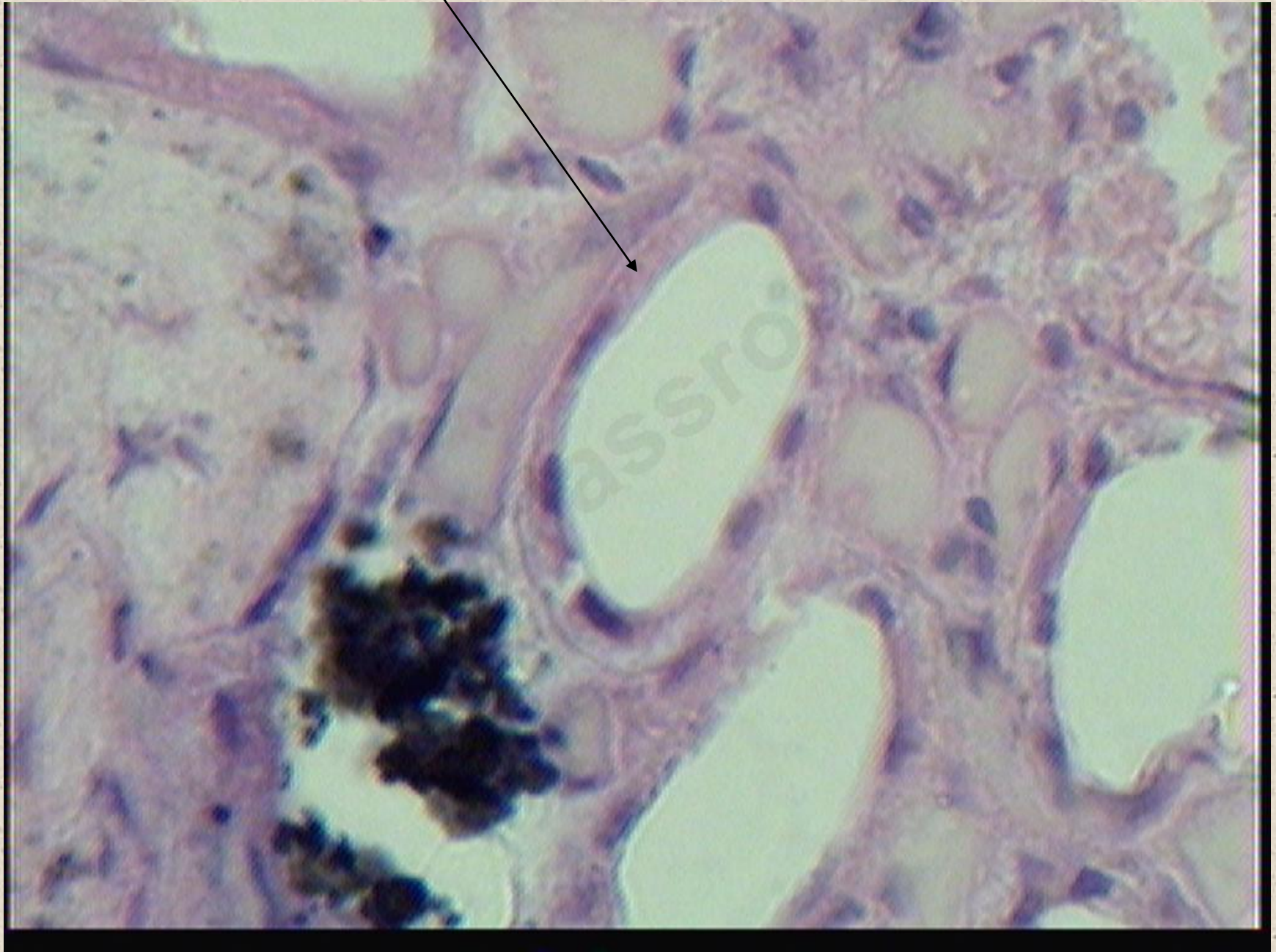
- where?
 - capillaries
 - alveoli (lung)
 - kidney



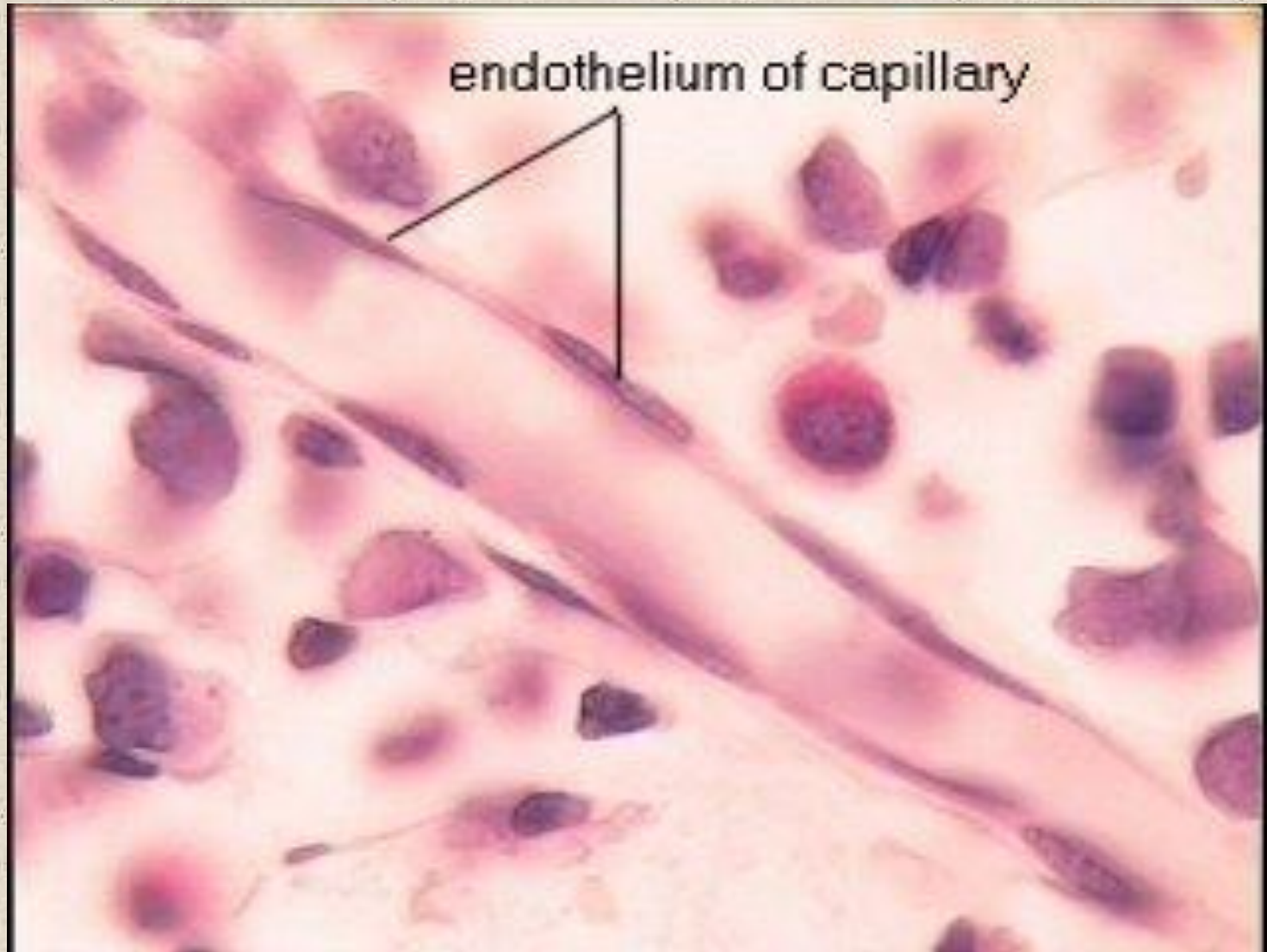


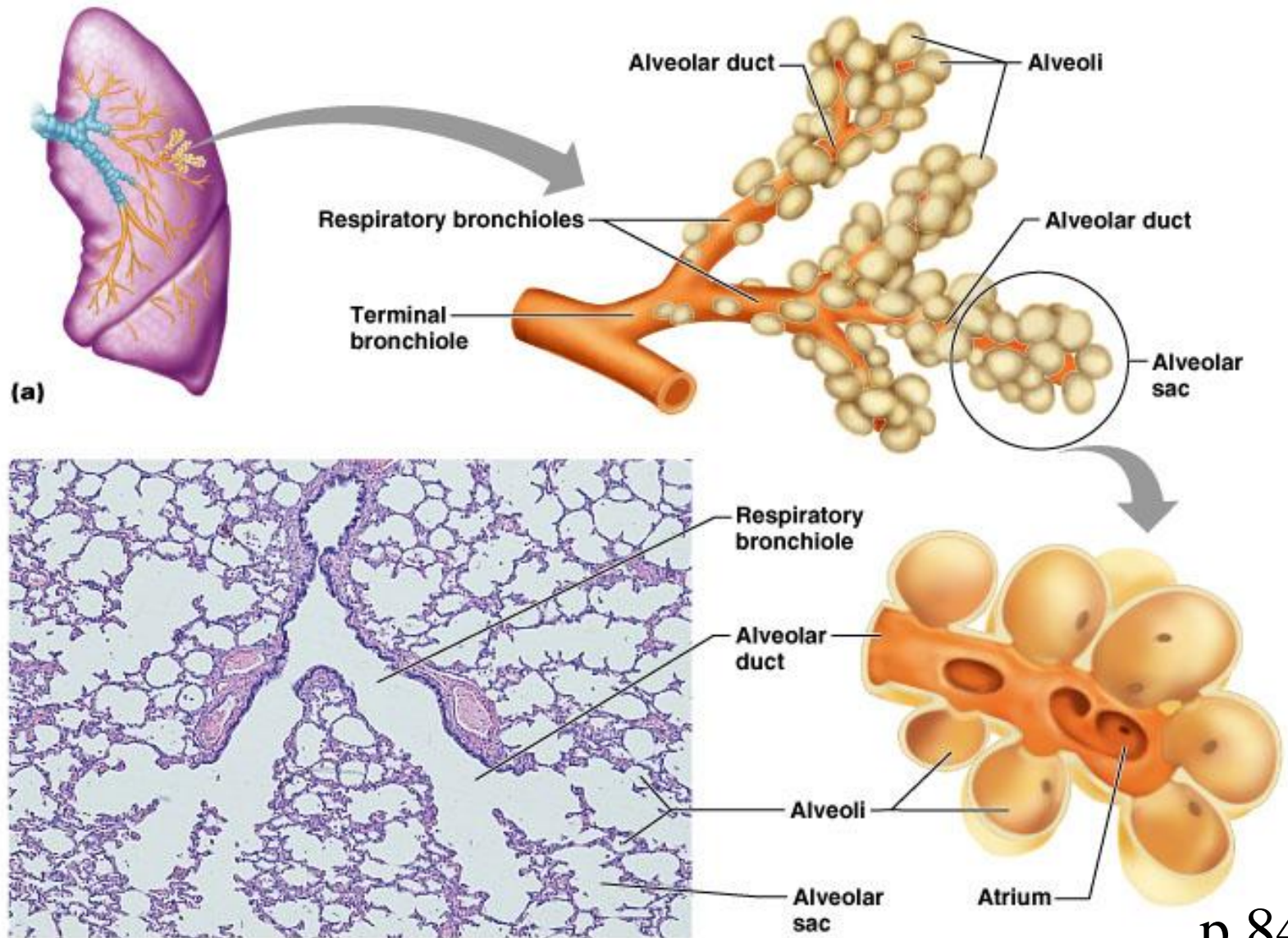
simple squamous

smooth , thin



endothelium of capillary





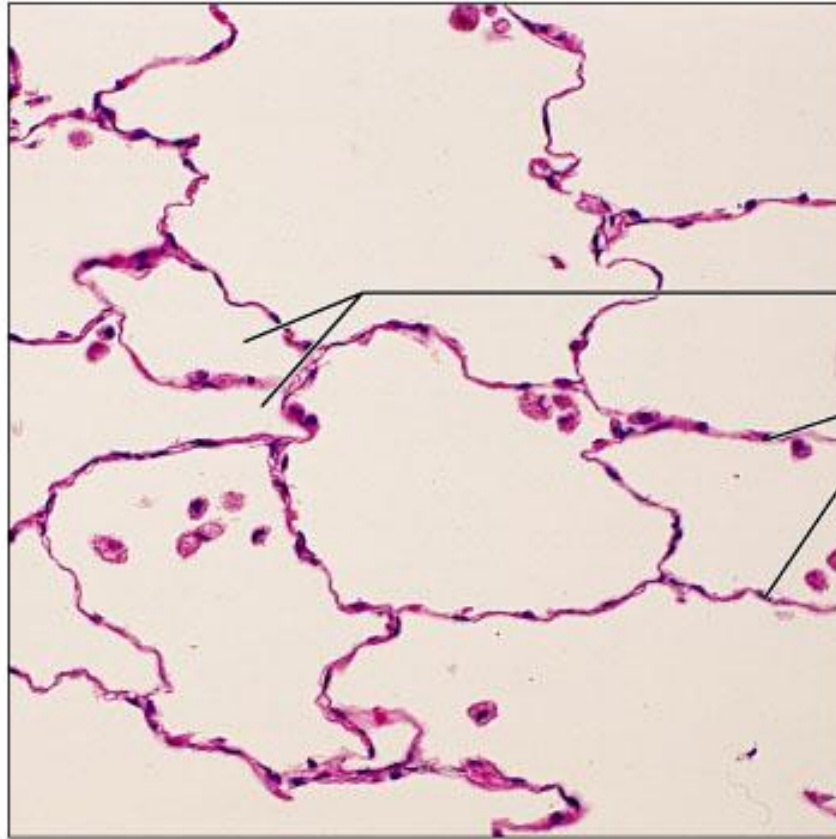
(a) Simple squamous epithelium

Description: Single layer of flattened cells with disc-shaped central nuclei and sparse cytoplasm; the simplest of the epithelia.



Function: Allows passage of materials by diffusion and filtration in sites where protection is not important; secretes lubricating substances in serosae.

Location: Kidney glomeruli; air sacs of lungs; lining of heart, blood vessels, and lymphatic vessels; lining of ventral body cavity (serosae).



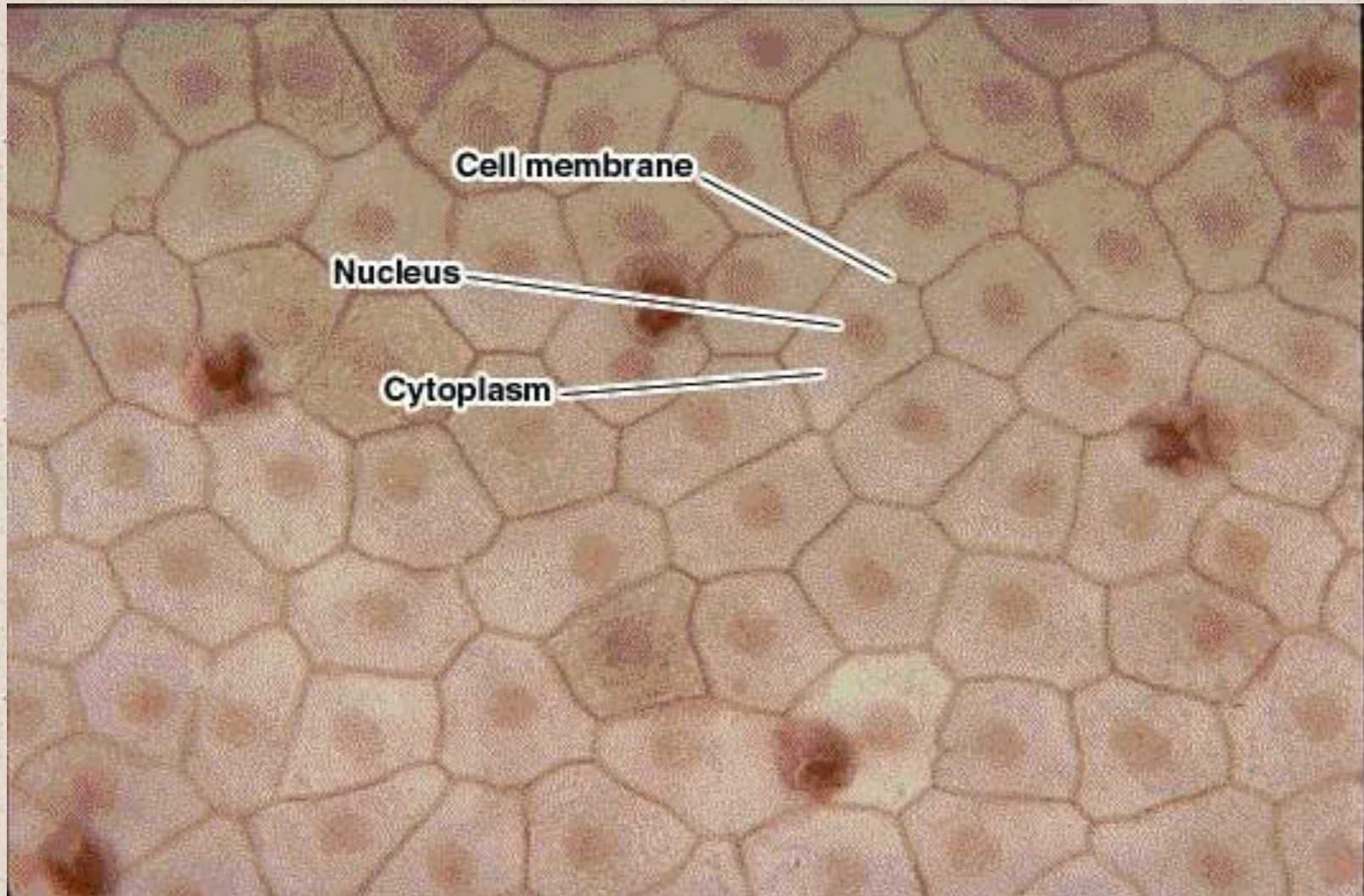
Air sacs of lung tissue

Nuclei of squamous epithelial cells

Photomicrograph: Simple squamous epithelium forming part of the alveolar (air sac) walls (400 \times).

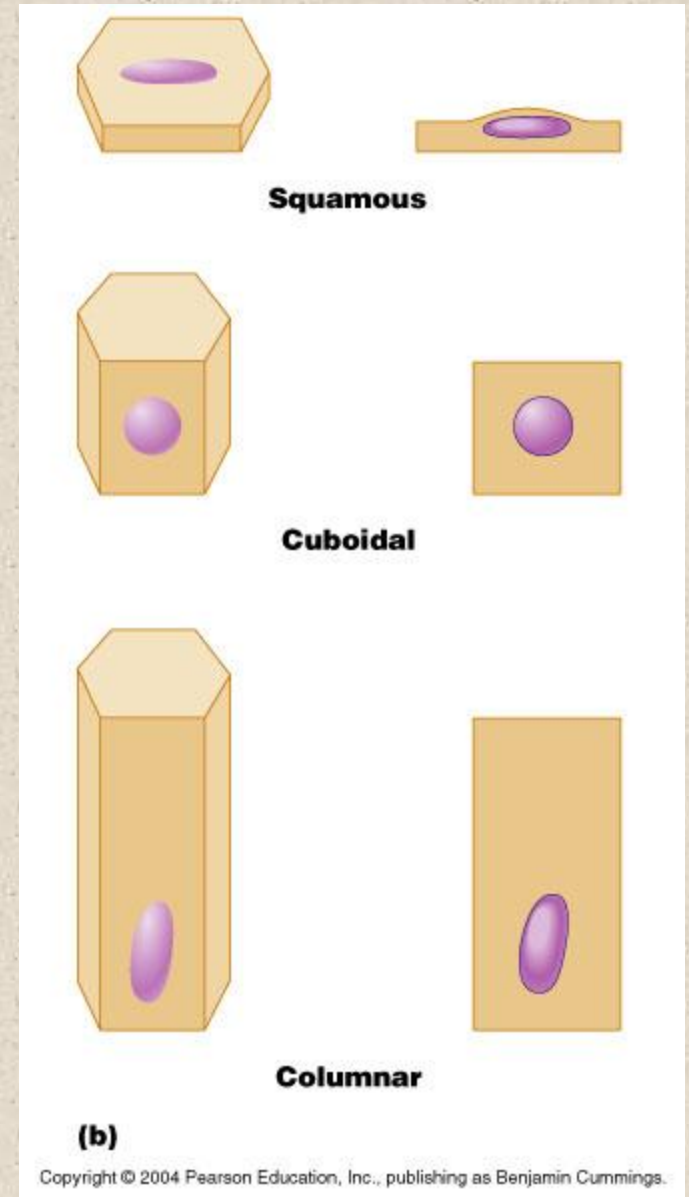
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squamous cells viewed from the top :



need secretions ?

- increase of what cell function ?
- increase what part of cell?
- simple or stratified ?
- simple cuboidal epithelium
- where ?
 - glands
 - kidney



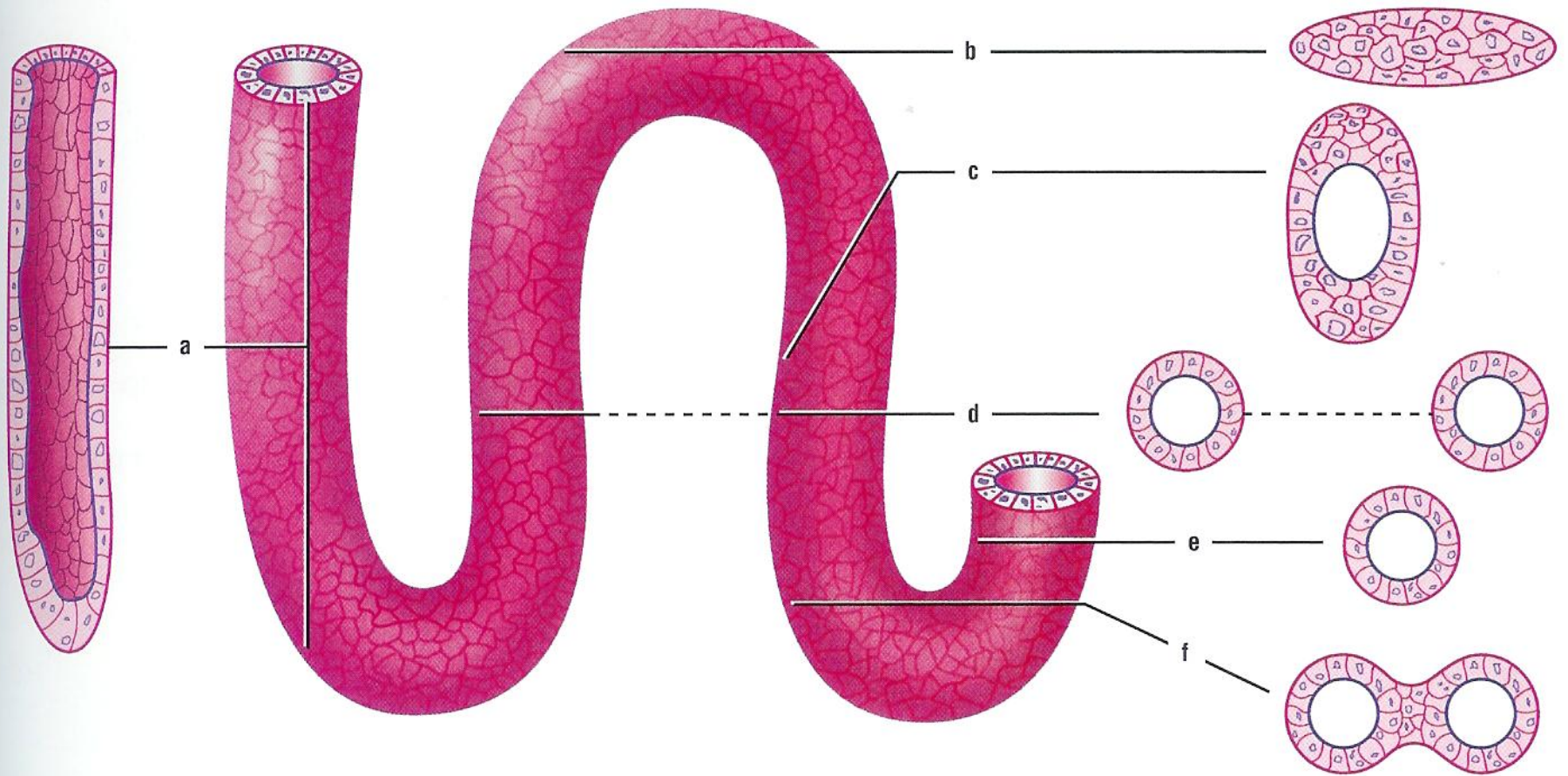


FIGURE I.2 ■ Planes of section of a tube.

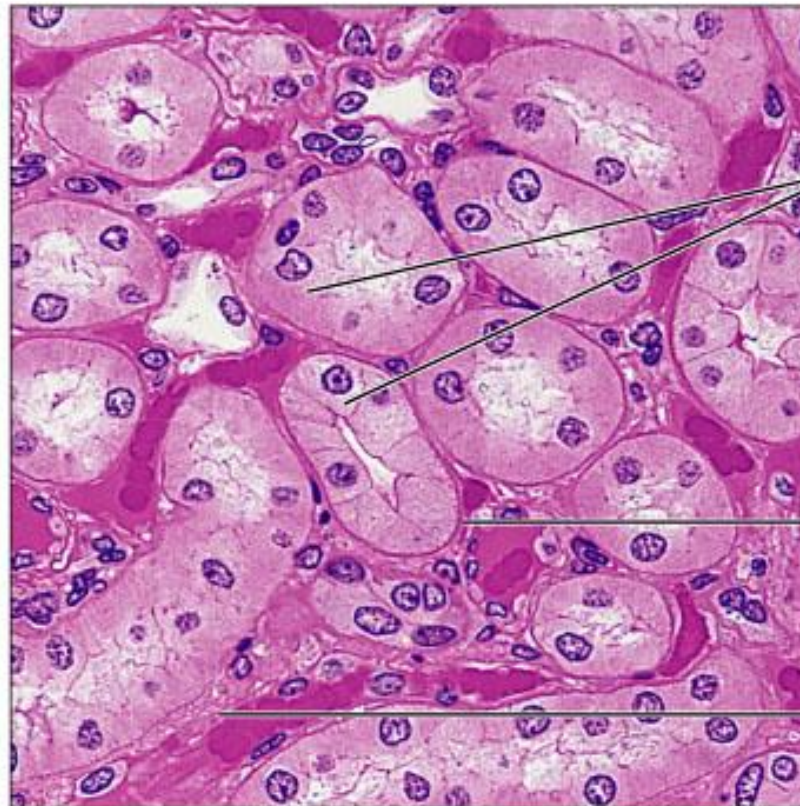
(b) Simple cuboidal epithelium

Description: Single layer of cubelike cells with large, spherical central nuclei.



Function: Secretion and absorption.

Location: Kidney tubules; ducts and secretory portions of small glands; ovary surface.



Simple cuboidal epithelial cells

Basement membrane

Connective tissue

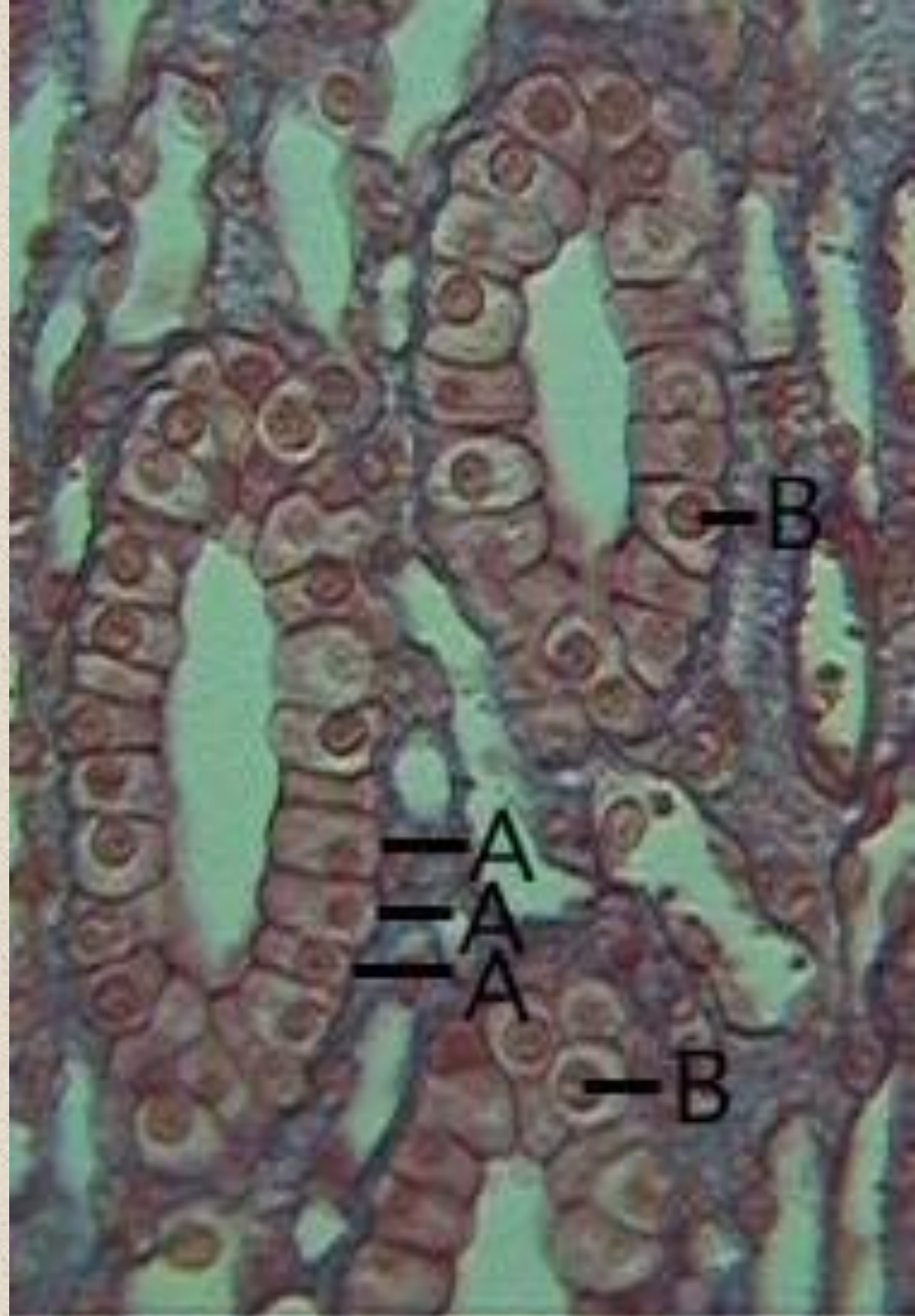
Photomicrograph: Simple cuboidal epithelium in kidney tubules (400 \times).








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Thyroid gland

cuboidal

other text



	Tubular secretory structure	Alveolar secretory structure		
Simple duct structure (duct does not branch)				
	(a) Simple tubular Example: intestinal glands	(b) Simple branched tubular Example: stomach (gastric) glands	(c) Simple alveolar Example: No important example in humans	(d) Simple branched alveolar Example: sebaceous (oil) glands
Compound duct structure (duct branches)				
	(e) Compound tubular Example: duodenal glands of small intestine	(f) Compound alveolar Example: mammary glands	(g) Compound tubuloalveolar Example: salivary glands	

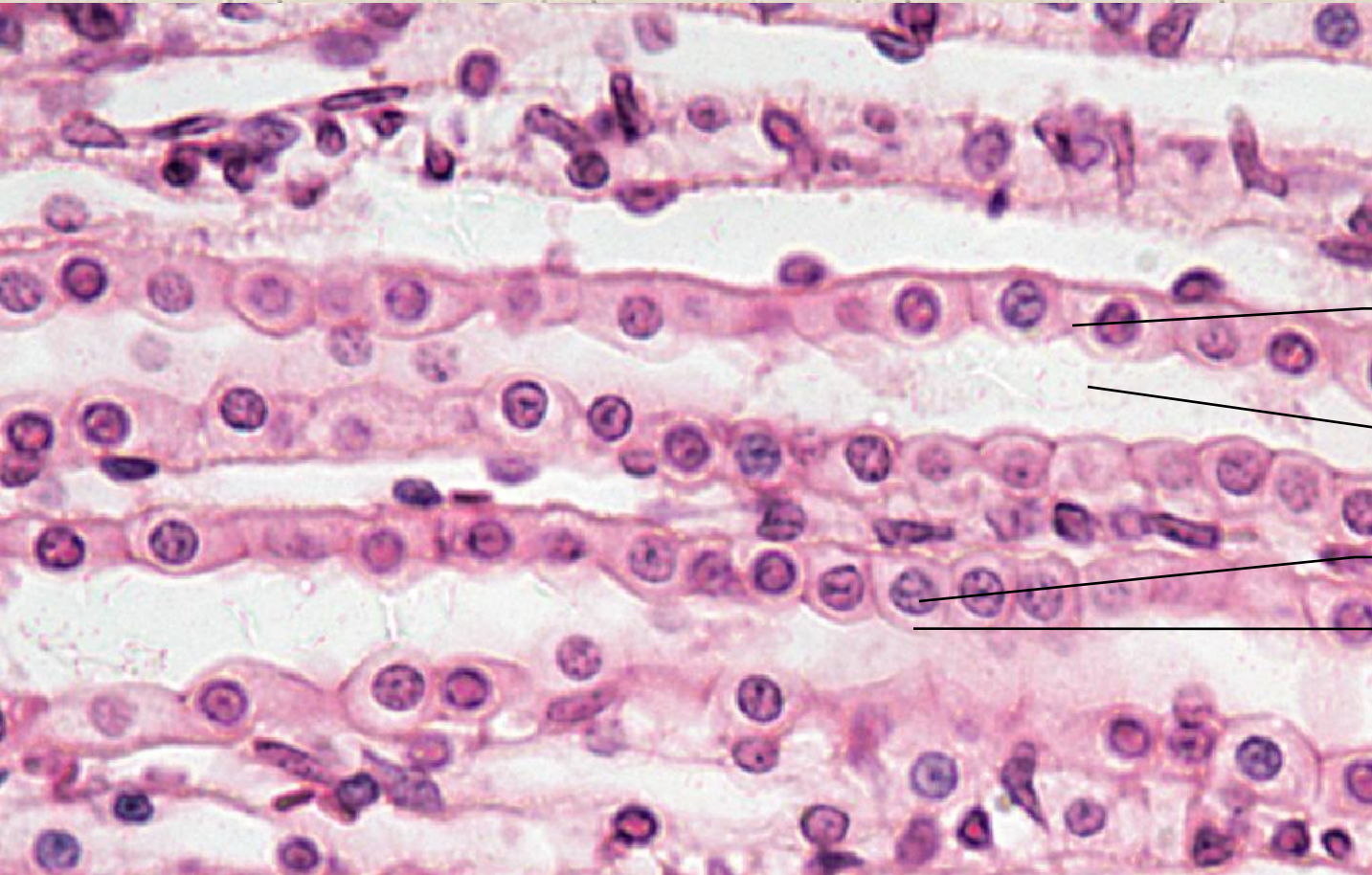
Key: = Surface epithelium = Duct = Secretory epithelium

kidney tubules

simple cuboidal epithelium



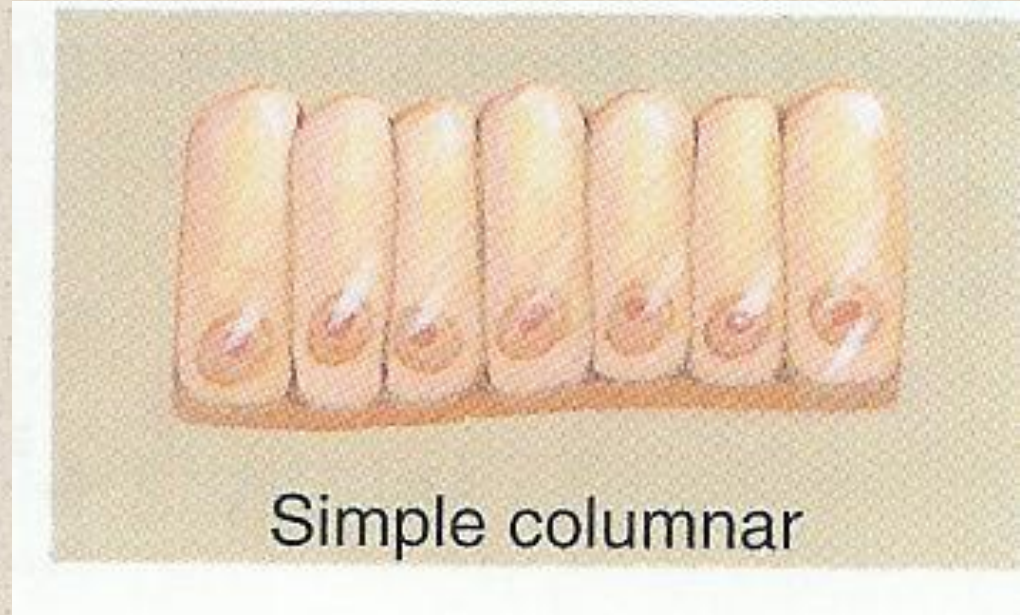
Simple cuboidal epithelium (kidney tubules)



- Simple cuboidal epithelium
- Lumen of kidney tubule
- Nucleus
- Cuboidal cell

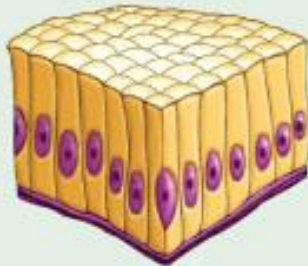
need secretion and absorption?

- need even more cytoplasm
- simple columnar epithelium
- why simple ?
- where ?
 - stomach
 - intestines



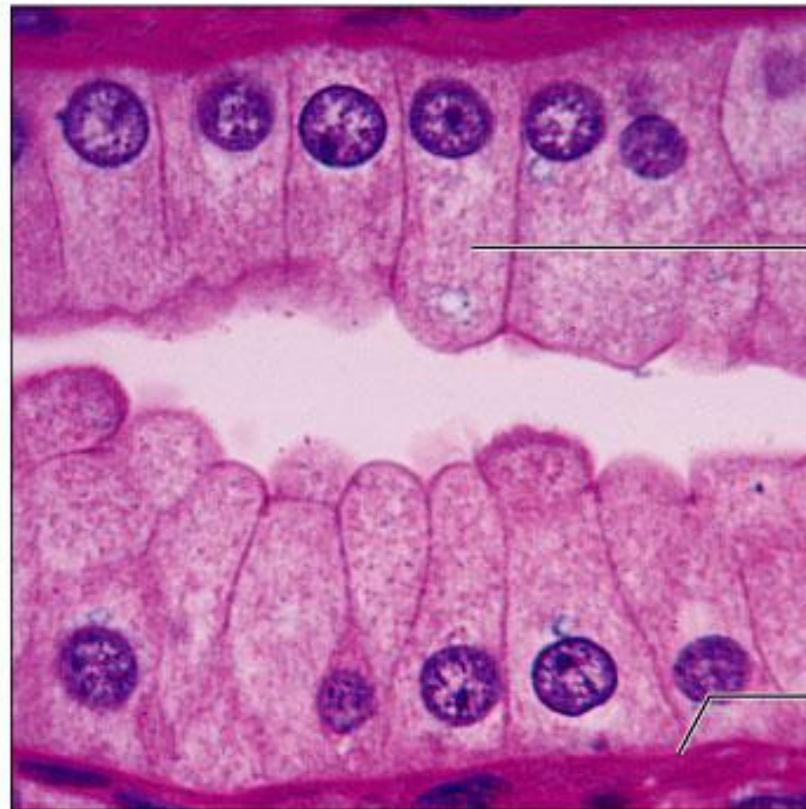
(c) Simple columnar epithelium

Description: Single layer of tall cells with *round to oval nuclei*; some cells bear cilia; layer may contain mucus-secreting unicellular glands (goblet cells).



Function: Absorption; secretion of mucus, enzymes, and other substances; ciliated type propels mucus (or reproductive cells) by ciliary action.

Location: Nonciliated type lines most of the digestive tract (stomach to anal canal), gallbladder, and excretory ducts of some glands; ciliated variety lines small bronchi, uterine tubes, and some regions of the uterus.

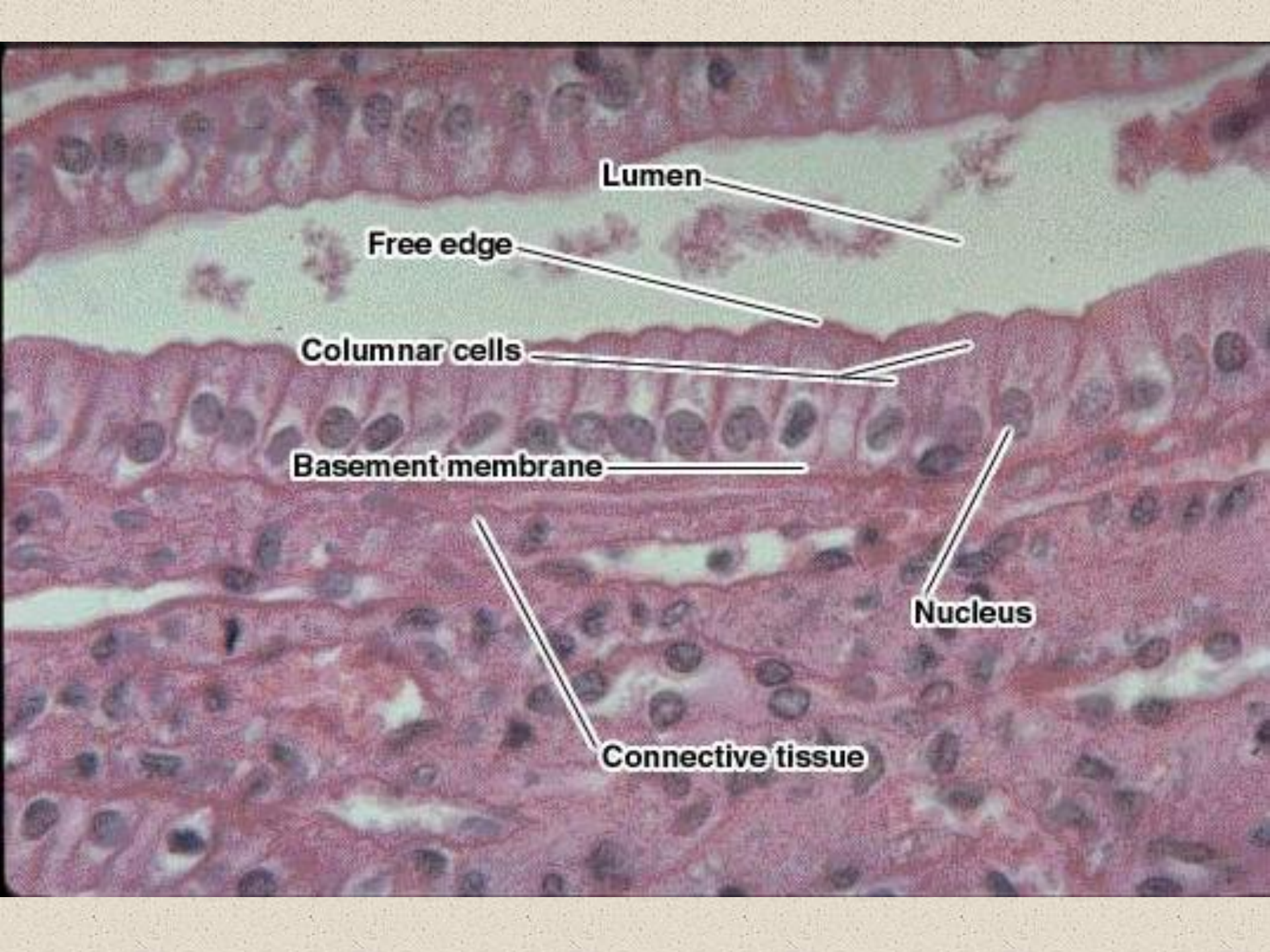


Simple columnar epithelial cell

Basement membrane

Photomicrograph: Simple columnar epithelium of the stomach mucosa (1300 \times).

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Lumen

Free edge

Columnar cells

Basement membrane

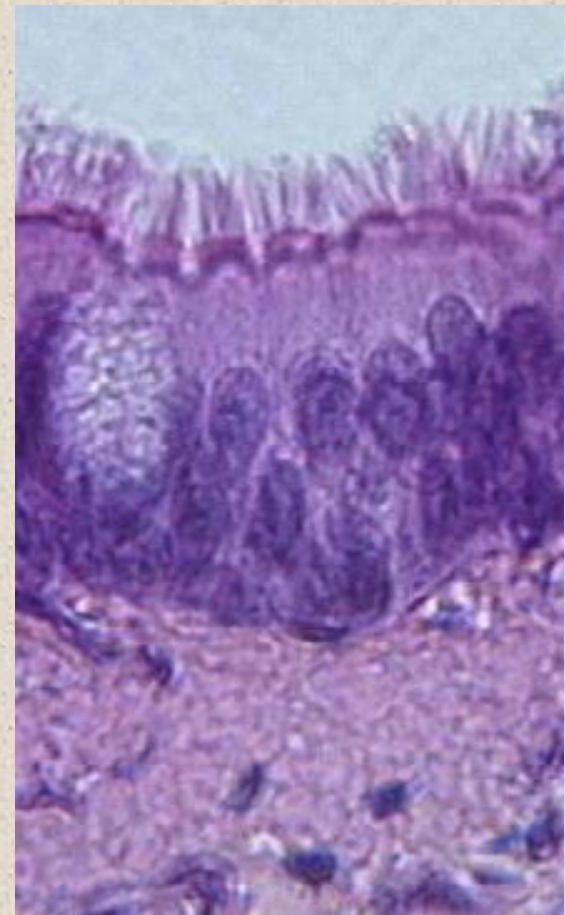
Nucleus

Connective tissue

need to move stuff past the cell ?

- cilia
- ciliated columnar epithelium
- pseudostratified ciliated columnar epithelium

- where ?
 - respiratory tract – trachea
 - fallopian tube



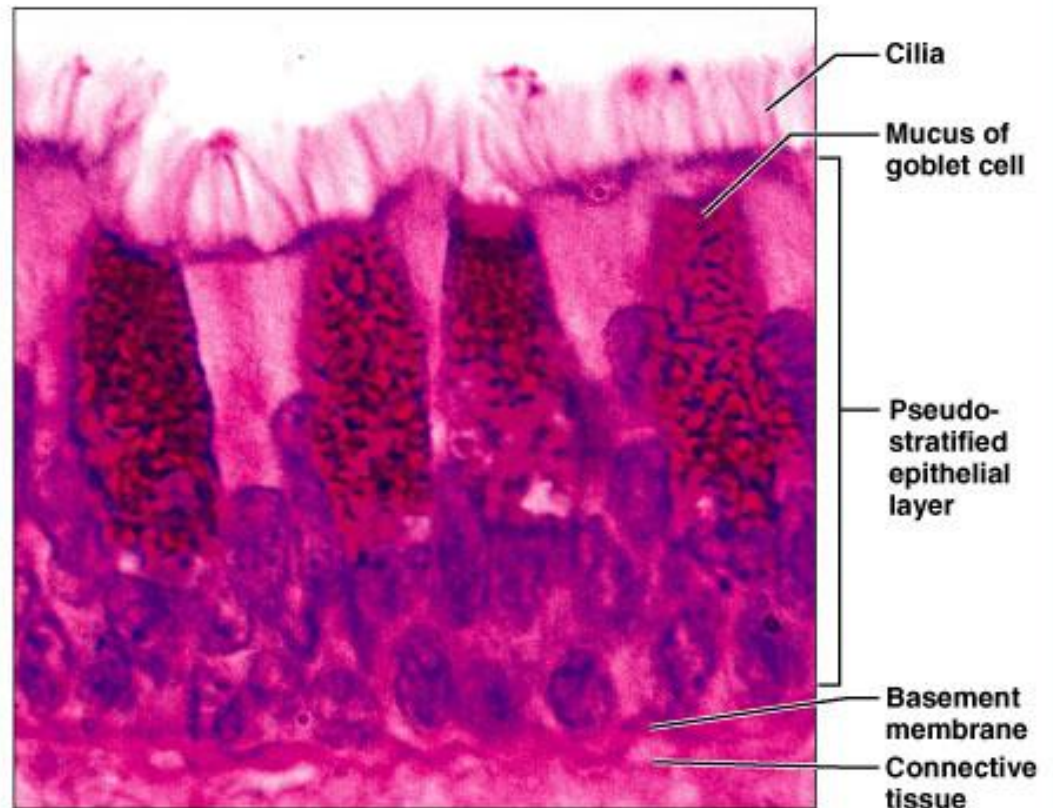
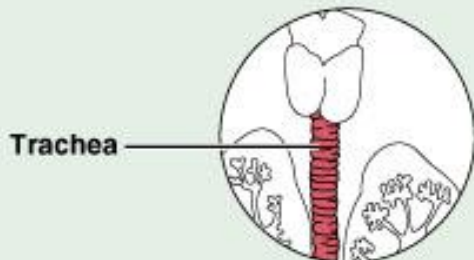
(d) Pseudostratified columnar epithelium

Description: Single layer of cells of differing heights, some not reaching the free surface; nuclei seen at different levels; may contain goblet cells and bear cilia.



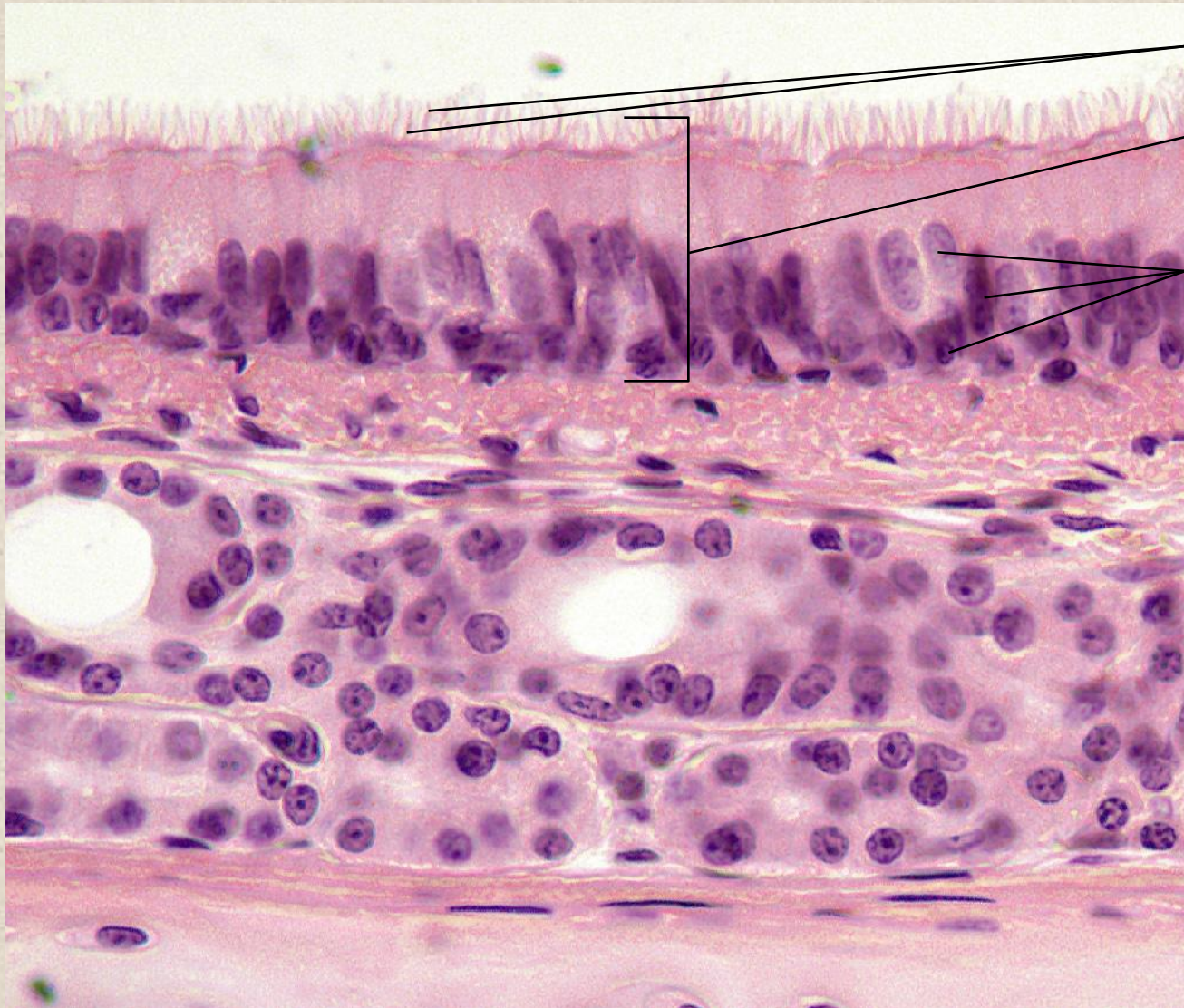
Function: Secretion, particularly of mucus; propulsion of mucus by ciliary action.

Location: Nonciliated type in male's sperm-carrying ducts and ducts of large glands; ciliated variety lines the trachea, most of the upper respiratory tract.



Photomicrograph: Pseudostratified ciliated columnar epithelium lining the human trachea (400 \times).

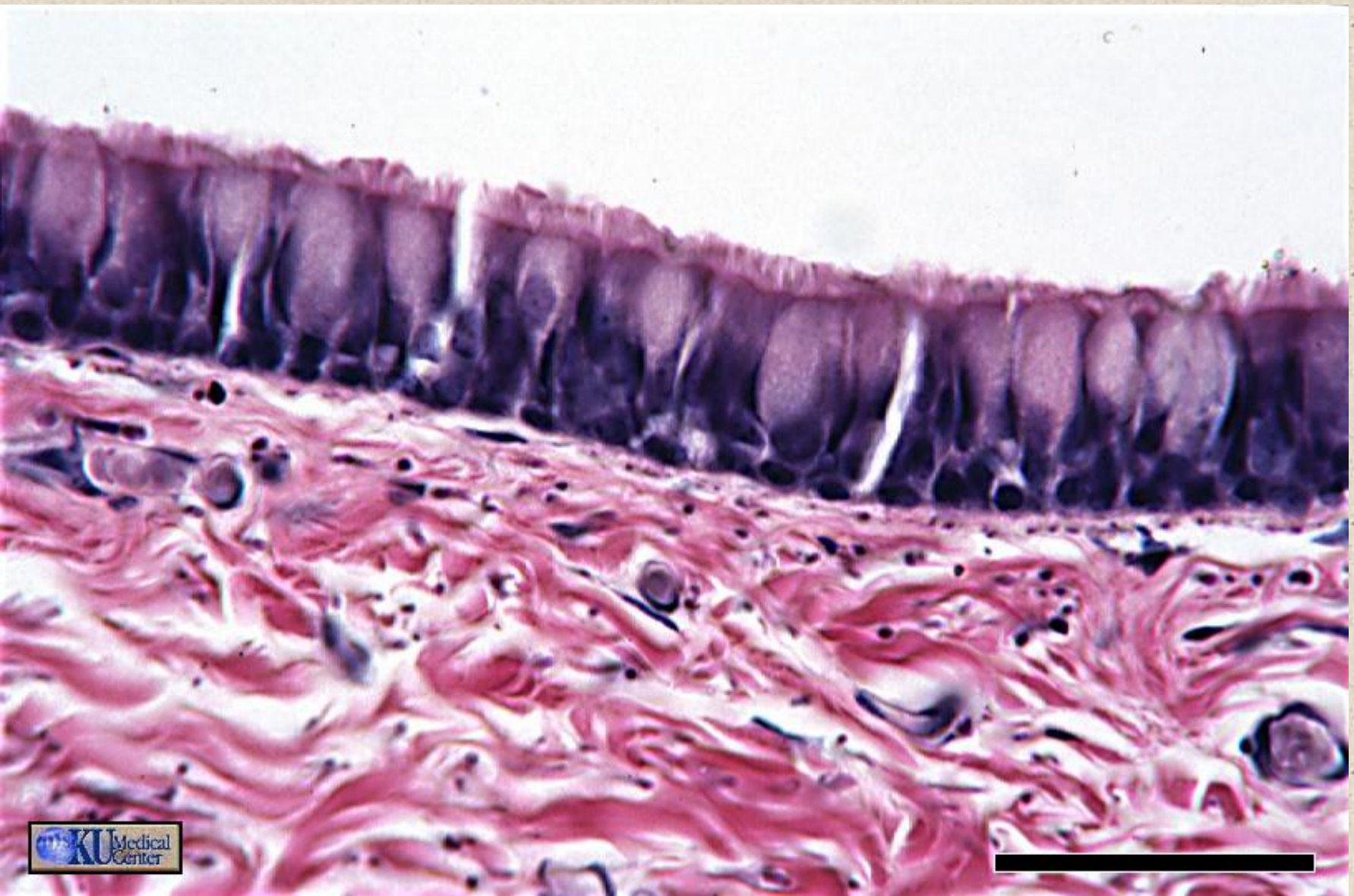
Pseudostratified epithelium (trachea)



Cilia

**Pseudostratified
epithelium**

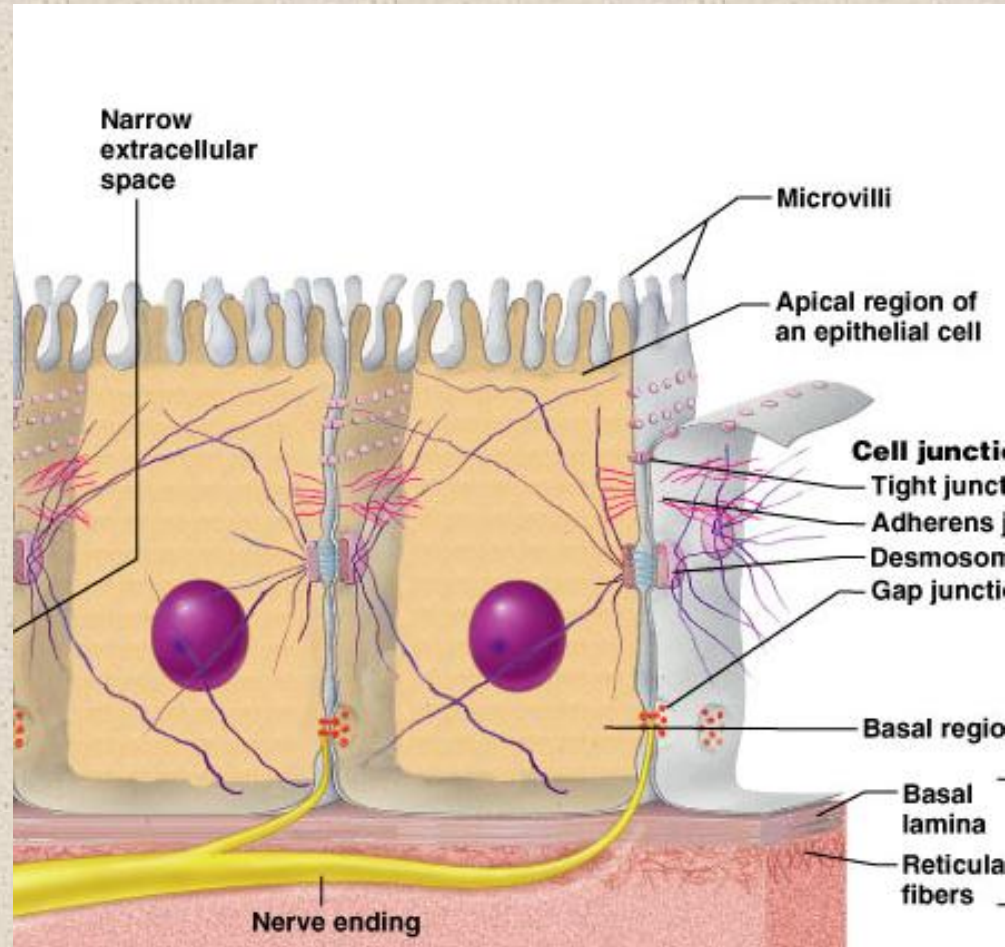
**Nuclei of
epithelial cells**

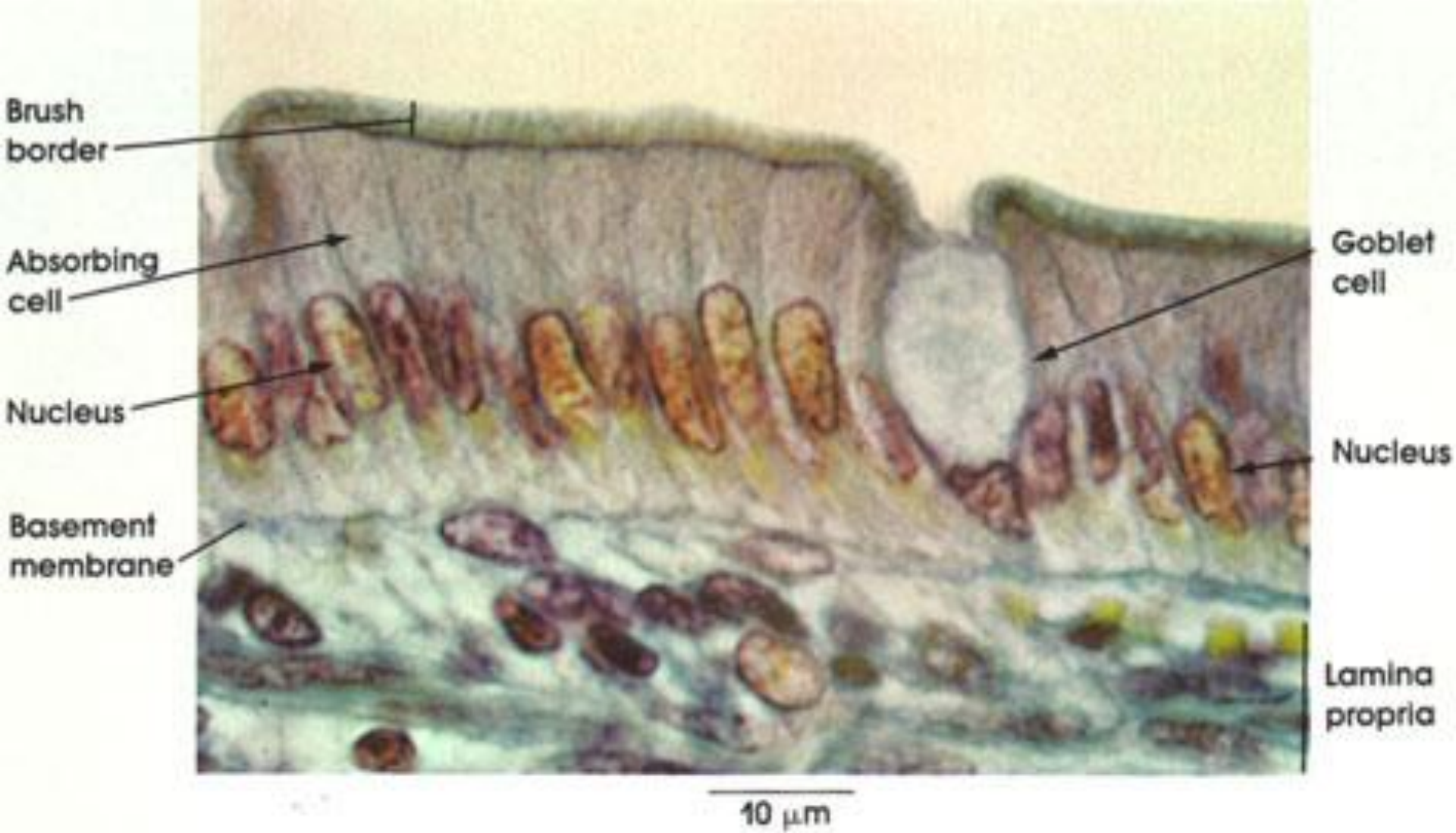


pseudostratified ciliated columnar epithelium

need to increase the surface area ?

- microvilli
- intestines
 - brush border
- kidney
- vs. cilia !

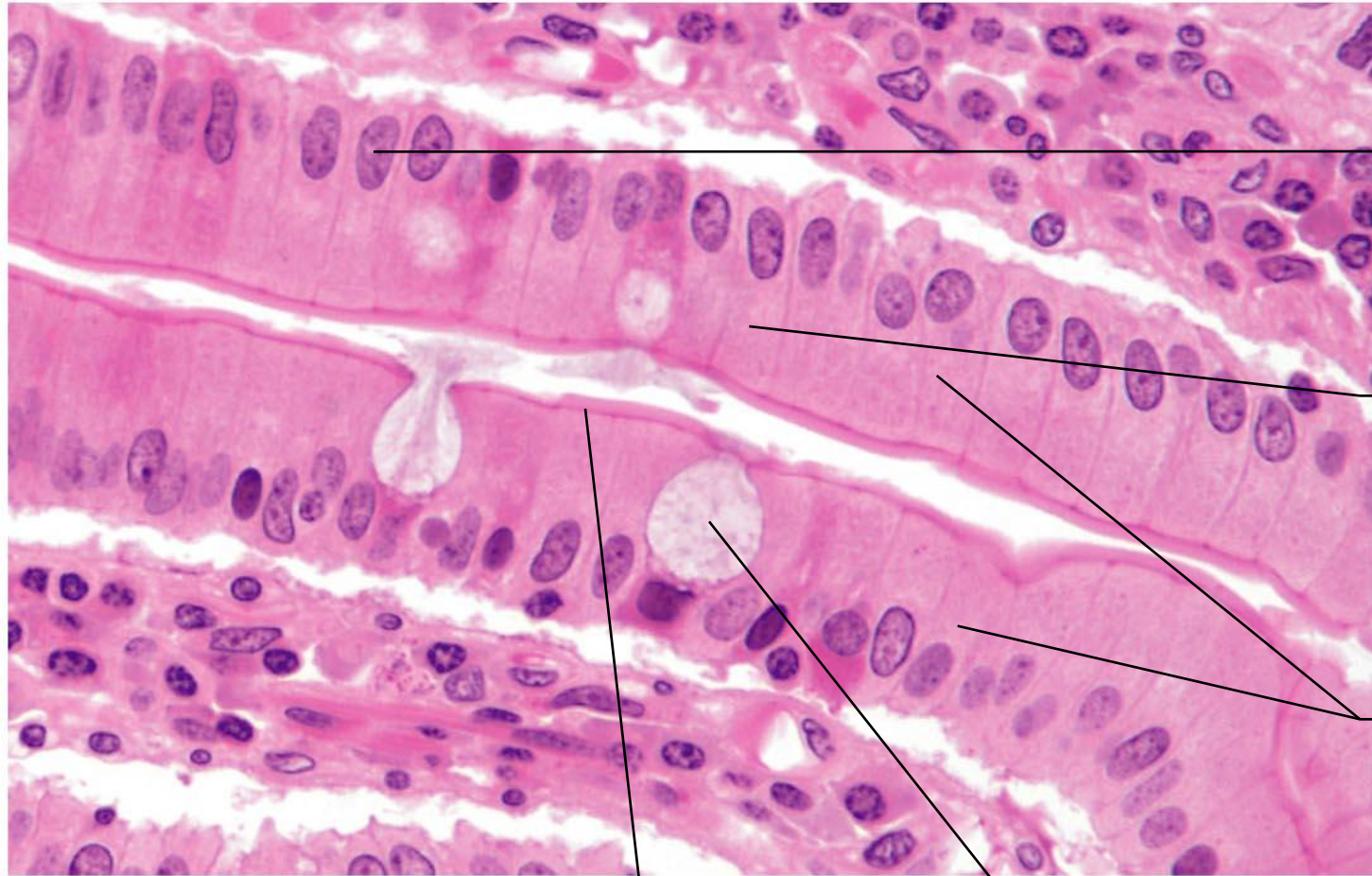




simple columnar epithelium - with microvilli

other

Simple columnar epithelium



**Nucleus of
columnar
cell**

**Columnar
cell**

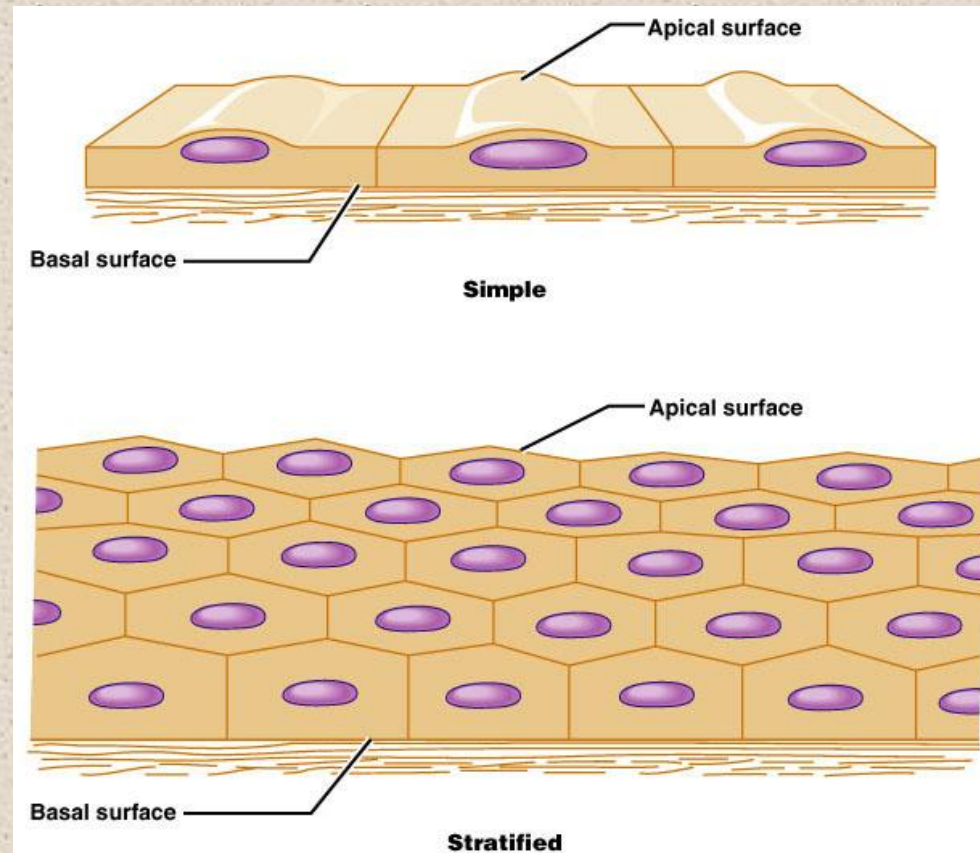
**Simple
columnar
epithelium**

Goblet cell

microvilli

need protection ?

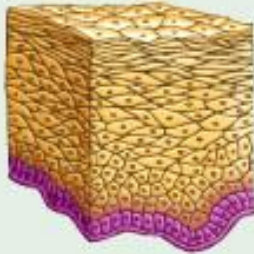
- thick or thin ?
- stratified squamous epithelium
- where?
 - skin
 - mouth
 - esophagus
 - rectum
 - vagina



(a)

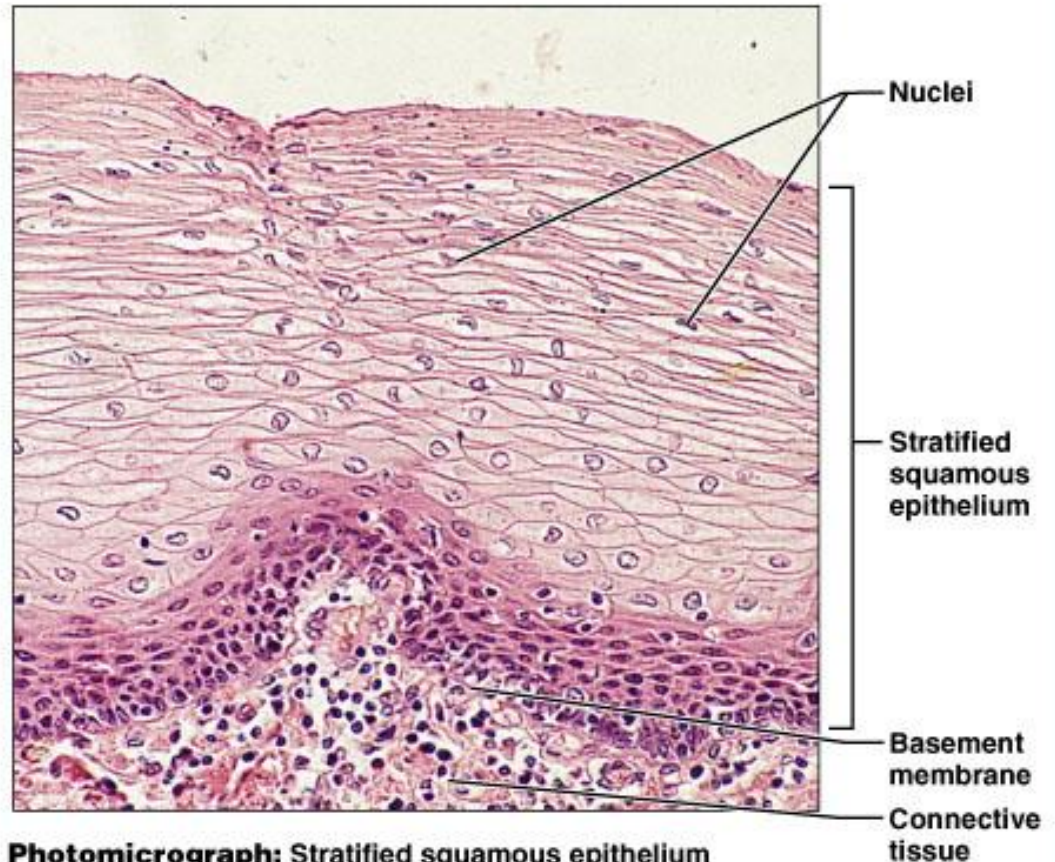
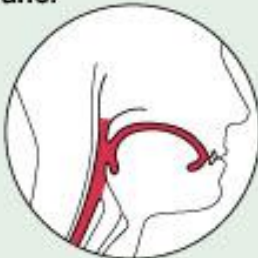
(e) Stratified squamous epithelium

Description: Thick membrane composed of several cell layers; basal cells are cuboidal or columnar and metabolically active; surface cells are flattened (squamous); in the keratinized type, the surface cells are full of keratin and dead; basal cells are active in mitosis and produce the cells of the more superficial layers.



Function: Protects underlying tissues in areas subjected to abrasion.

Location: Nonkeratinized type forms the moist linings of the esophagus, mouth, and vagina; keratinized variety forms the epidermis of the skin, a dry membrane.



Photomicrograph: Stratified squamous epithelium lining of the esophagus (300 \times).

other

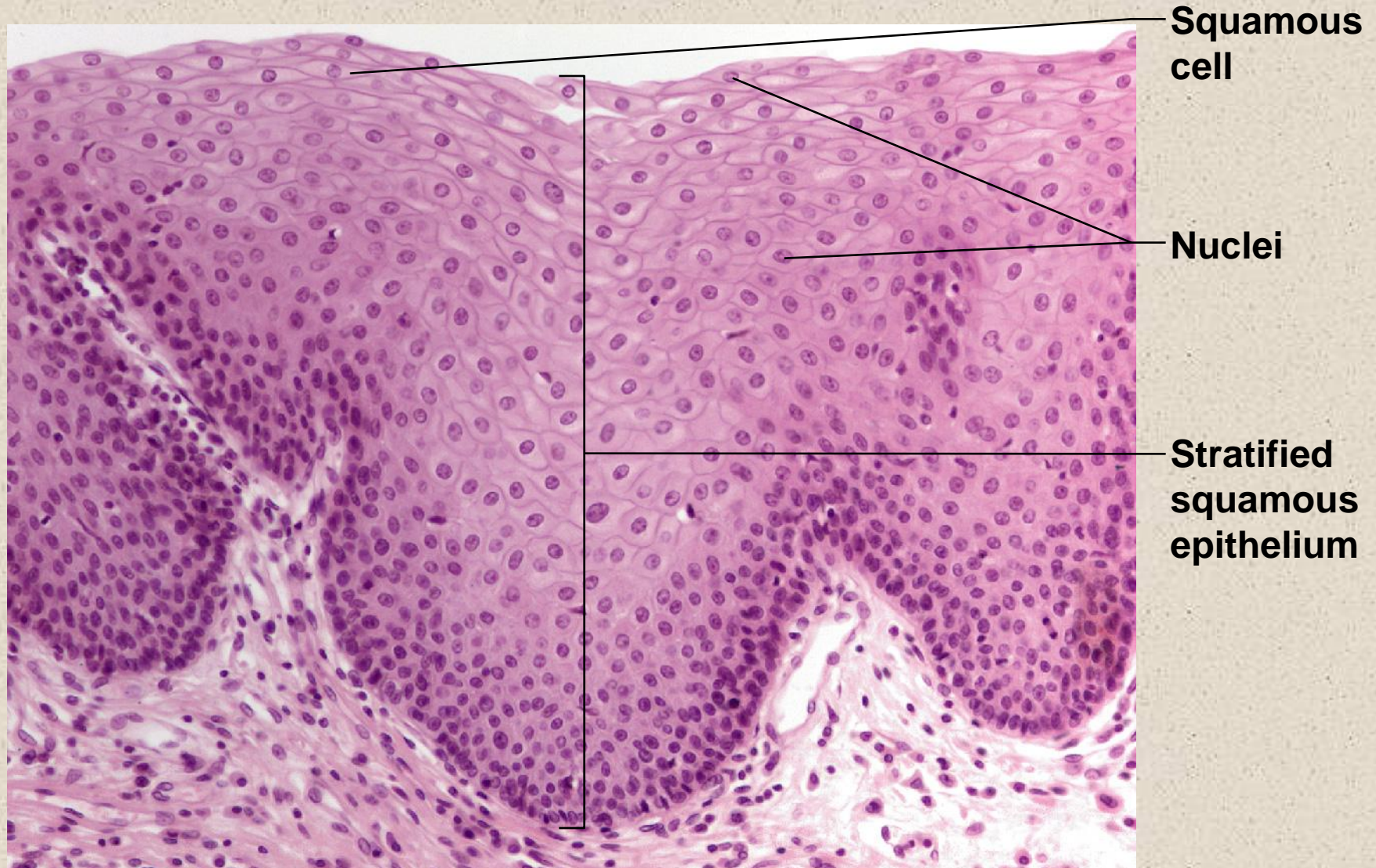


Stratified squamous epithelium

Basement membrane

Areolar connective tissue

Stratified squamous epithelium (esophagus)

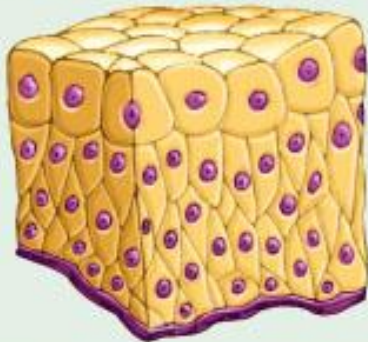


need a stretch ?

- transitional epithelium
 - stratified becomes simple
 - many cuboidal layers can become squamous
- where ?
 - urinary bladder
 - ureter

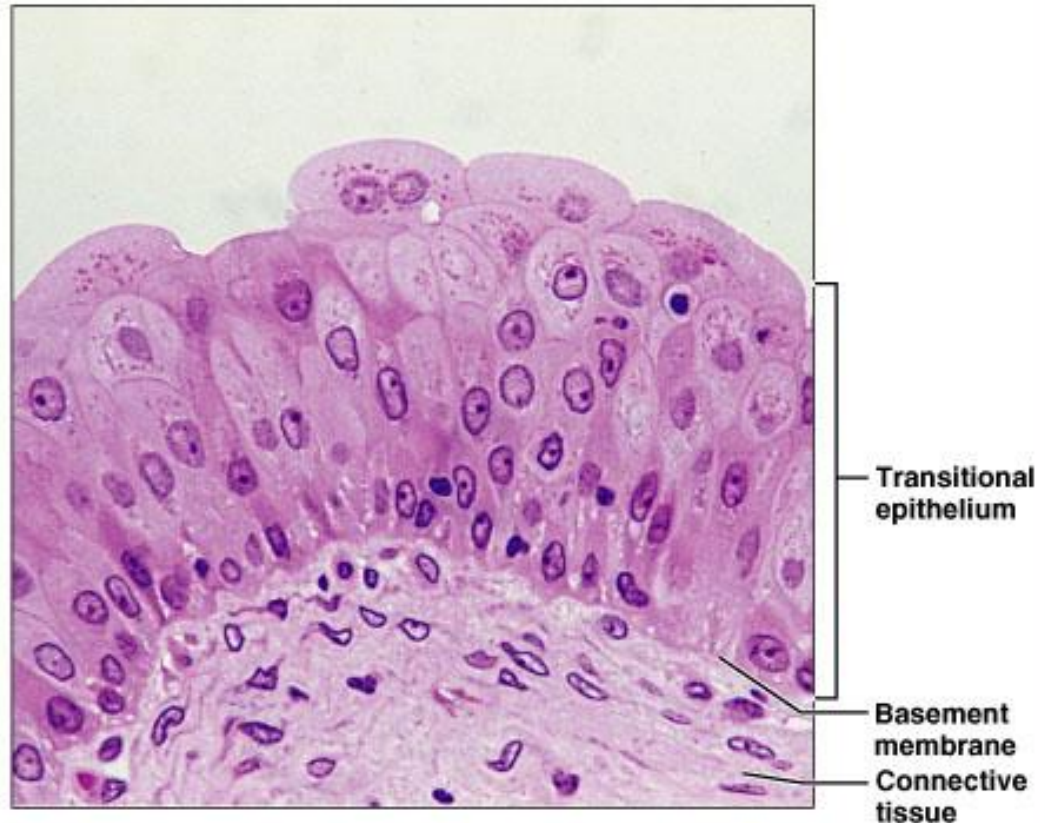
(h) Transitional epithelium

Description: Resembles both stratified squamous and stratified cuboidal; basal cells cuboidal or columnar; surface cells dome shaped or squamouslike, depending on degree of organ stretch.

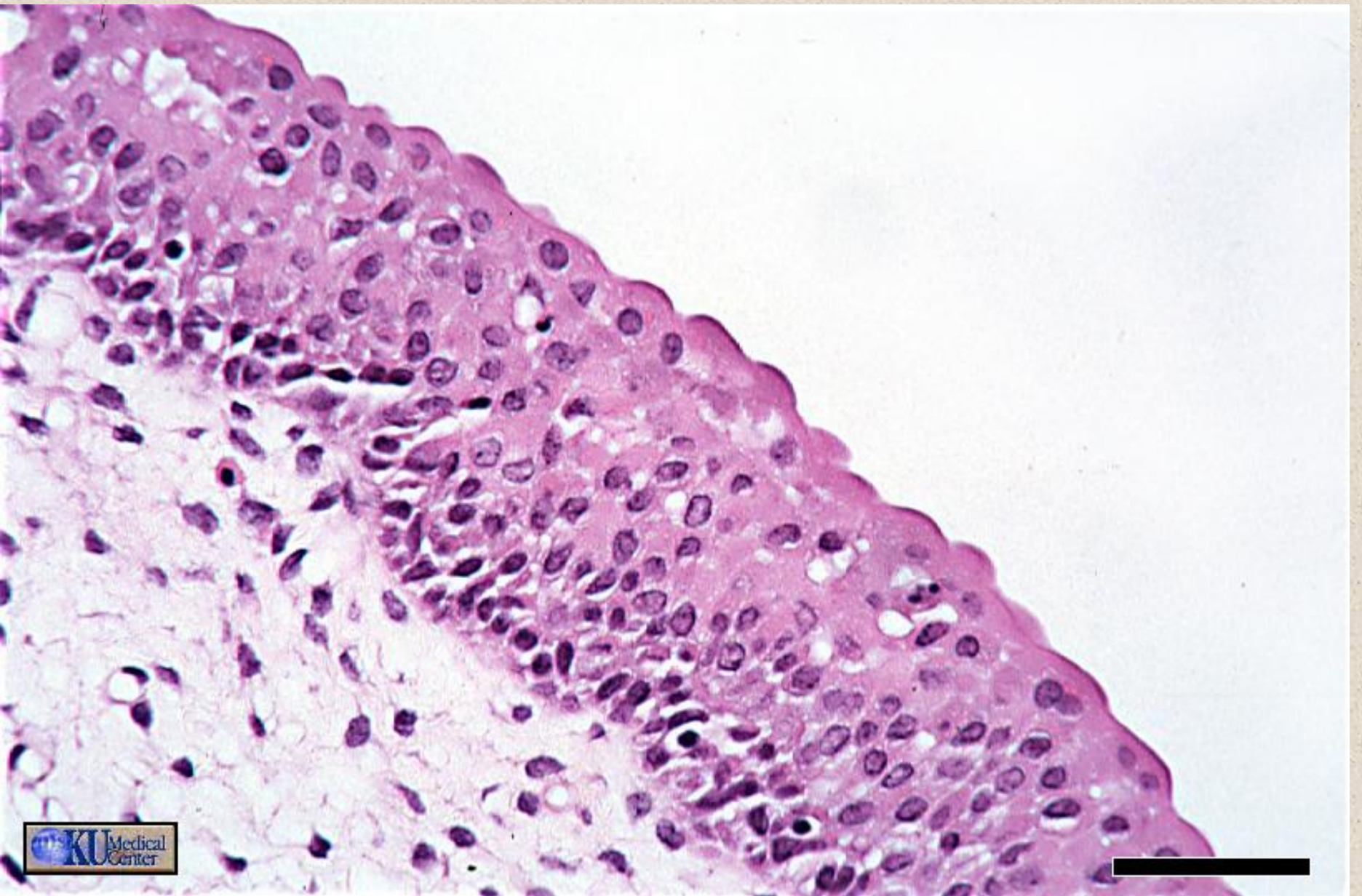


Function: Stretches readily and permits distension of urinary organ by contained urine.

Location: Lines the ureters, bladder, and part of the urethra.



Photomicrograph: Transitional epithelium lining of the bladder, relaxed state (500 \times); note the bulbous, or rounded, appearance of the cells at the surface; these cells flatten and become elongated when the bladder is filled with urine.



transitional epithelium

other text

exocrine glands

- unicellular

- Goblet cells

secrete mucus






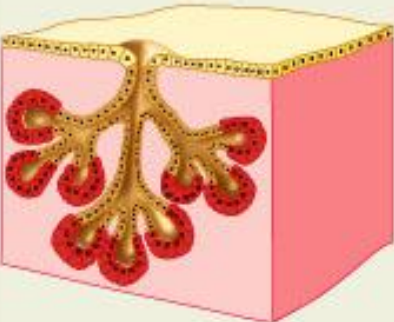

intestines

respiratory tract



exocrine glands

- multicellular
 - sweat glands
 - sebaceous glands
 - digestive glands
 - mammary glands
- gland simple cuboidal epithelium
- ducts simple or stratified cuboidal epithelium

	Tubular secretory structure	Alveolar secretory structure
Simple duct structure (duct does not branch)	  <p>(a) Simple tubular Example: intestinal glands</p> <p>(b) Simple branched tubular Example: stomach (gastric) glands</p>	  <p>(c) Simple alveolar Example: No important example in humans</p> <p>(d) Simple branched alveolar Example: sebaceous (oil) glands</p>
Compound duct structure (duct branches)	 <p>(e) Compound tubular Example: duodenal glands of small intestine</p>	  <p>(f) Compound alveolar Example: mammary glands</p> <p>(g) Compound tubuloalveolar Example: salivary glands</p>

Key: = Surface epithelium = Duct = Secretory epithelium

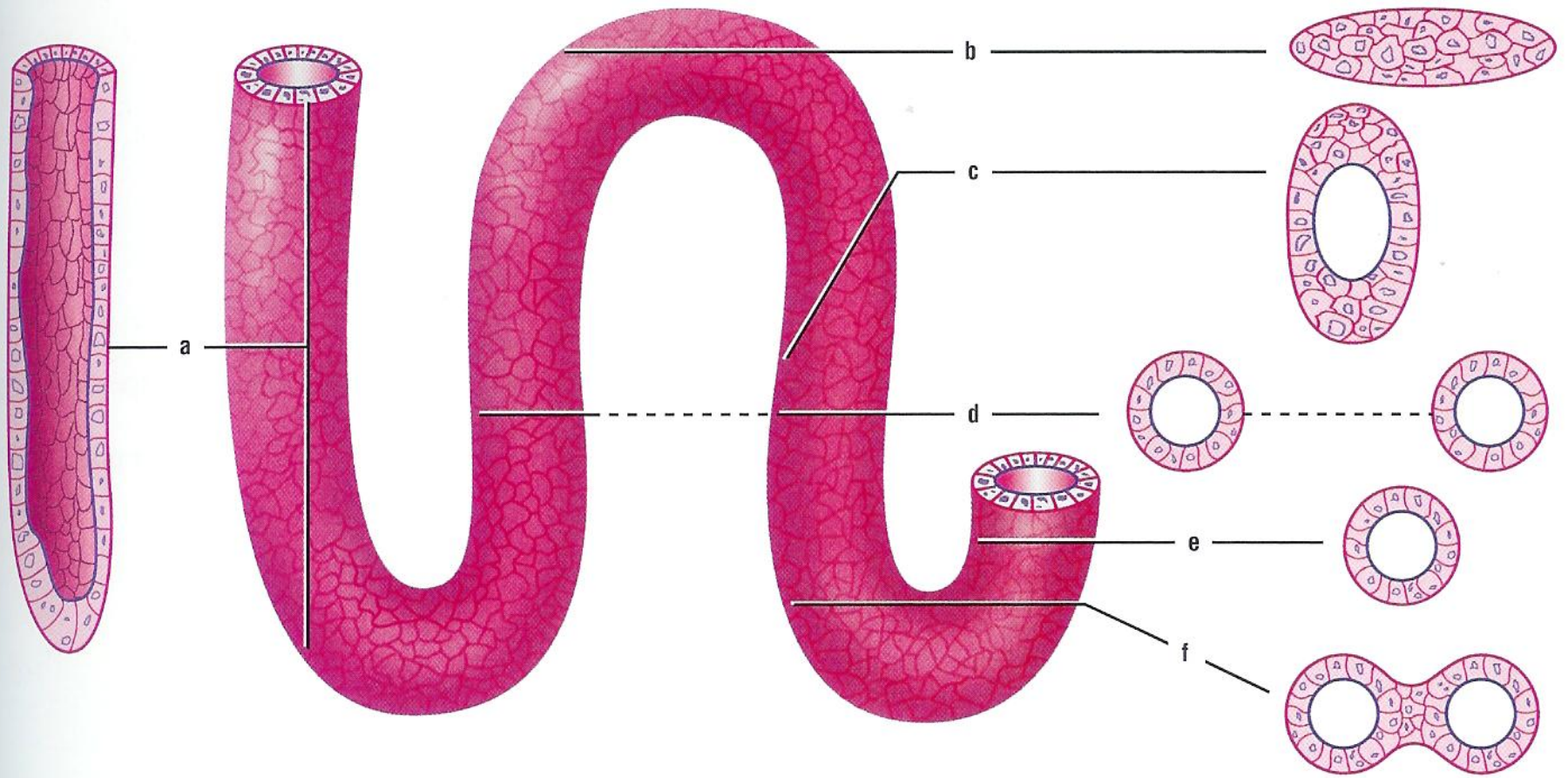
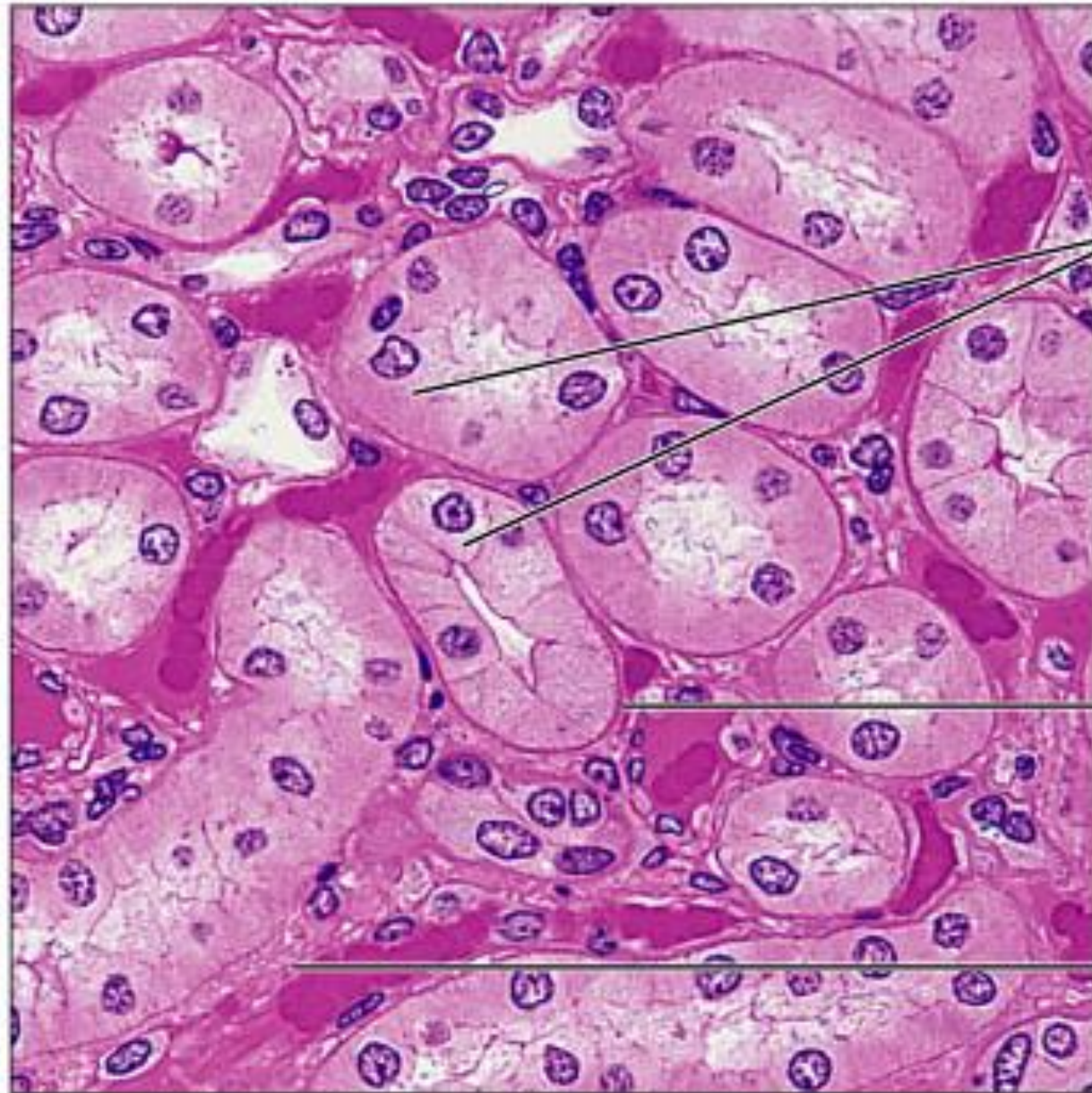
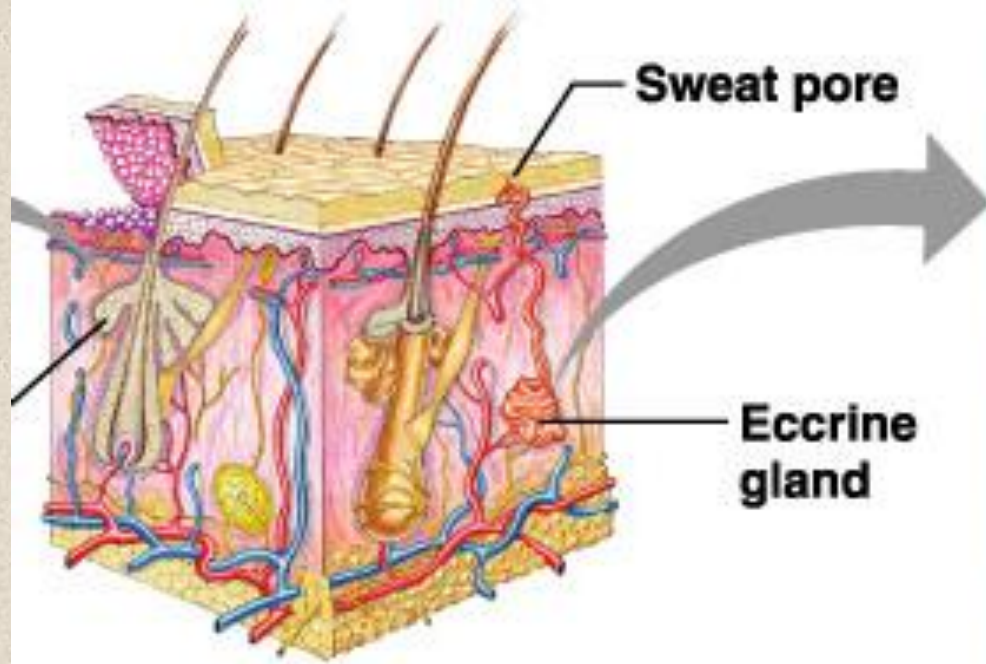


FIGURE I.2 ■ Planes of section of a tube.

typical cross sections through glands ; ducts

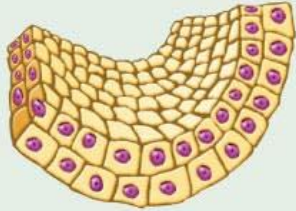




(b) Sectioned eccrine gland

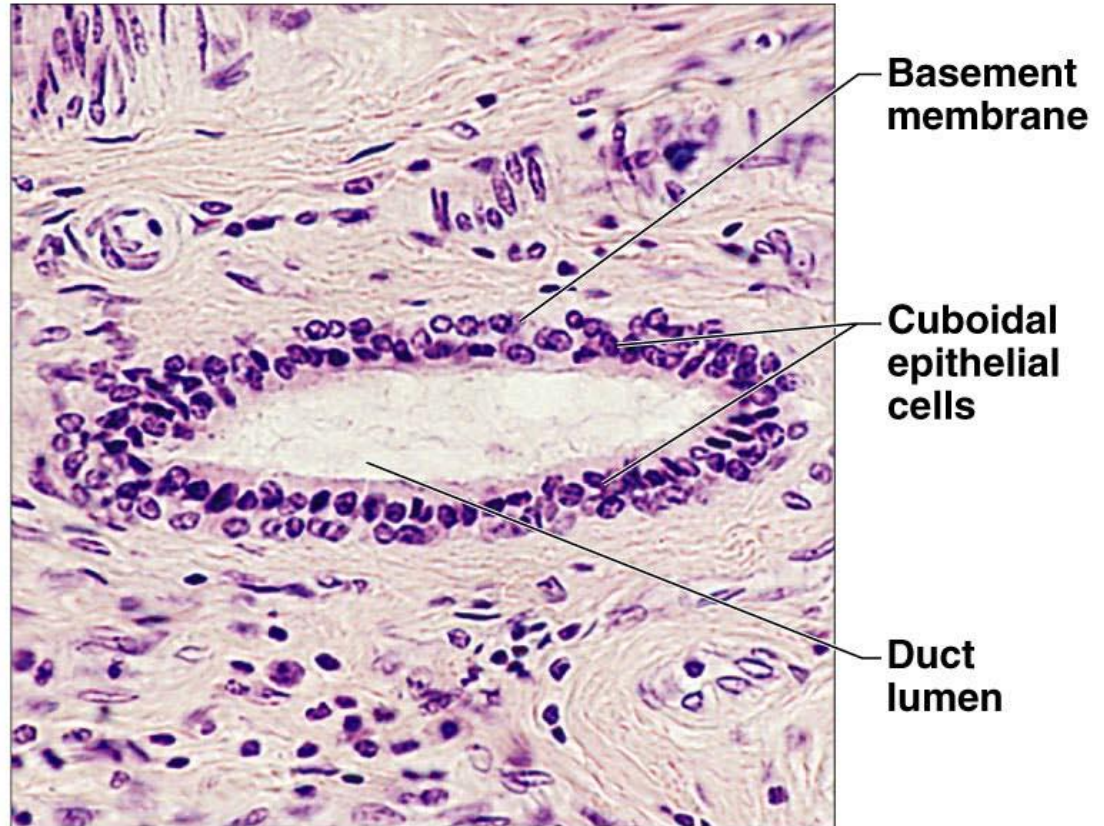
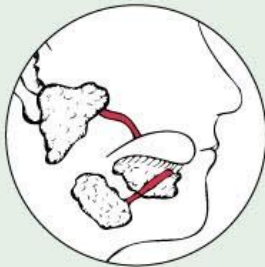
(f) Stratified cuboidal epithelium

Description: Generally two layers of cubelike cells.



Function: Protection

Location: Largest ducts of sweat glands, mammary glands, and salivary glands.



Photomicrograph: Stratified cuboidal epithelium forming a salivary gland duct (300 \times).