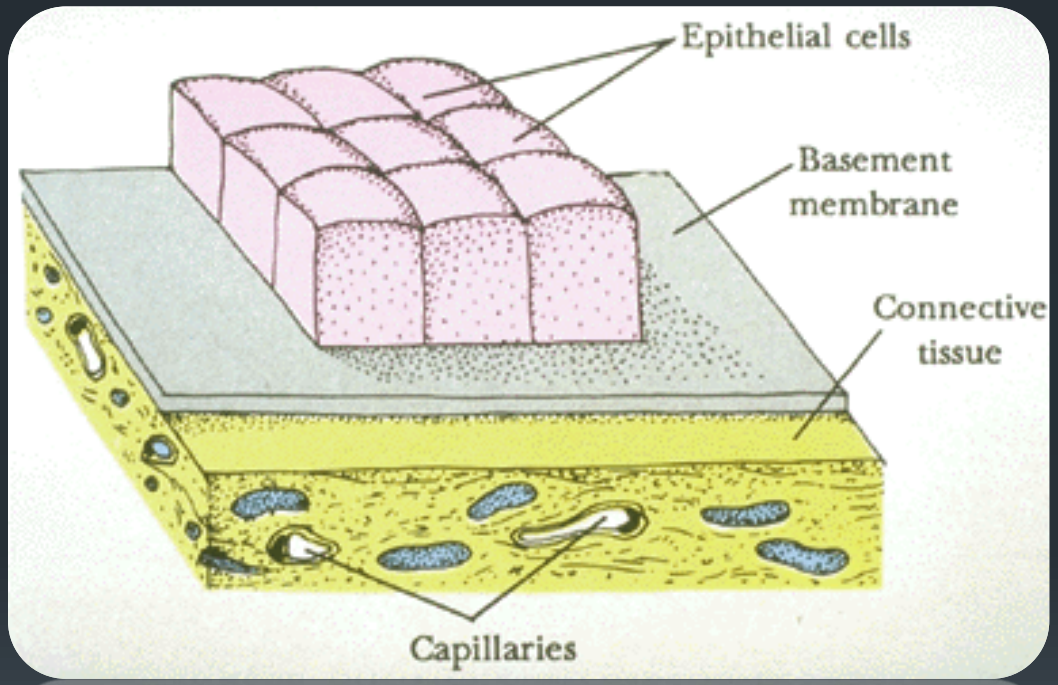
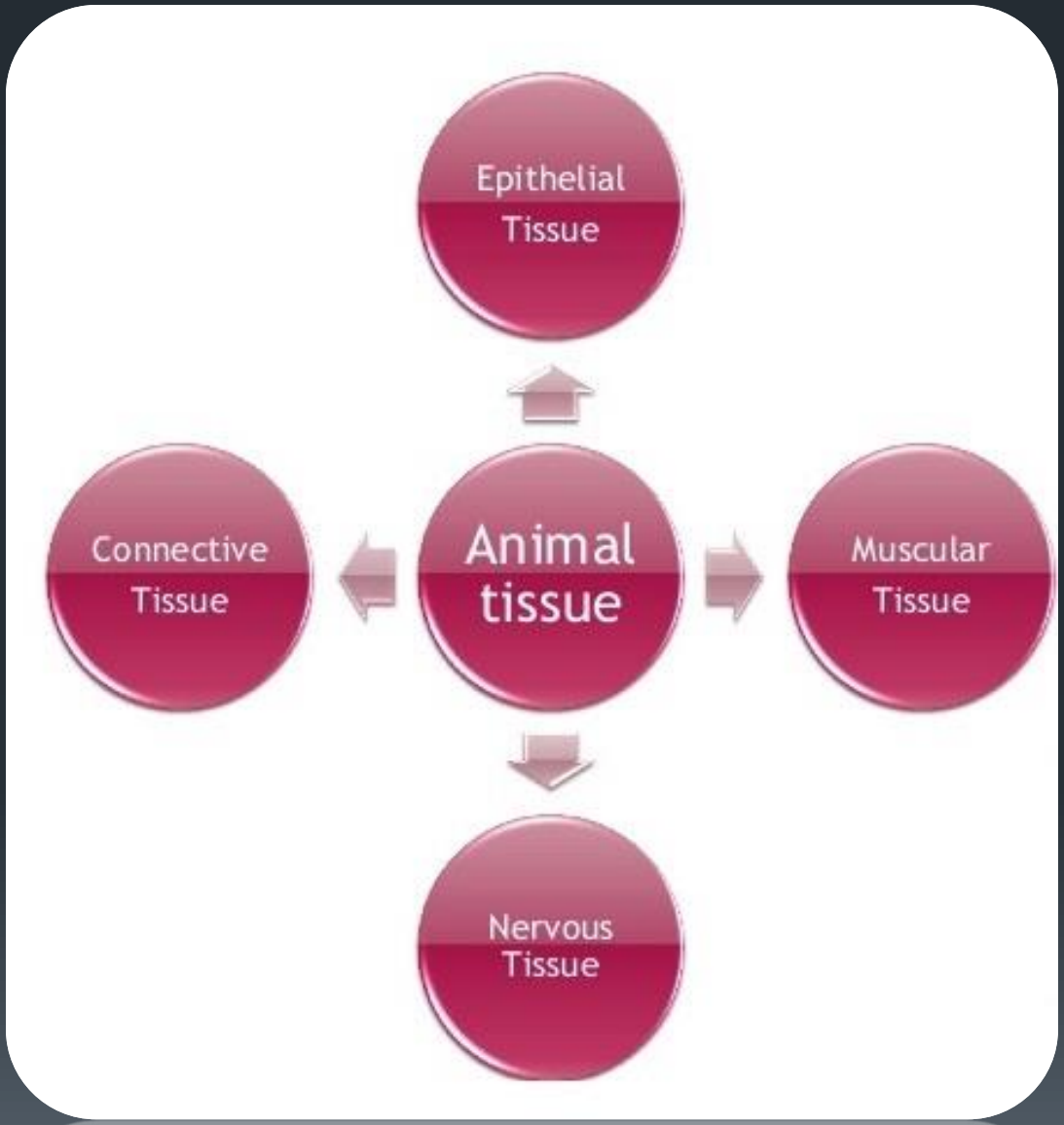
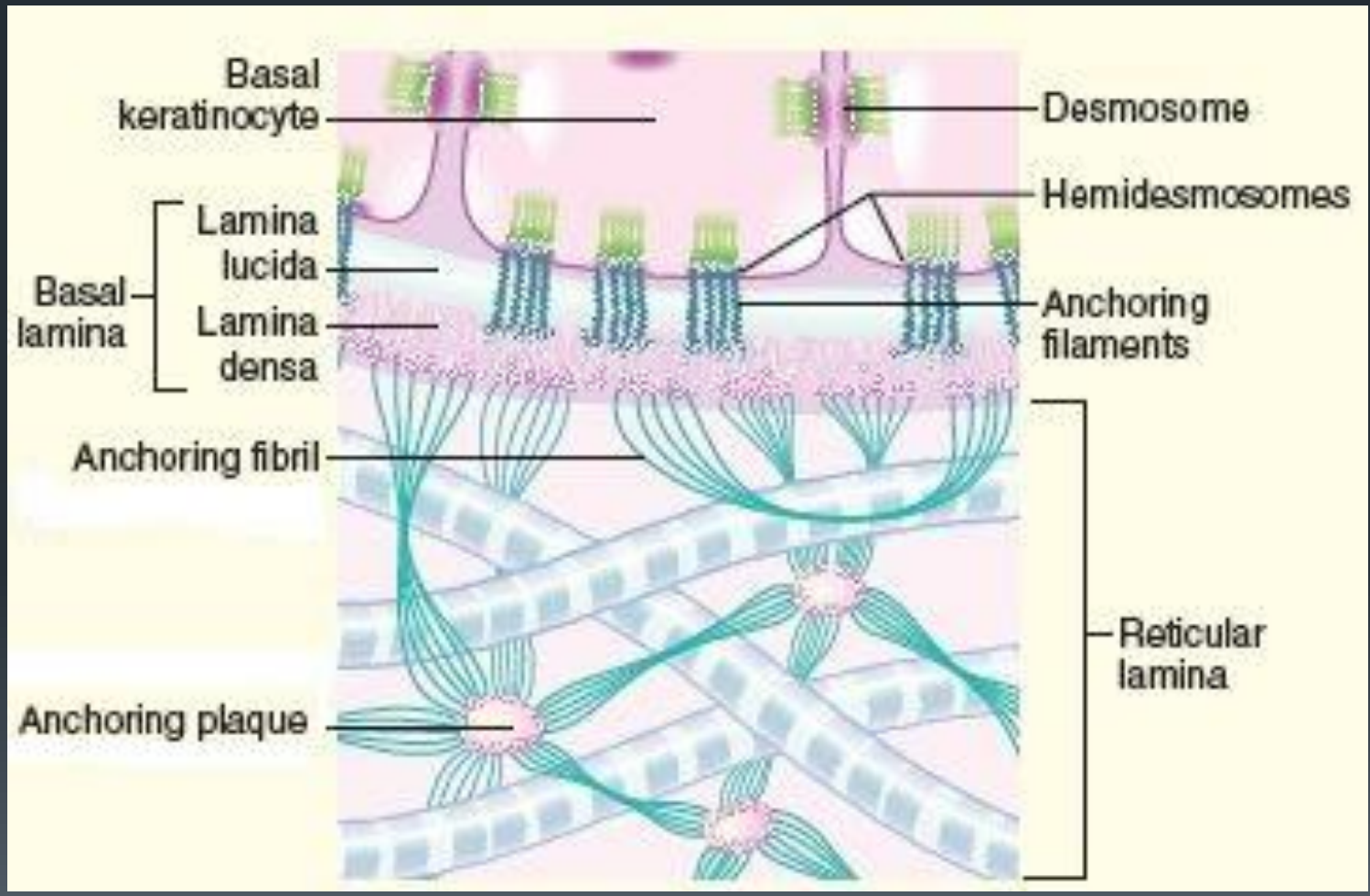
# Epithelial tissue

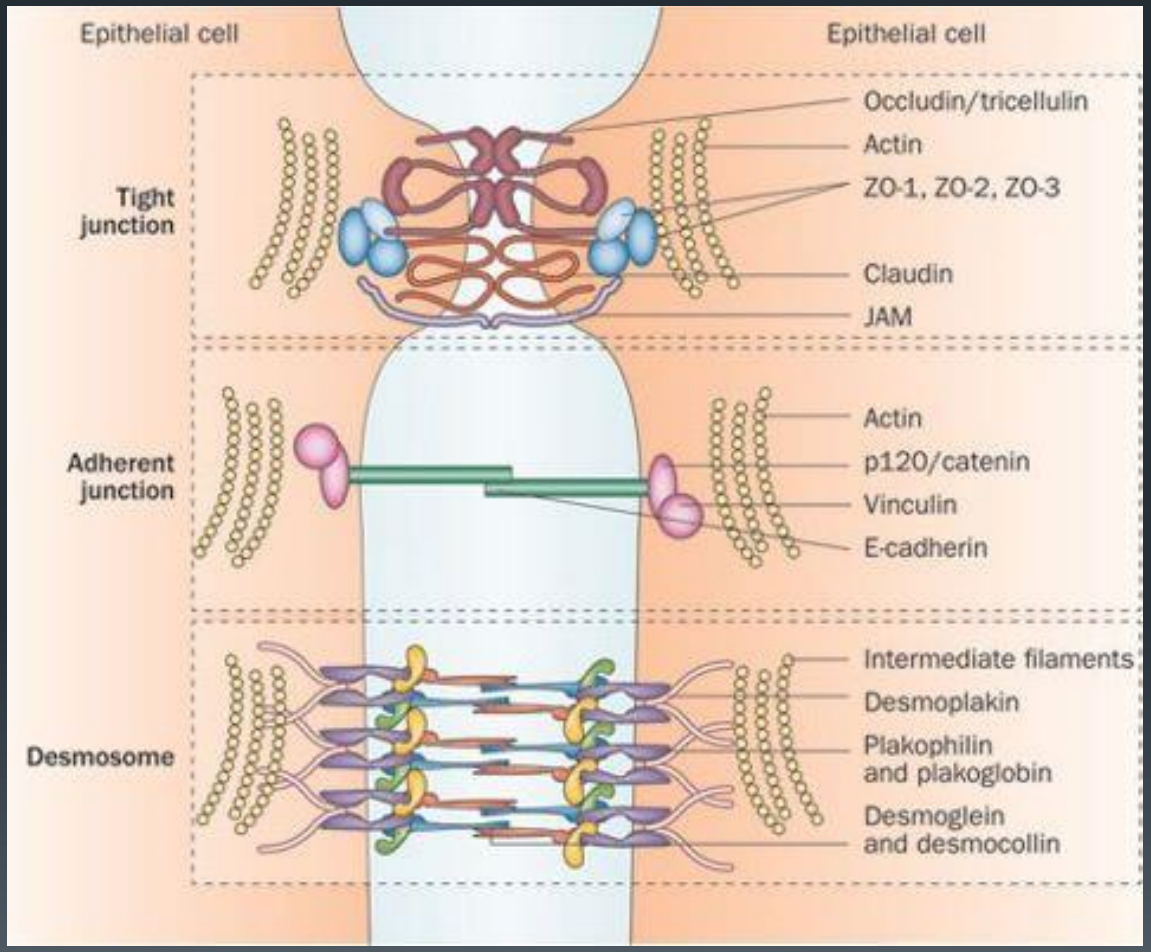


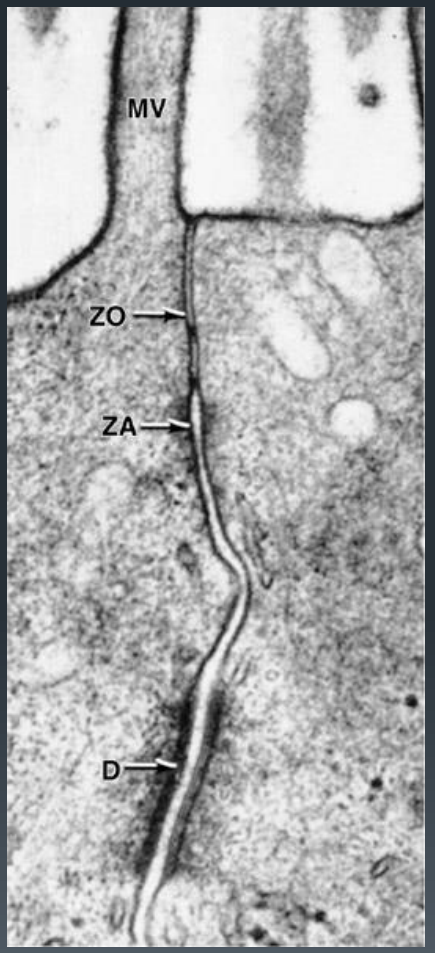

Epithelial Tissue
Connective Tissue
Animal tissue
Muscular Tissue
Nervous Tissue

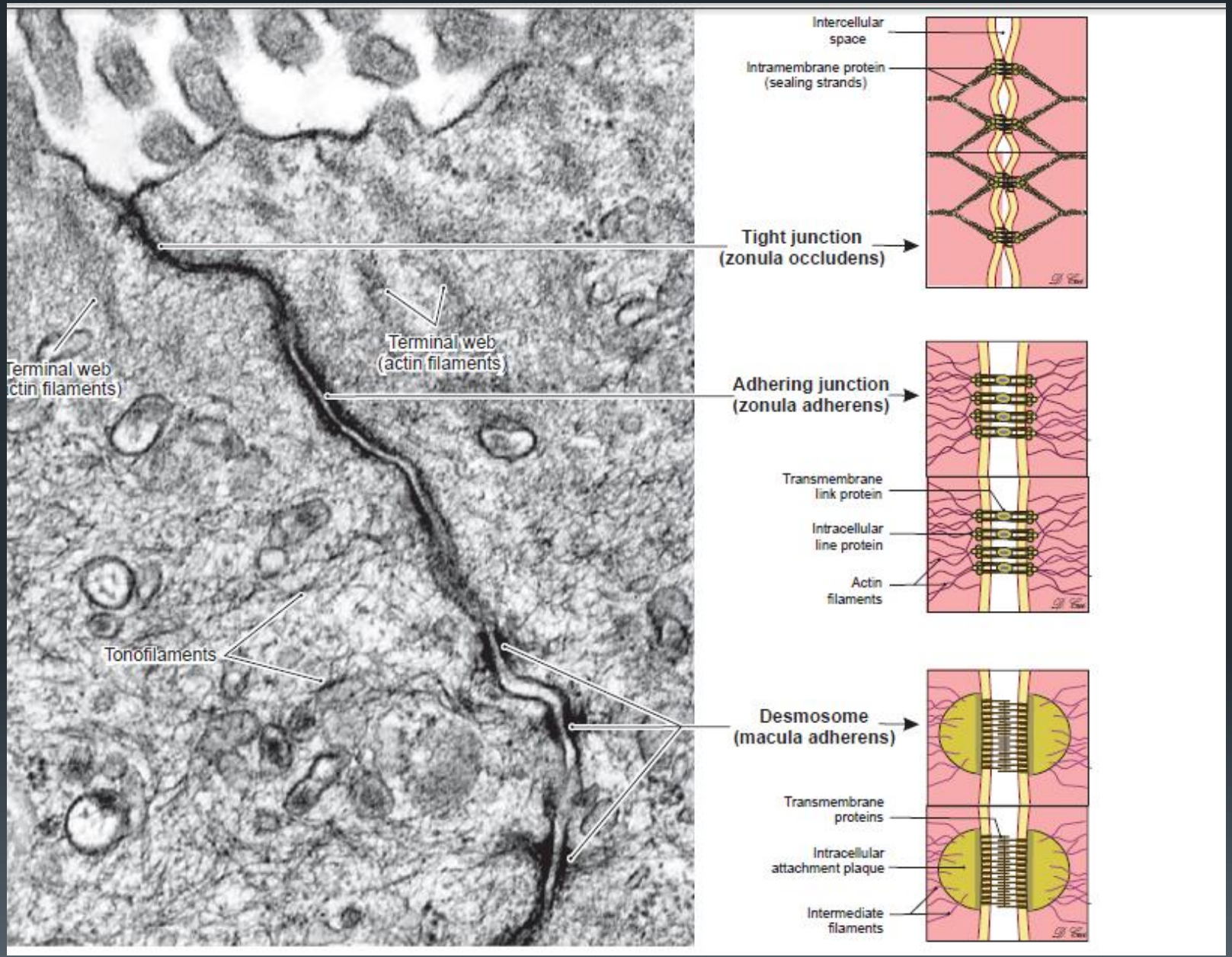
# Basement Membrane



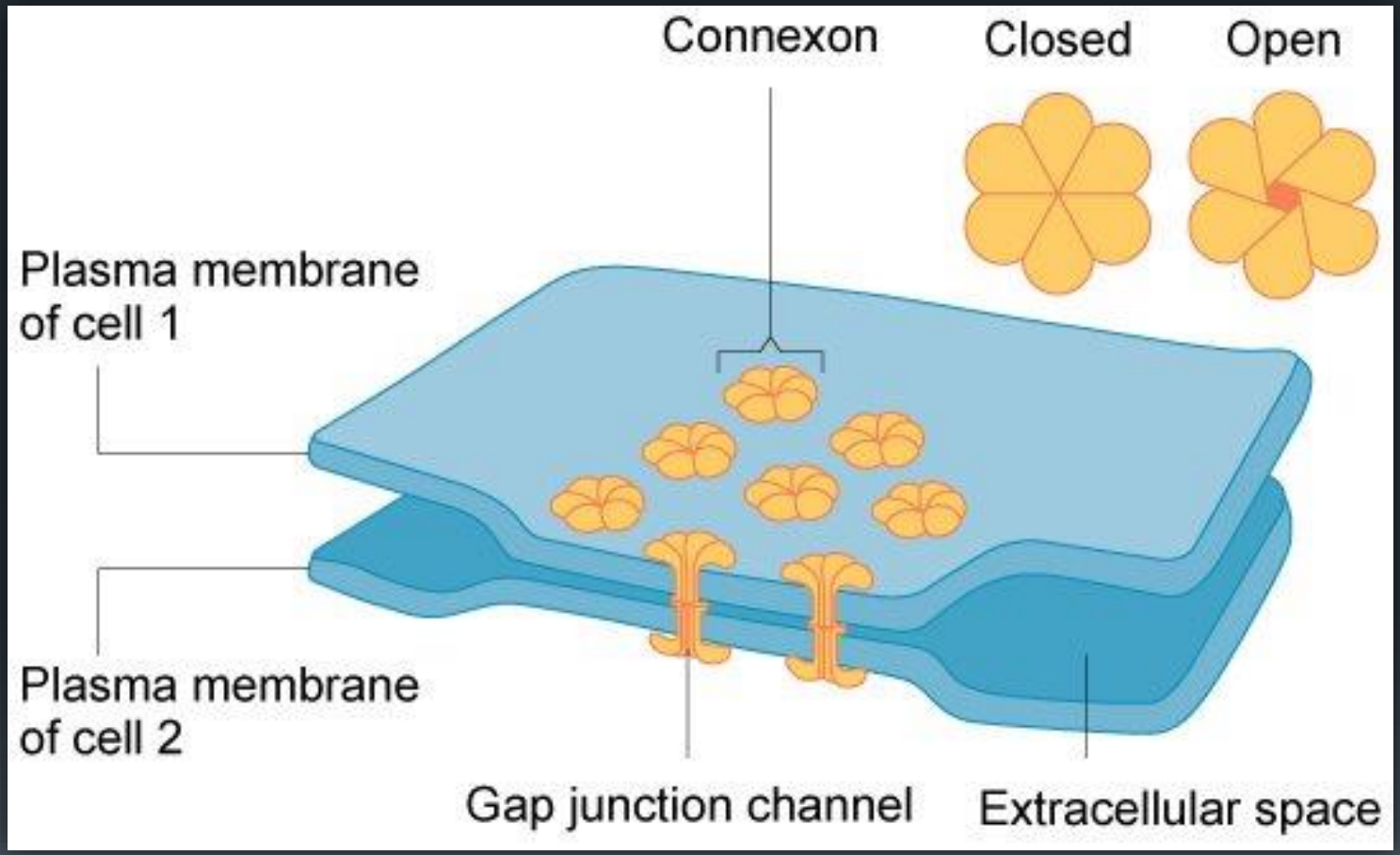
# Cellular junctions



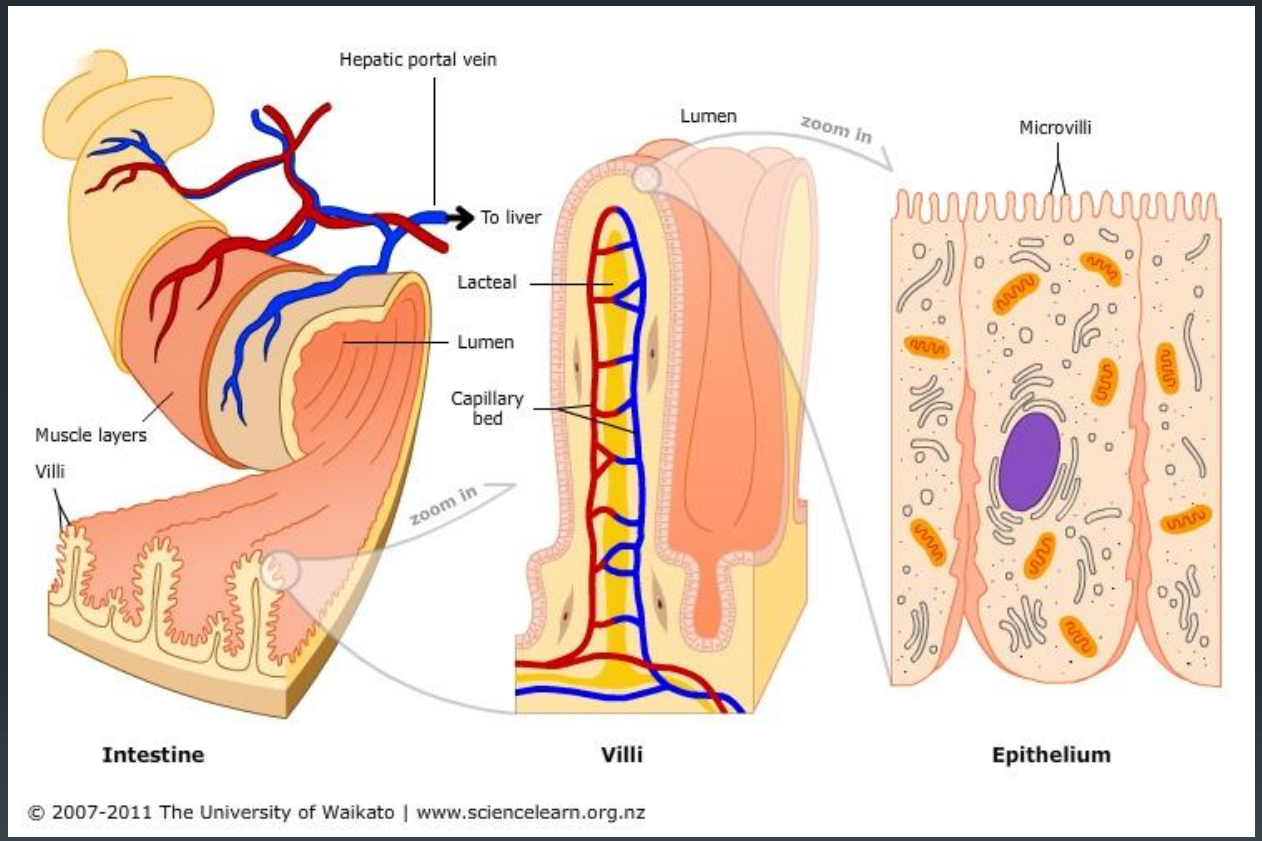




Terminal web
(actin filaments)
Terminal web
(actin filaments)
Tonofilaments
Intercellular
space
Intramembrane protein
(sealing strands)
Tight junction
(zonula occludens)
Adhering junction
(zonula adherens)
Transmembrane
link protein
Intracellular
line protein
Actin
filaments
Desmosome
(macula adherens)
Transmembrane
proteins
Intracellular
attachment plaque
Intermediate
filaments

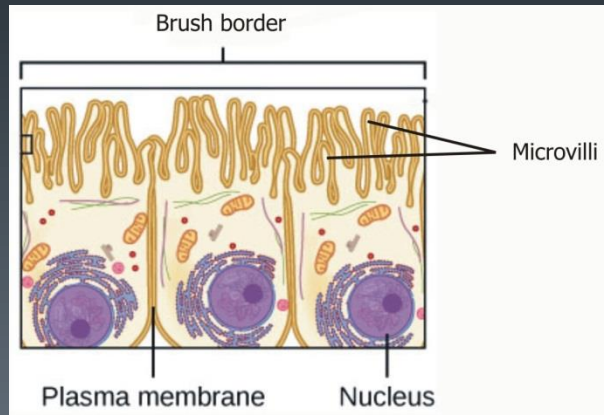
# Gap junction



# Special structures of apical surface




1. microvilli( Brush border)



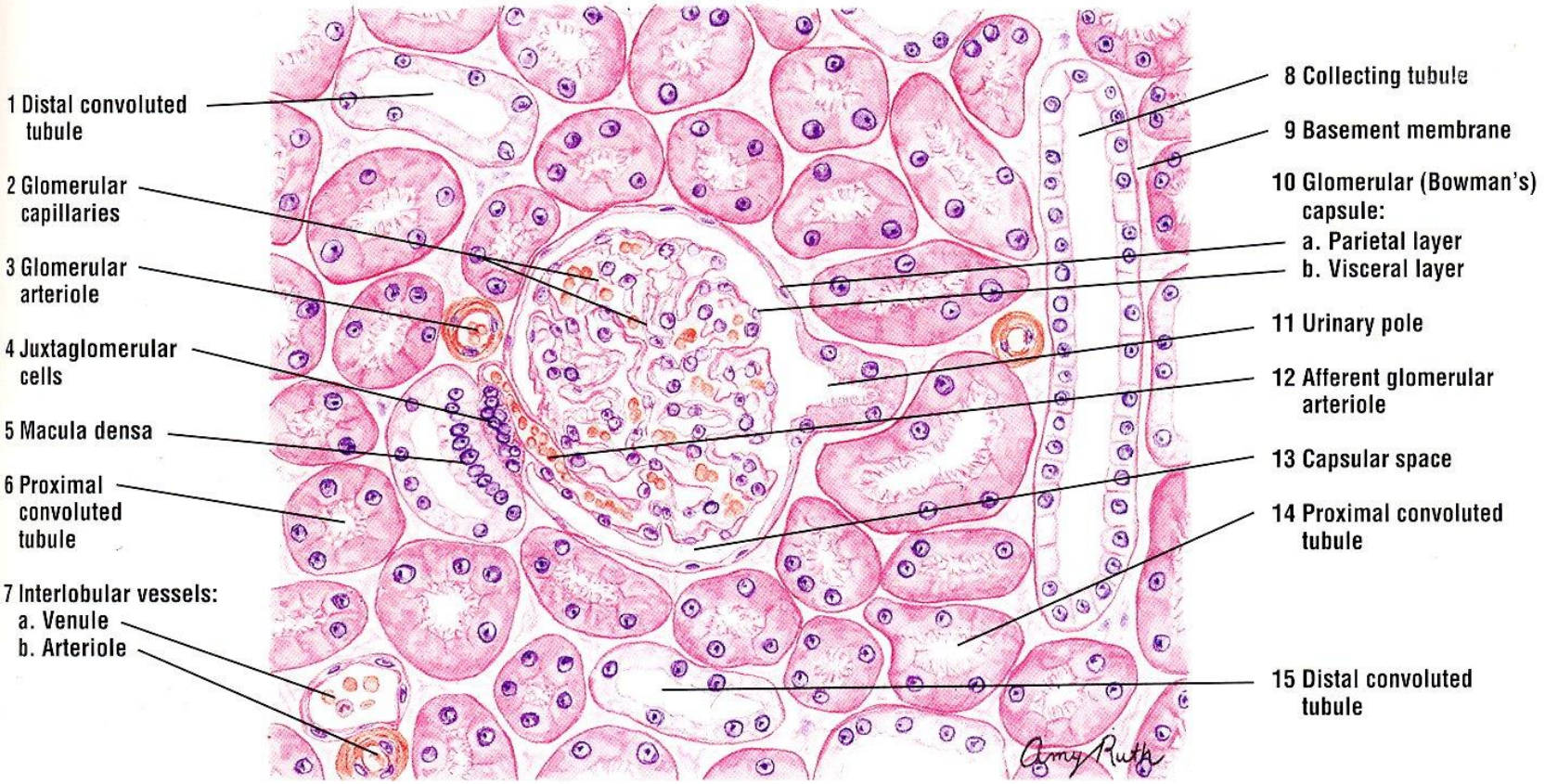
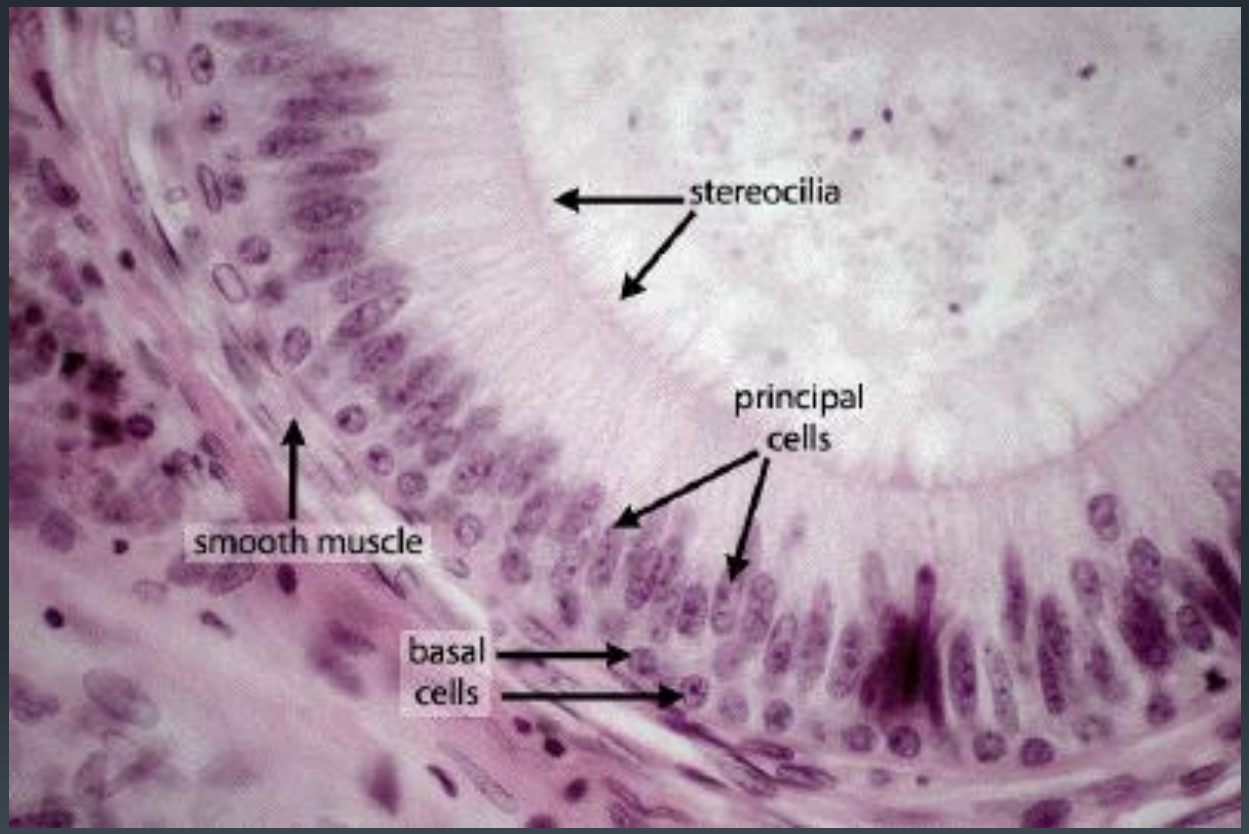
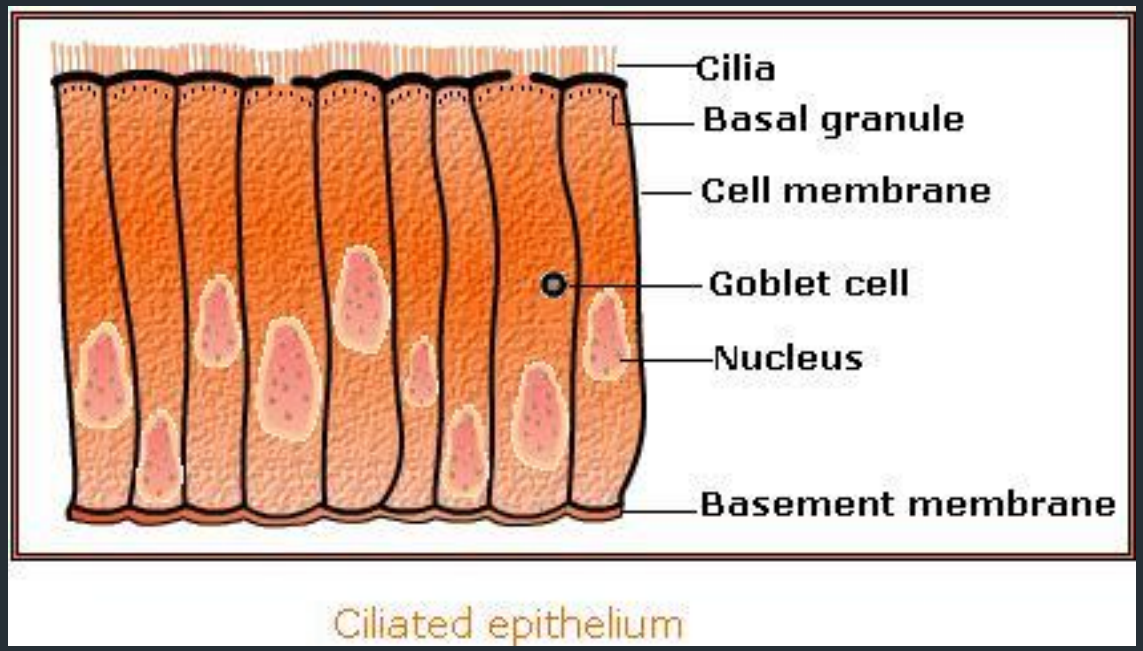



**FIGURE 16.3** ■ Kidney cortex: juxtaglomerular apparatus. Stain: periodic acid-Schiff and hematoxylin. Medium magnification.

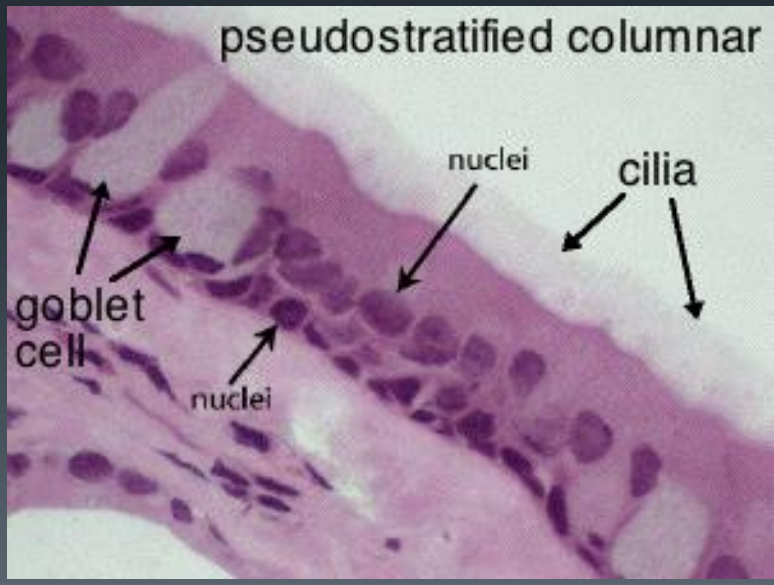


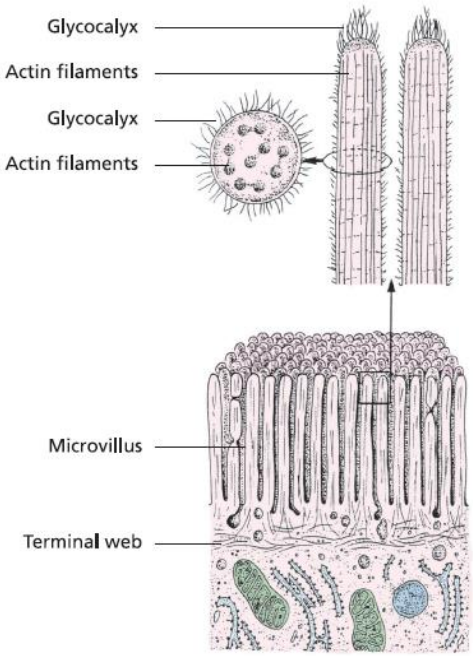

## 2.sterocilia



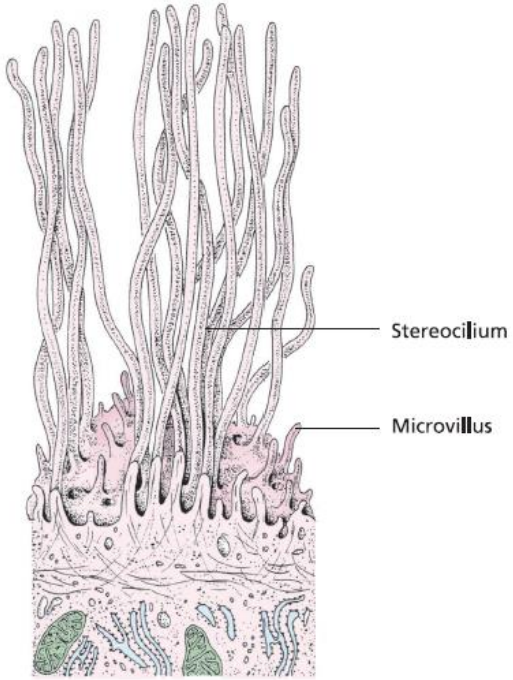

Ciliated epithelium

## 3. cilium

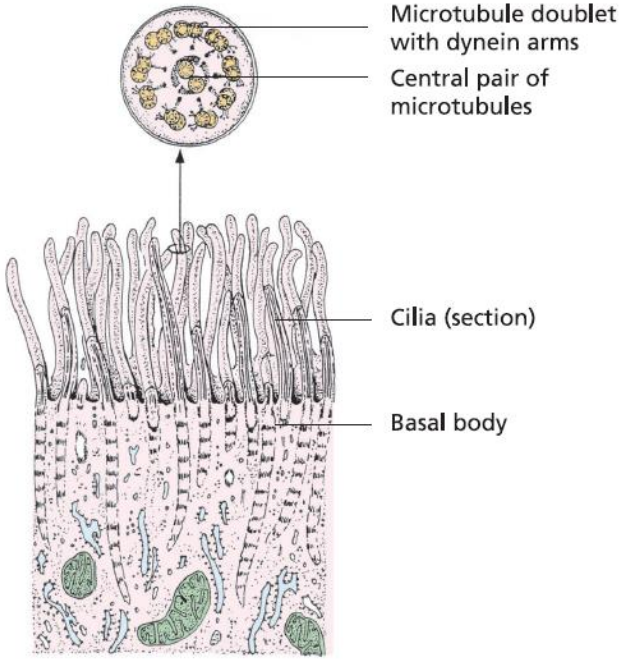




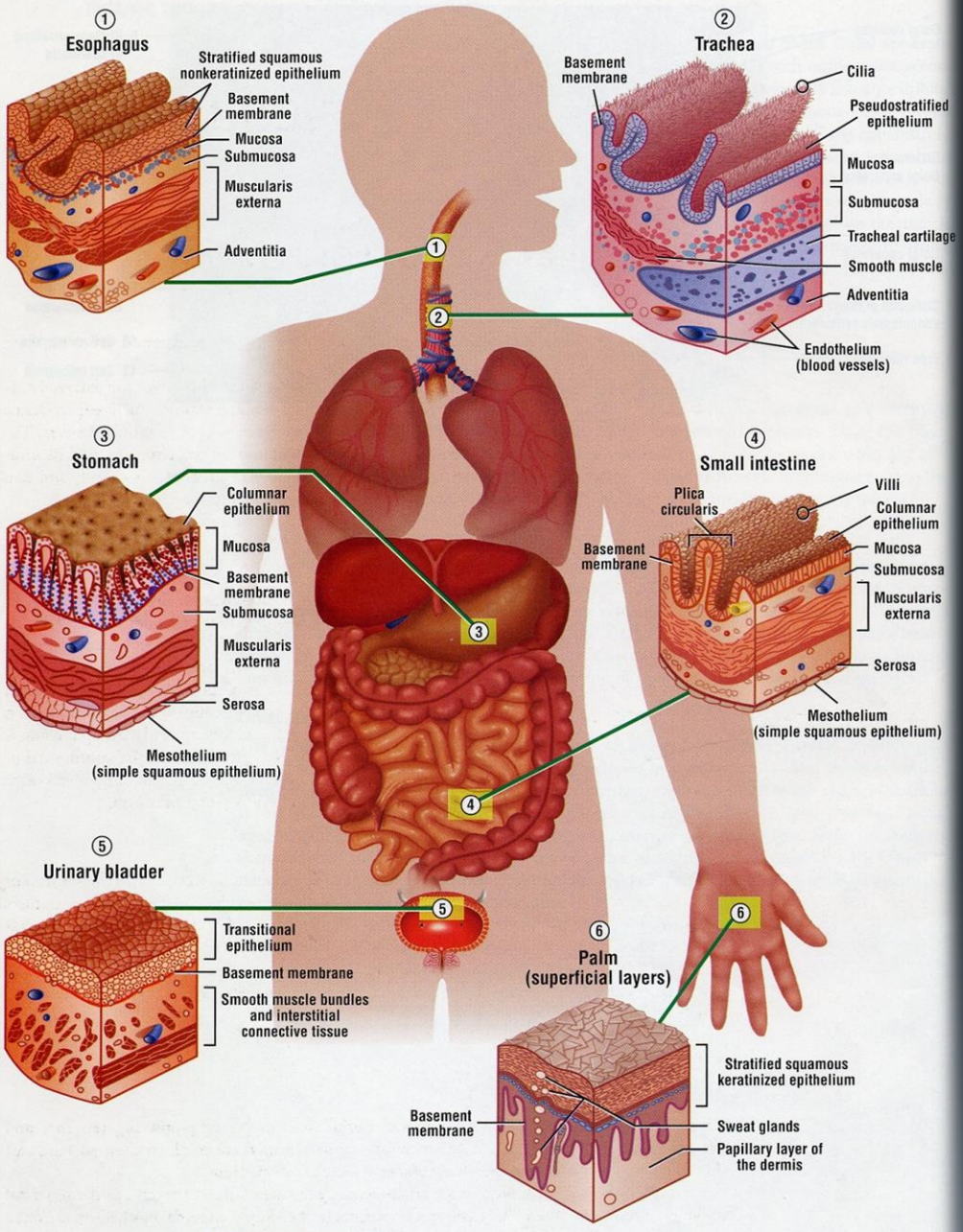

1.43 Apical cell surface with brush border of microvilli (schematic).




1.46 Apical cell surface with stereocilia (schematic).




1.44 Apical cell surface with cilia (schematic).




**OVERVIEW FIGURE** ■ Different types of epithelia in selected organs.

# Classification of Epithelia

Epithelia mainly classified into 2 sorts:

**Covering epithelia :** **Cells arranged like membrane**

Localization: covering the outer surface of the body and the inner surface of the cavities ,Sacs or ducts within the body.

Function: Protection.

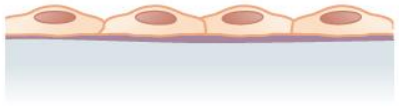
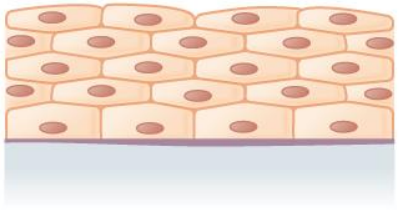
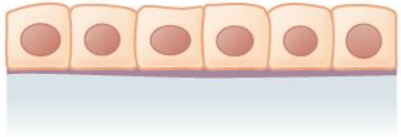
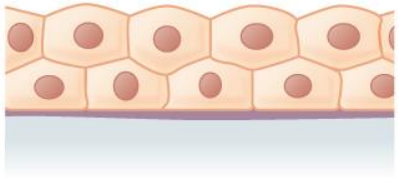
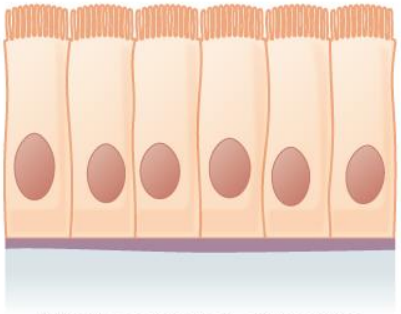
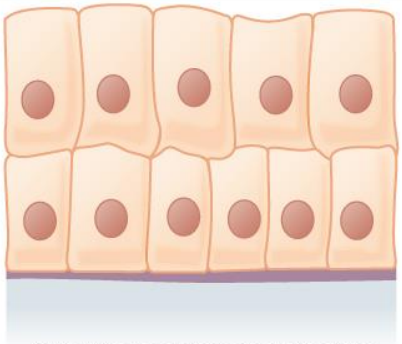
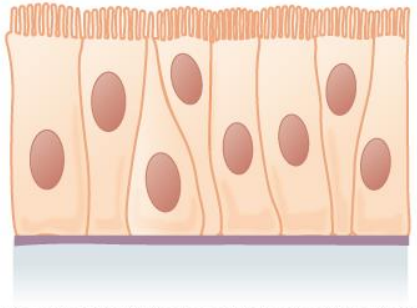
**Glandular epithelia :** Function- Secretion

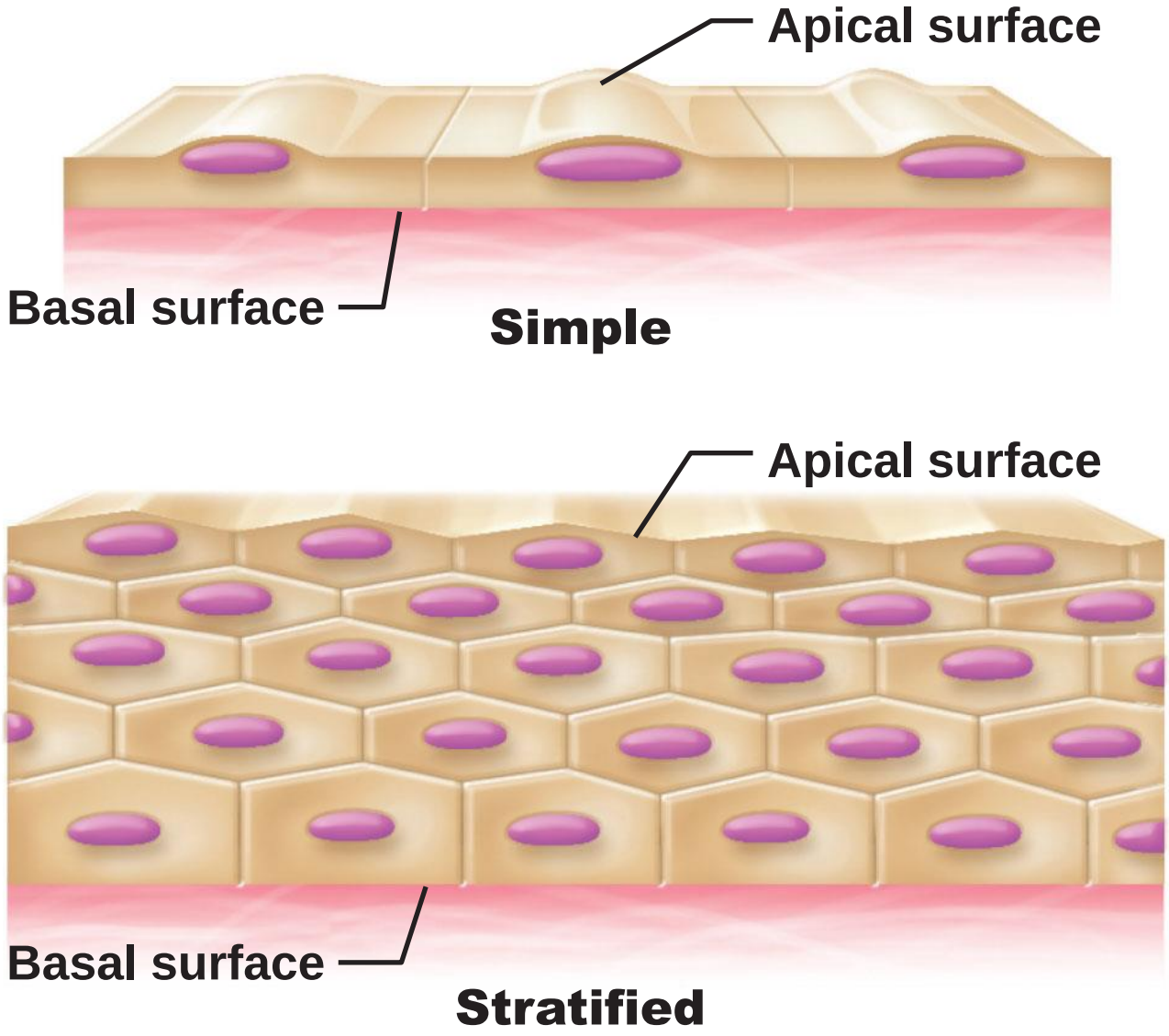
# Covering epithelia

**Principles of the classification:**

**Shape of the cells:** Squamous epithelia
Cuboidal epithelia
Columnar epithelia

**Layers of the cells:** simple epithelia
stratified epithelia

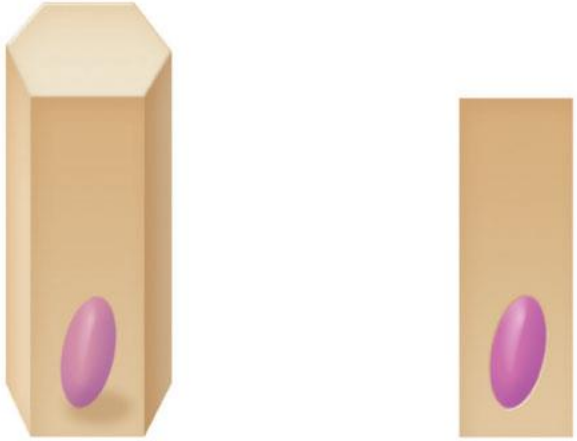
| | Simple | Stratified | |
|---|---|---|---|
| **Squamous** |  Simple squamous epithelium |  Stratified squamous epithelium | |
| **Cuboidal** |  Simple cuboidal epithelium |  Stratified cuboidal epithelium | |
| **Columnar** |  Simple columnar epithelium |  Stratified columnar epithelium | **Pseudostratified**  Pseudostratified columnar epithelium |




**Classification based on number of cell layers.**

Squamous

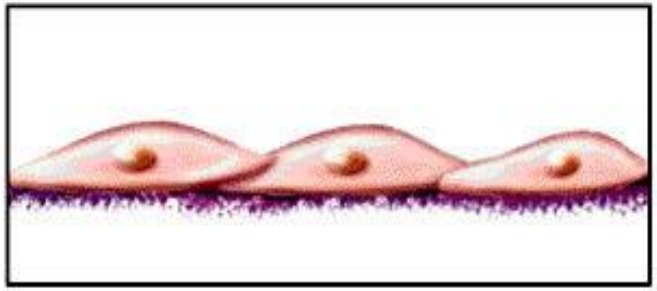
Cuboidal



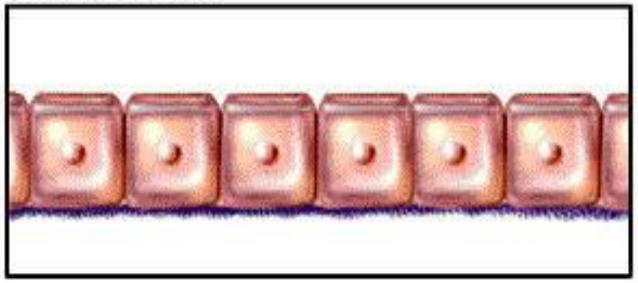
Columnar

Classification based on cell shape.

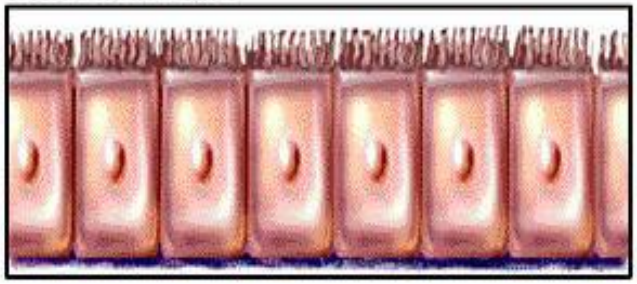
Squamous



Cuboidal



Columnar

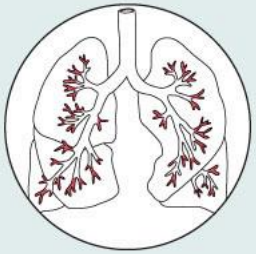


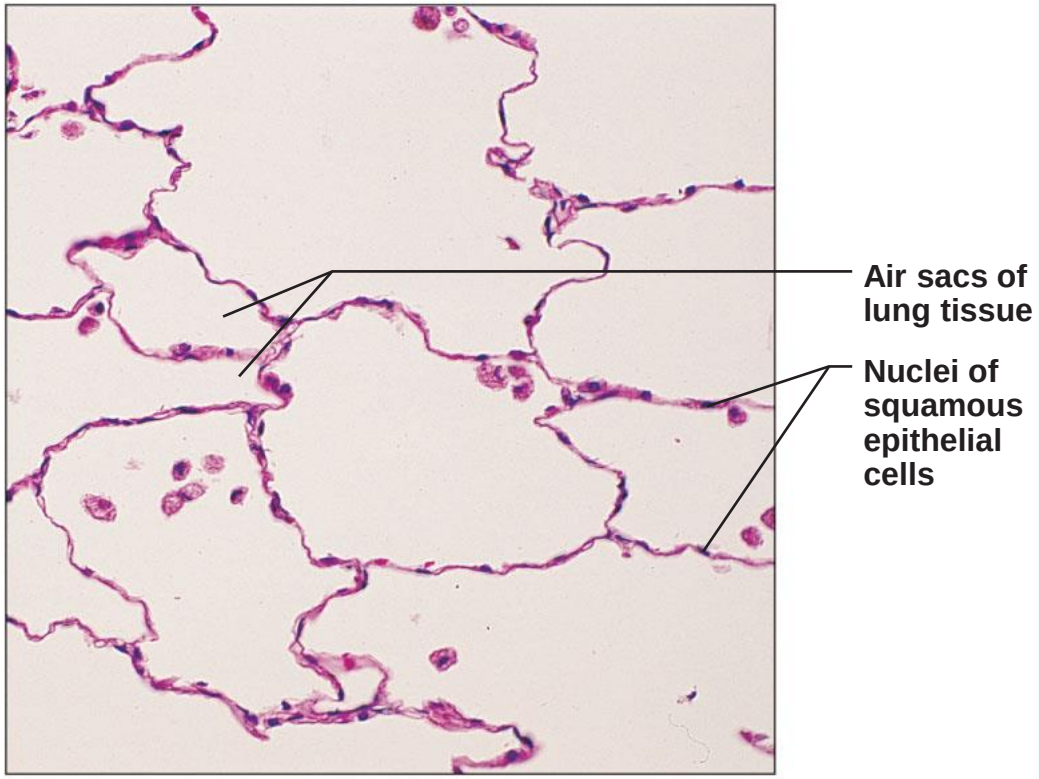
# Simple squamous epithelium

**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.

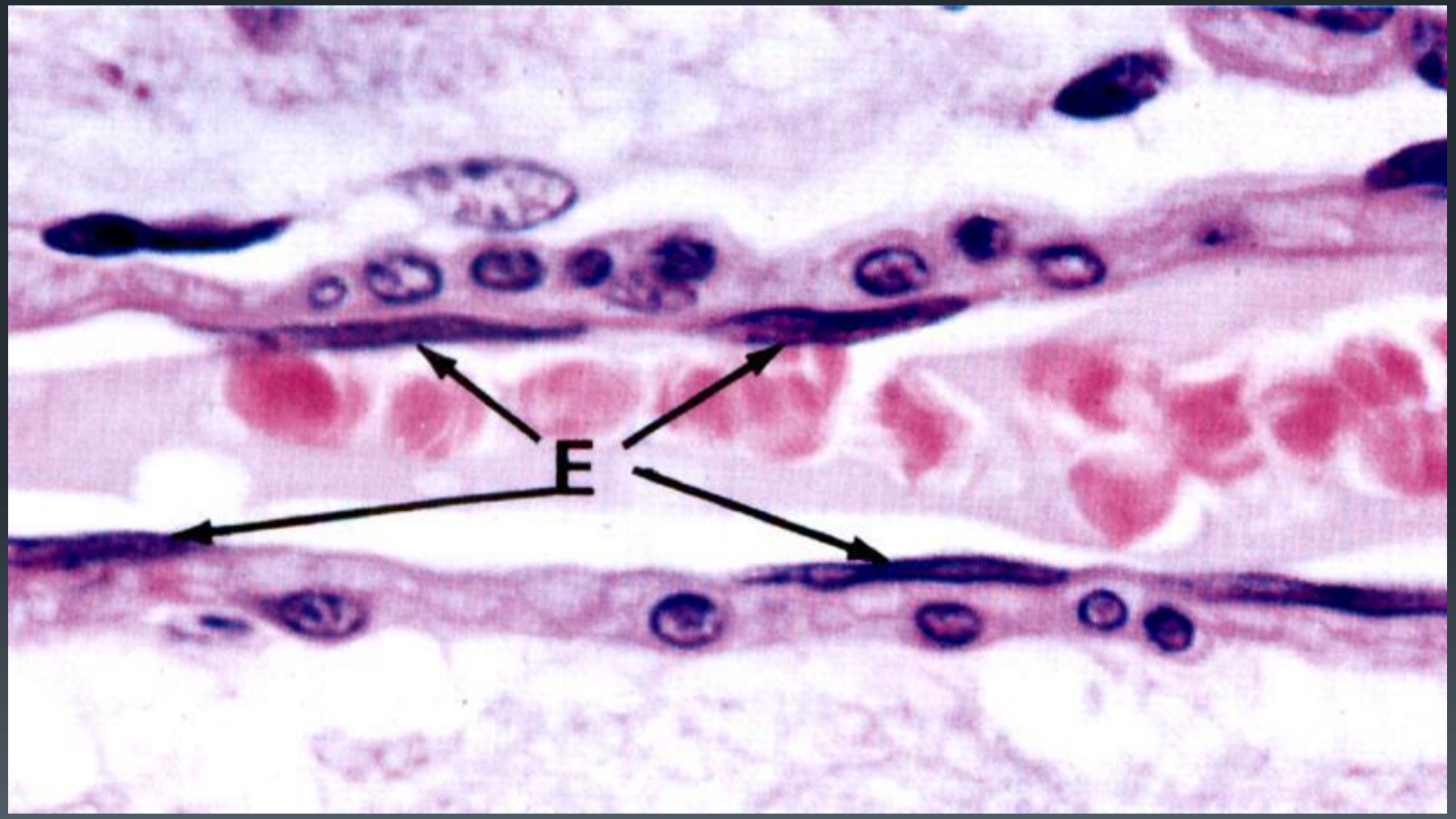
**Location:** Kidney glomeruli; air sacs of lungs; lining of heart, blood vessels, and lymphatic vessels; lining of ventral body cavity (serosae).



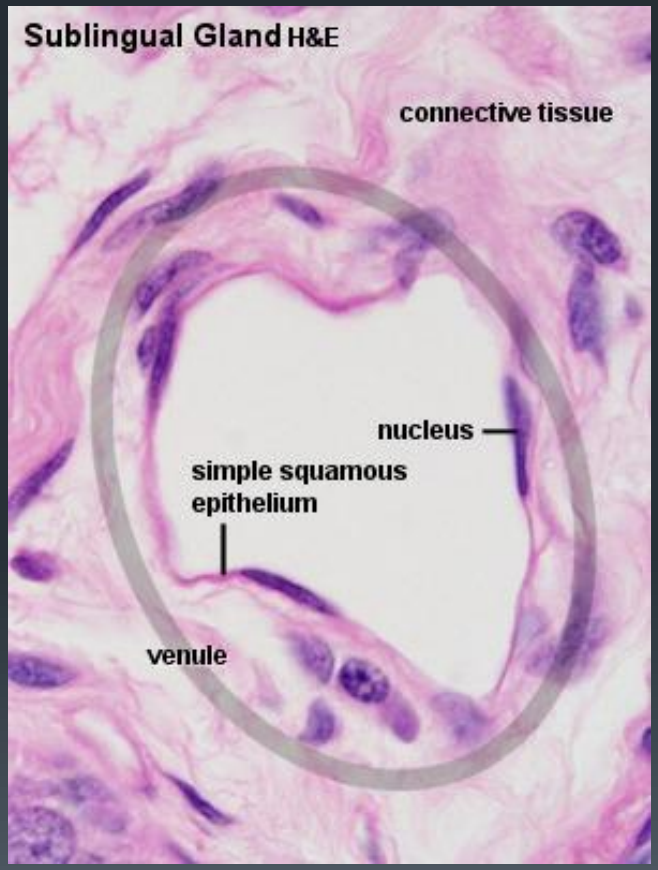


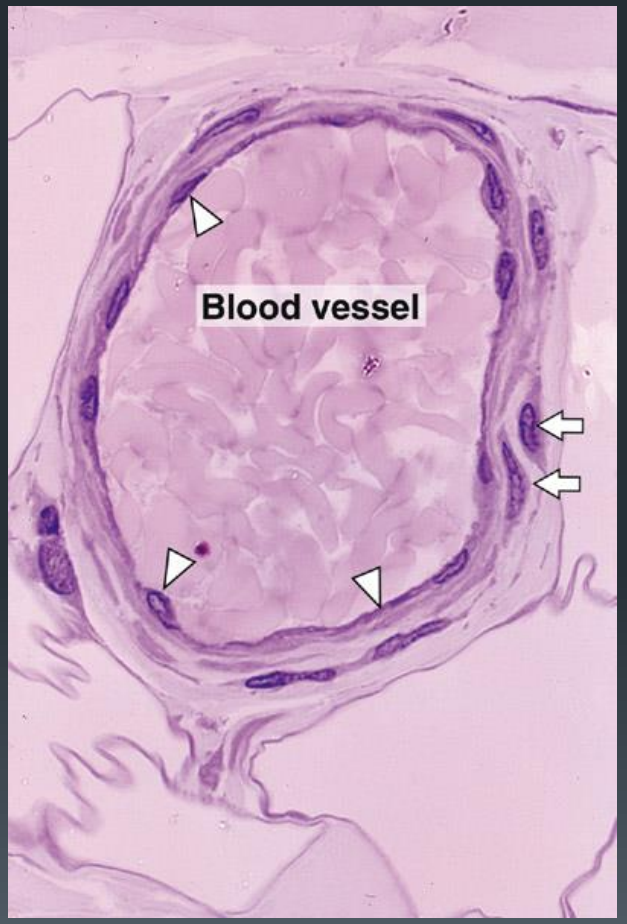

**Photomicrograph:** Simple squamous epithelium forming part of the alveolar (air sac) walls (125x).

# Endothelium



# Endothelium

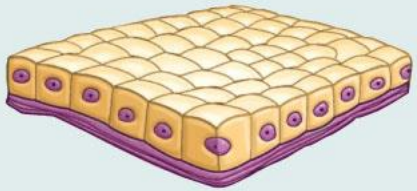


# Mesothelium

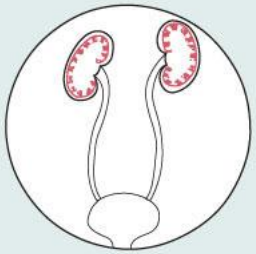
# Simple cuboidal epithelium

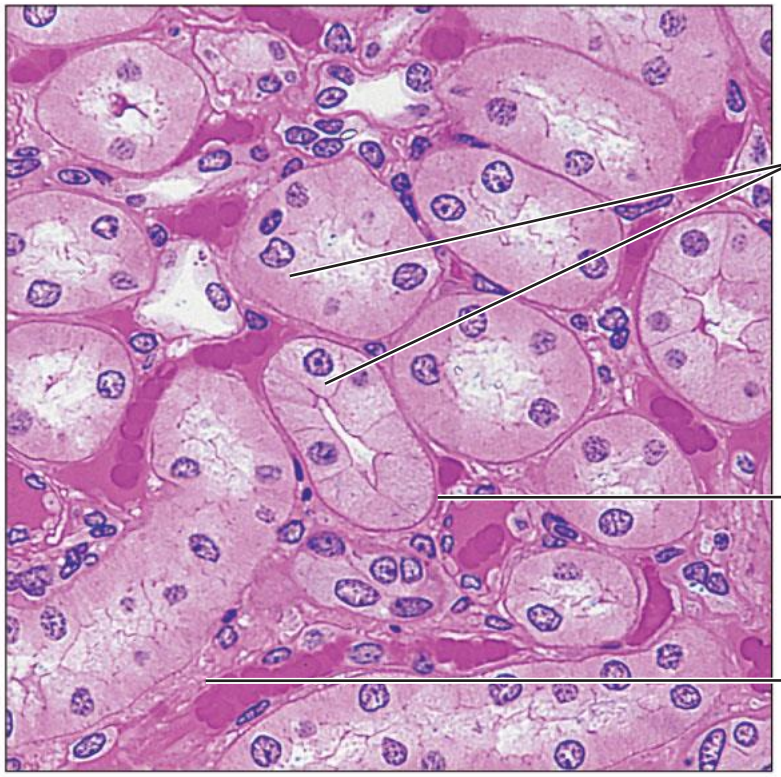
**Description:** Single layer of cubelike cells with large, spherical central nuclei.



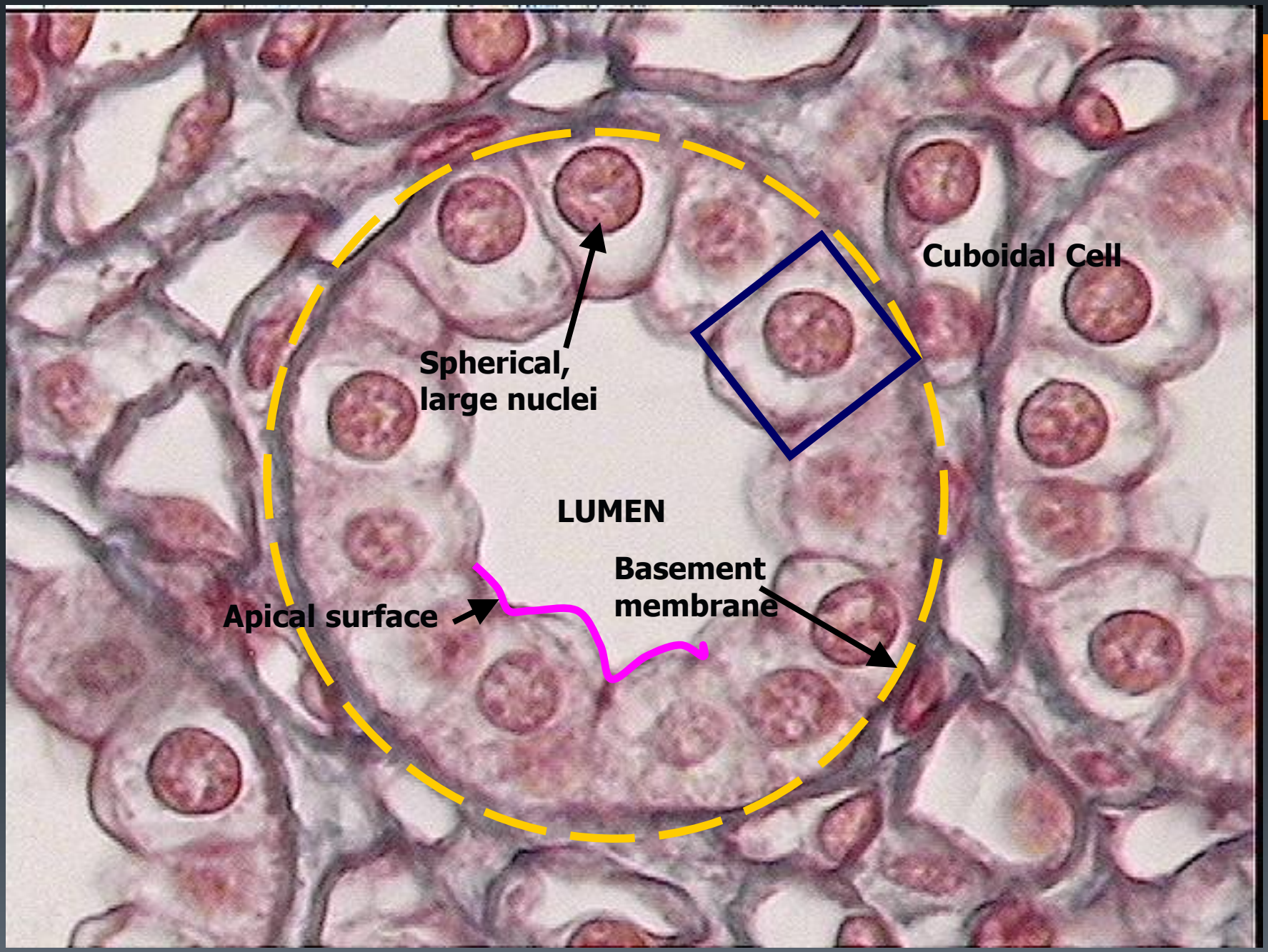
**Function:** Secretion and absorption.

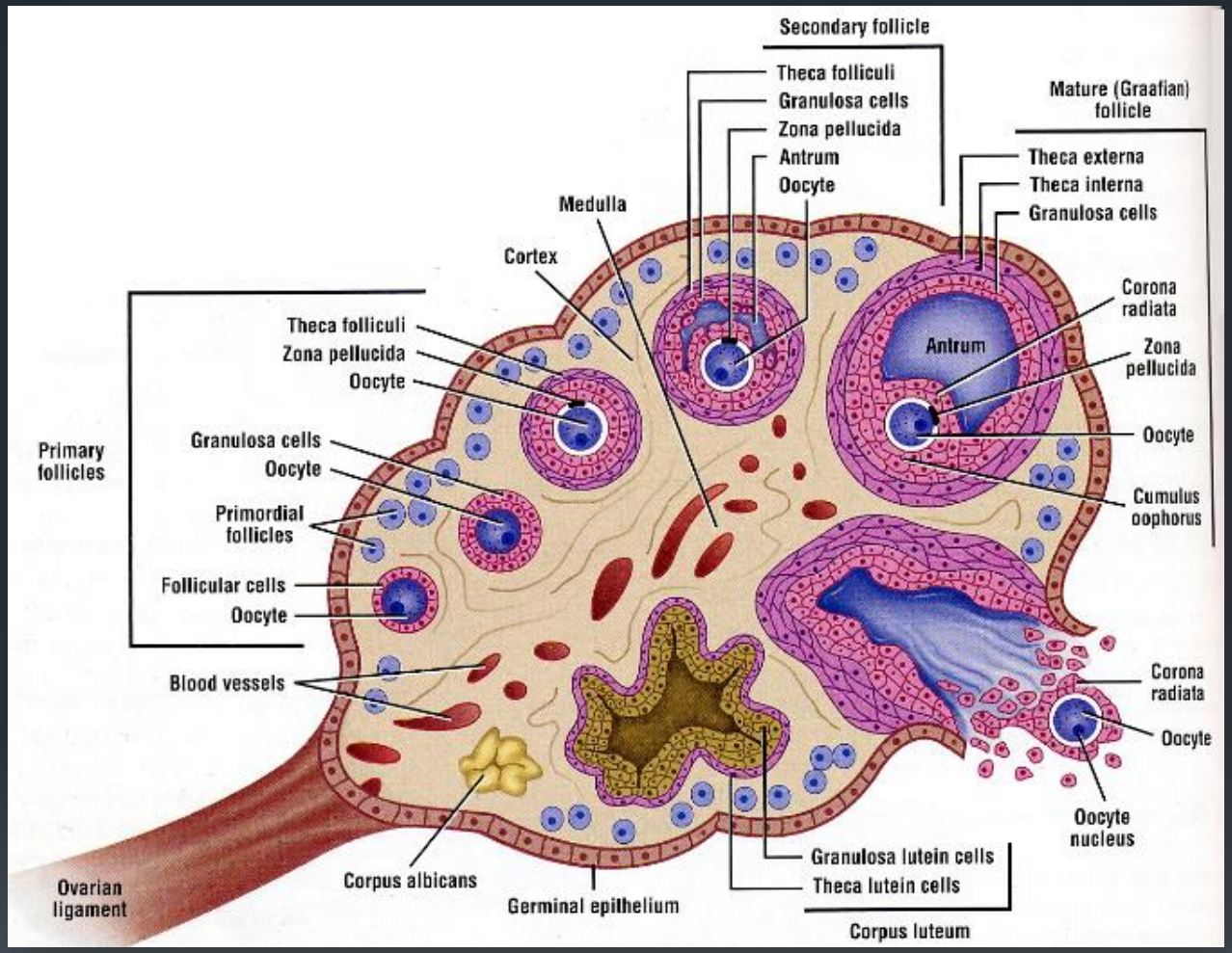
**Location:** Kidney tubules; ducts and secretory portions of small glands; ovary surface.






**Photomicrograph:** Simple cuboidal epithelium in kidney tubules (430x).

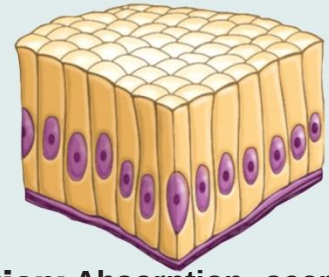

Cuboidal Cell
Spherical,
large nuclei
LUMEN
Basement
membrane
Apical surface


Secondary follicle
Theca folliculi
Granulosa cells
Zona pellucida
Antrum
Oocyte
Mature (Graafian) follicle
Theca externa
Theca interna
Granulosa cells
Medulla
Cortex
Corona radiata
Antrum
Zona pellucida
Theca folliculi
Zona pellucida
Oocyte
Oocyte
Primary follicles
Granulosa cells
Oocyte
Cumulus oophorus
Primordial follicles
Follicular cells
Oocyte
Blood vessels
Corona radiata
Oocyte
Oocyte nucleus
Granulosa lutein cells
Theca lutein cells
Corpus luteum
Ovarian ligament
Corpus albicans
Germinal epithelium

# Ovary

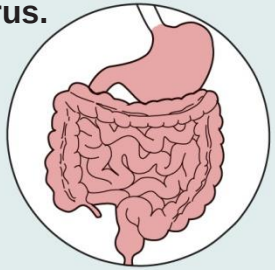
# Simple columnar epithelium

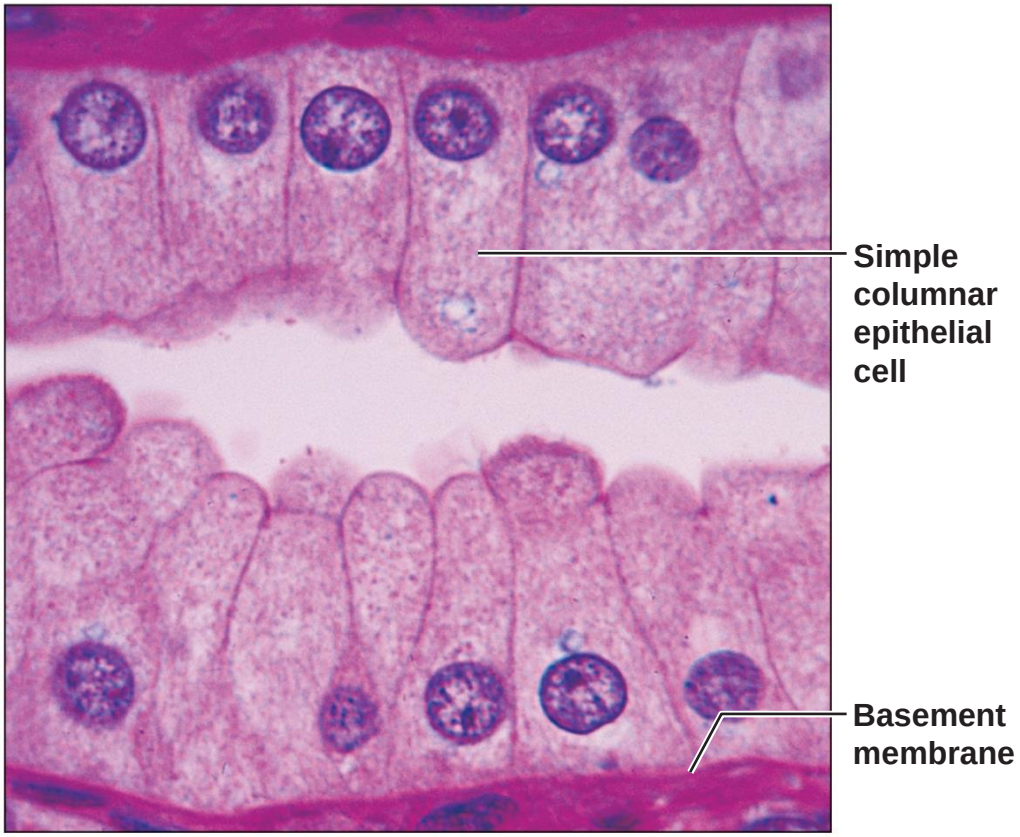
**Description:** Single layer of tall cells with *round* to *oval* nuclei; some cells bear cilia; layer may contain mucus-secreting unicellular glands (goblet cells).



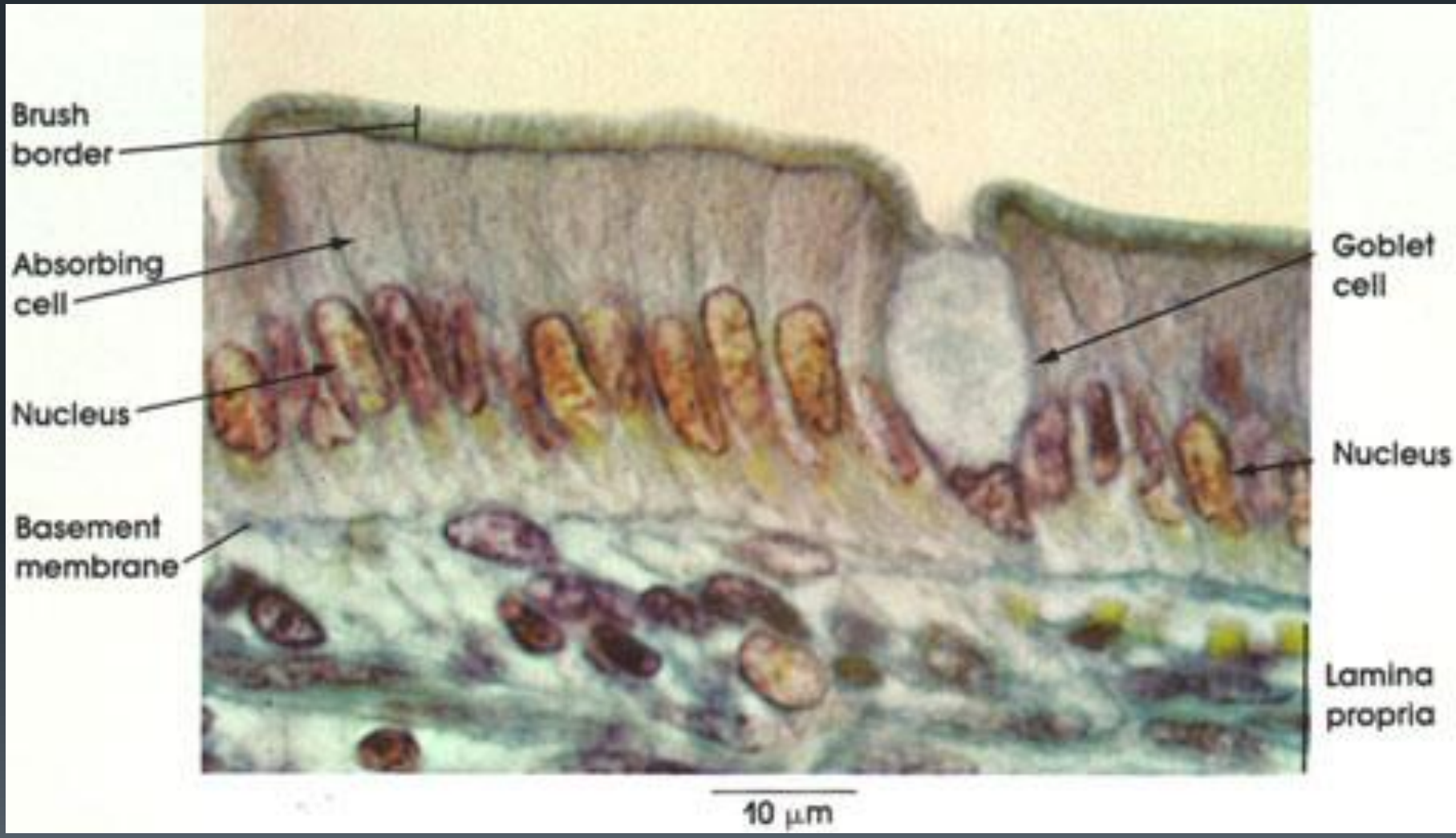
**Function:** Absorption; secretion of mucus, enzymes, and other substances; ciliated type propels mucus (or reproductive cells) by ciliary action.

**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.






**Photomicrograph:** Simple columnar epithelium of the stomach mucosa (860X).


Brush border
Absorbing cell
Nucleus
Basement membrane
Goblet cell
Nucleus
Lamina propria
10 μm

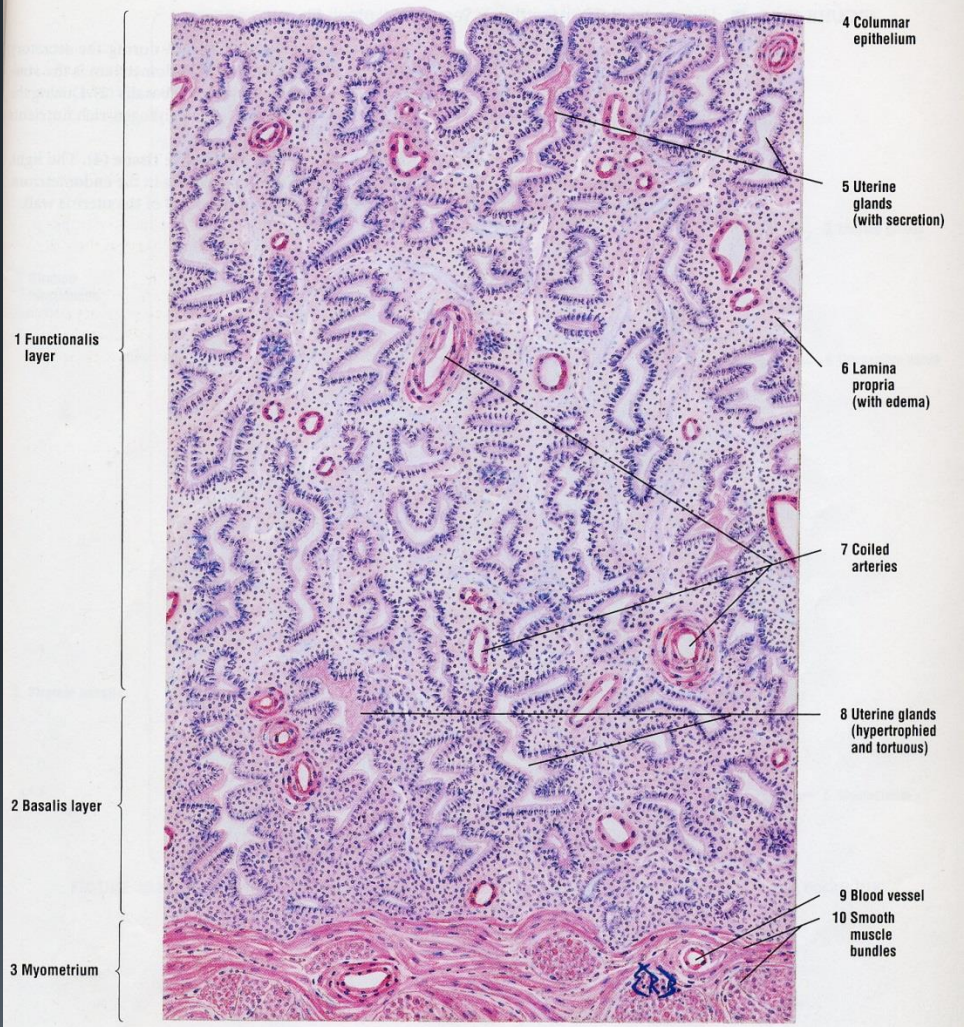
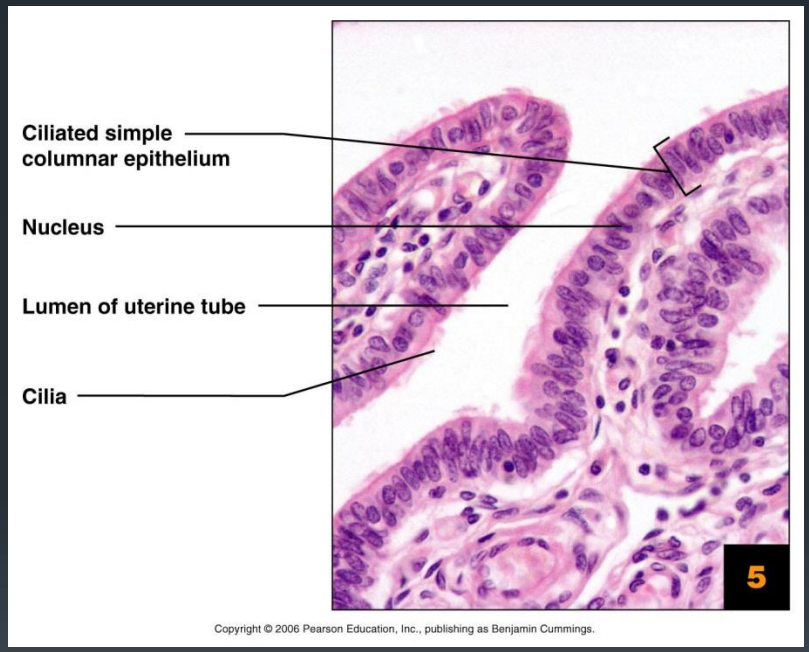



FIGURE 19.13 ■ Uterus: secretory (luteal) phase. Stain: hematoxylin and eosin. Low magnification.

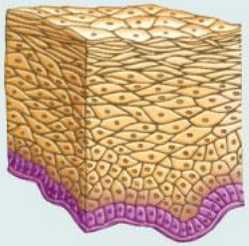





# Uterus

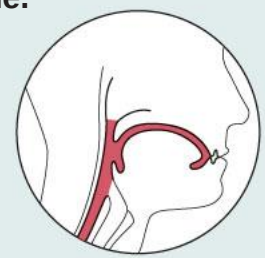
# Stratified squamous epithelium

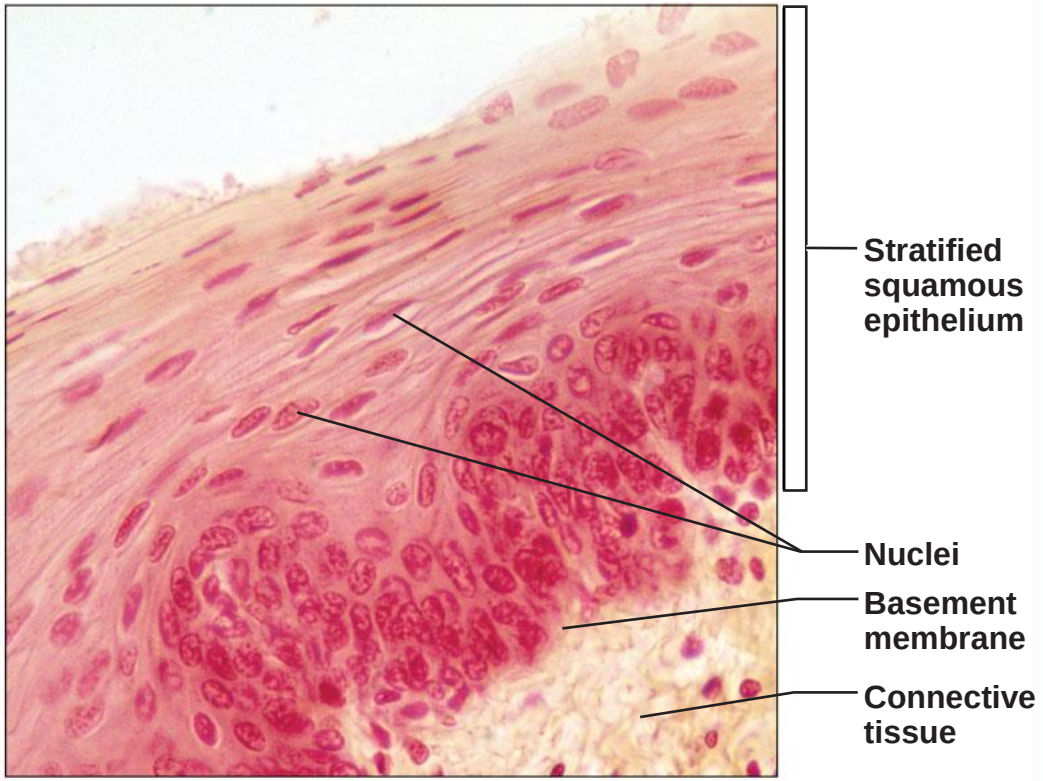
**Description:** Thick membrane composed of several cell layers; basal cells are cuboidal or columnar and metabolically active; surface cells are flattened (squamous); in the keratinized type, the surface cells are full of keratin and dead; basal cells are active in mitosis and produce the cells of the 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 the esophagus (285x).

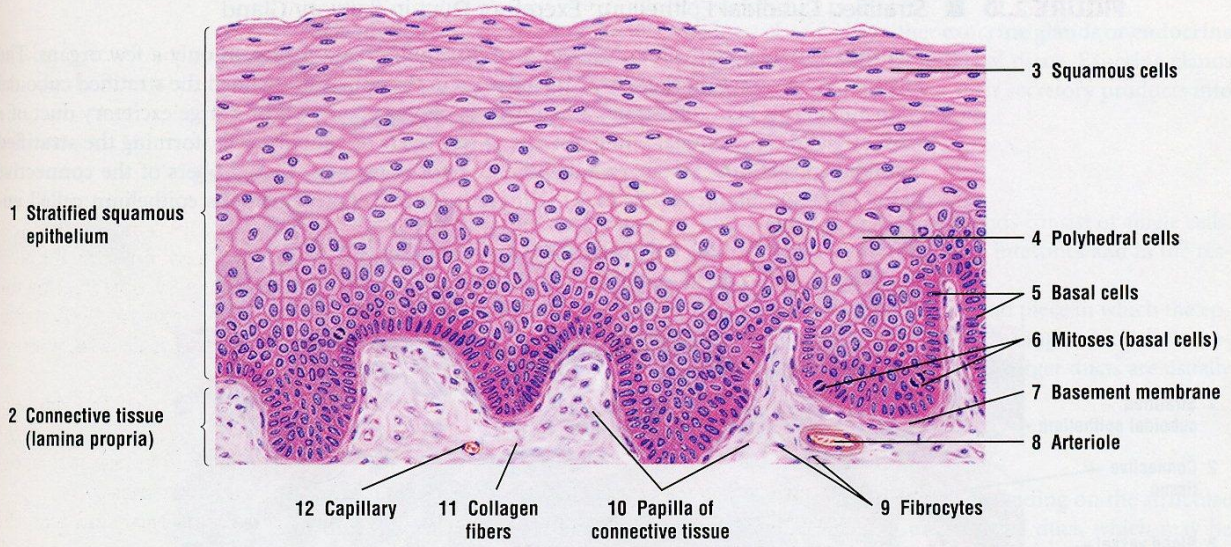



**FIGURE 2.8** ■ Stratified squamous nonkeratinized epithelium: esophagus. Stain: hematoxylin and eosin. Medium magnification.


**FIGURE 2.9** ■ Stratified squamous keratinized epithelium: palm of the hand. Stain: hematoxylin and eosin. 40×

# Stratified cuboidal epithelium

**FIGURE 2.10** ■ Stratified Cuboidal Epithelium: Excretory Duct in Salivary Gland

Stratified cuboidal epithelium has a limited distribution and is seen in only a few organs. The larger excretory ducts in the salivary glands and in the pancreas are lined the stratified cuboidal epithelium. This figure illustrates a high-power photomicrograph of a large excretory duct of a salivary gland. The luminal lining consists of two layers of cuboidal cells, forming the **stratified cuboidal epithelium (1).** Surrounding the excretory duct are collagen fibers of the **connective tissue (2,7)** and **blood vessels (3, 5)** that are lined by simple squamous epithelium called **endothelium (4,6).**

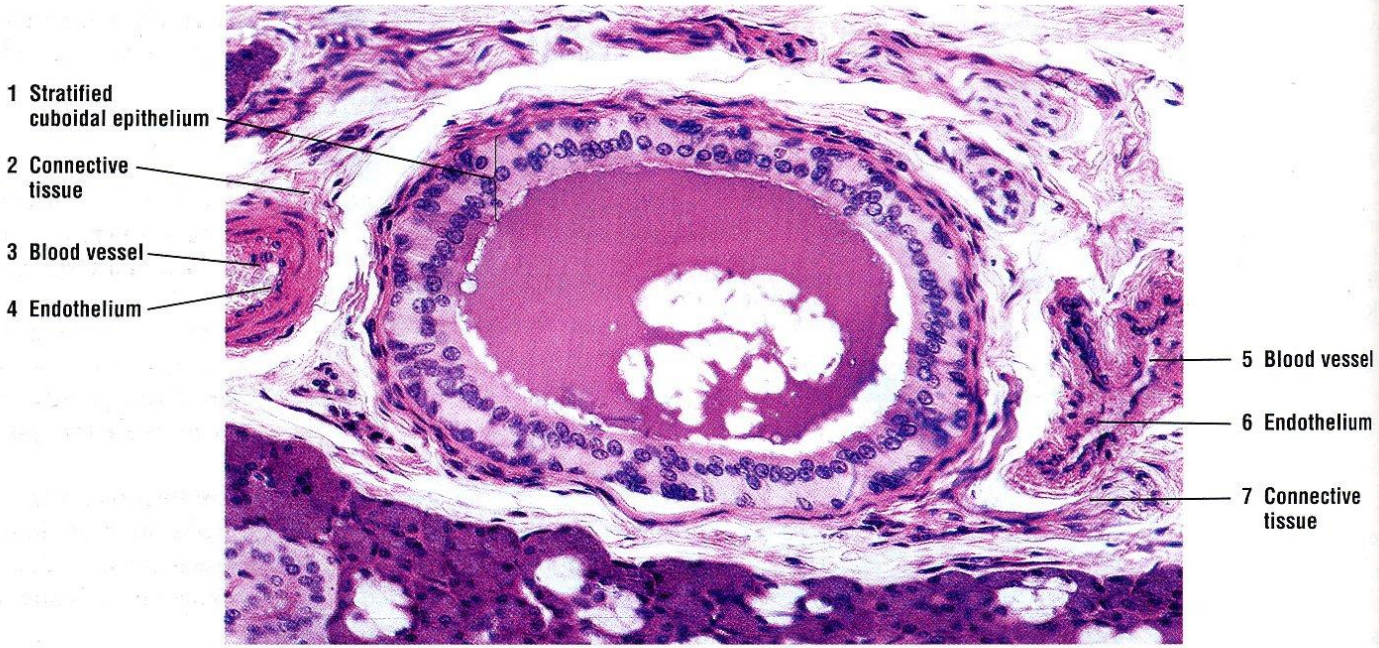
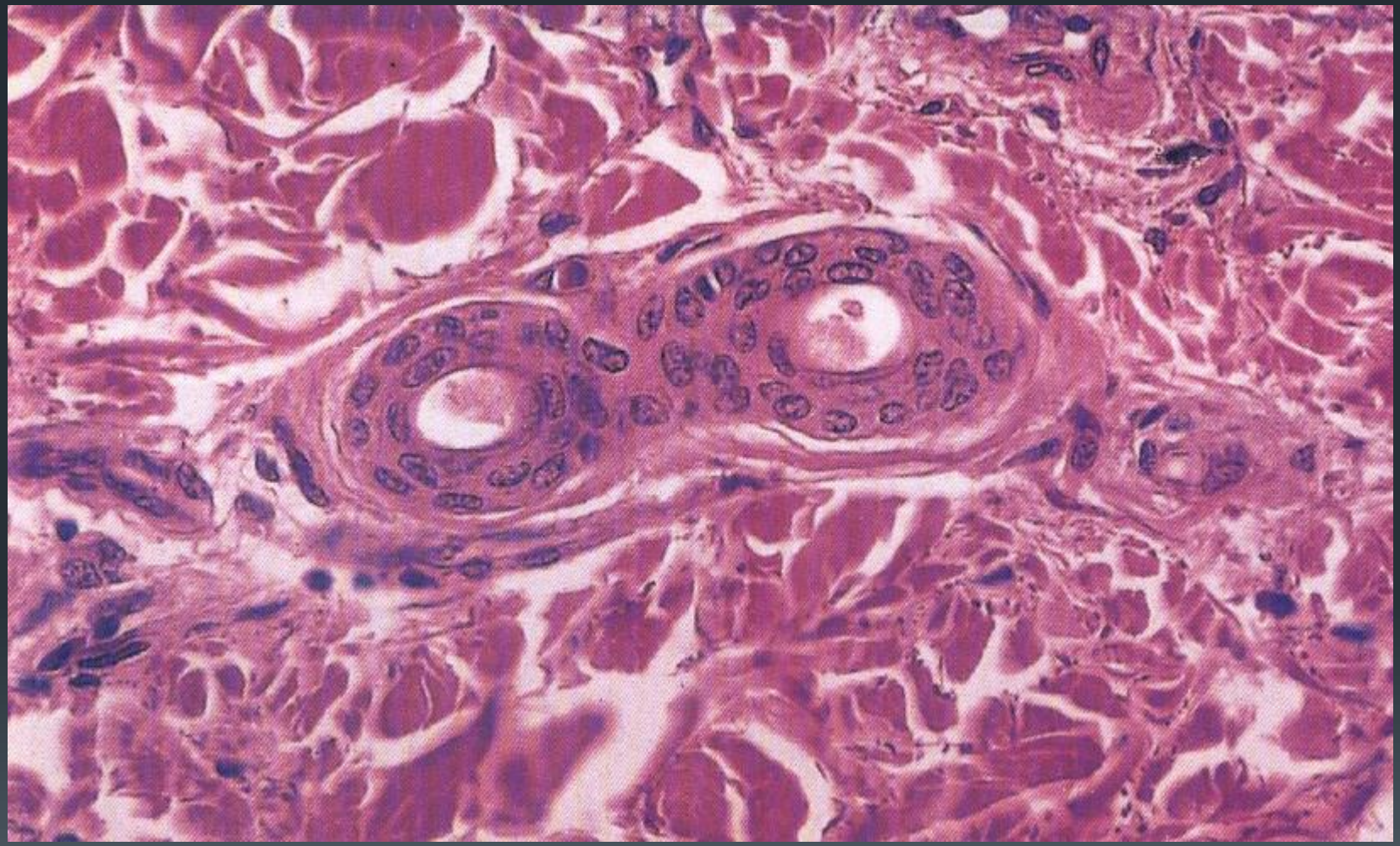


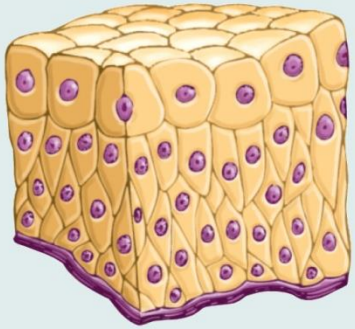

**FIGURE 2.10** ■ Stratified cuboidal epithelium: excretory duct in salivary gland. Stain: hematoxylin and eosin. 100×



Sweat gland duct

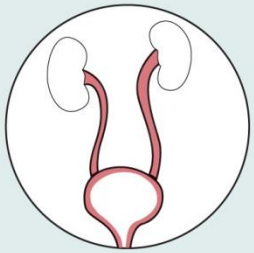
# Transitional epithelium

**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.



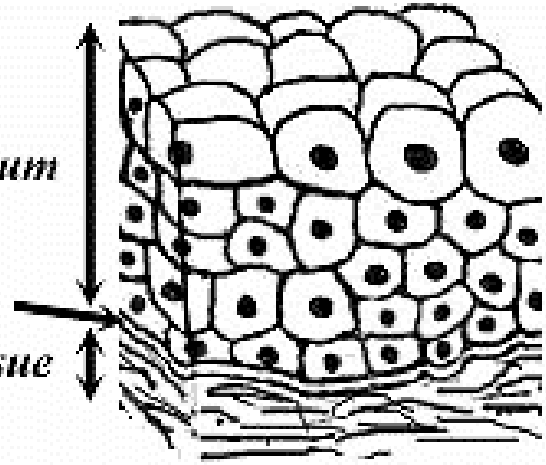
**Function:** Stretches readily and permits distension of urinary organ by contained urine.

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



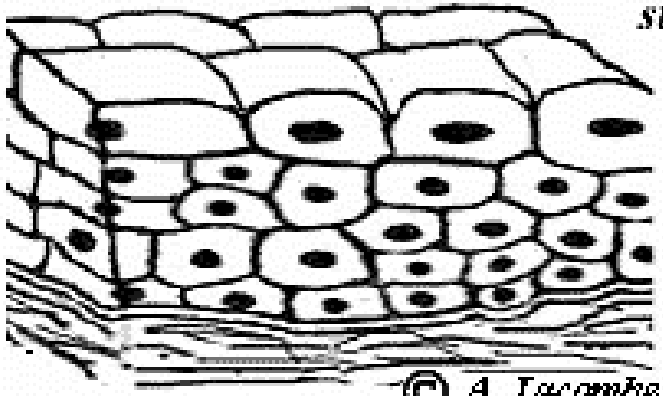

**Photomicrograph:** Transitional epithelium lining the urinary bladder, relaxed state (360X); note the bulbous, or rounded, appearance of the cells at the surface; these cells flatten and become elongated when the bladder is filled with urine.

*RELAXED ORGAN:*




- *several layers of epithelial cells*
- *the shape of the cells of the top layer changes from dome-shaped to squamous-like depending of the degree of organ stretch*

*STRETCHED ORGAN:*

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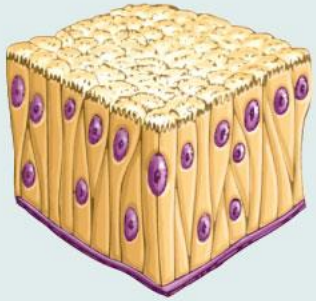
***STRATIFIED TRANSITIONAL EPITHELIUM***

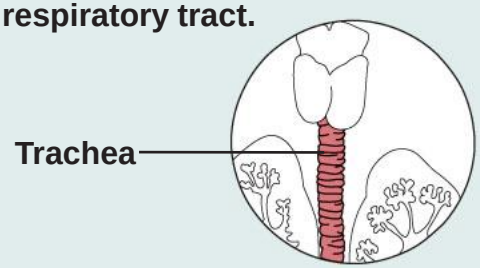
# Pseudo-stratified columnar epithelium

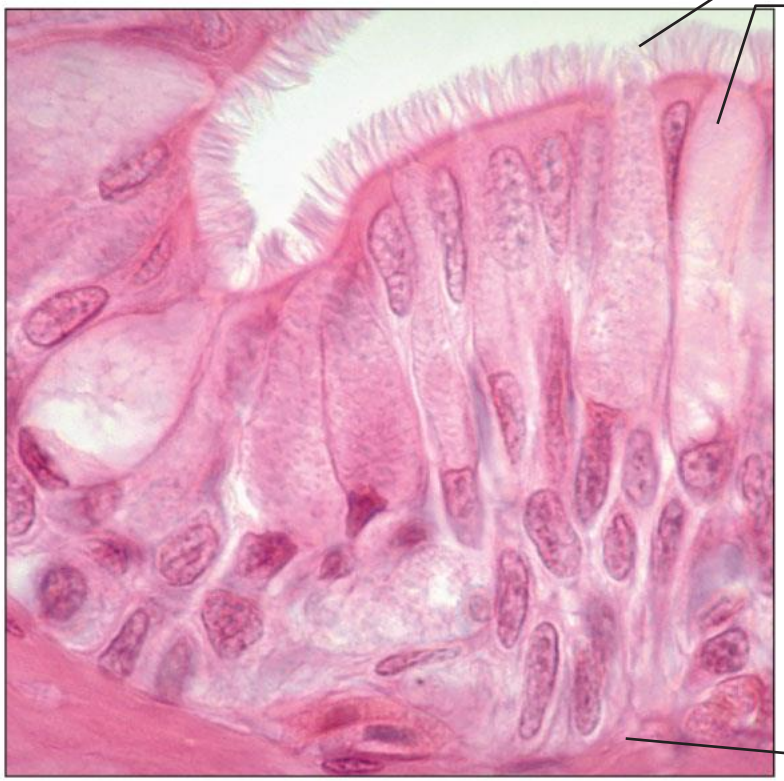
**Description:** Single layer of cells of differing heights, some not reaching the free surface; nuclei seen at different levels; may contain mucus-secreting cells and bear cilia.



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

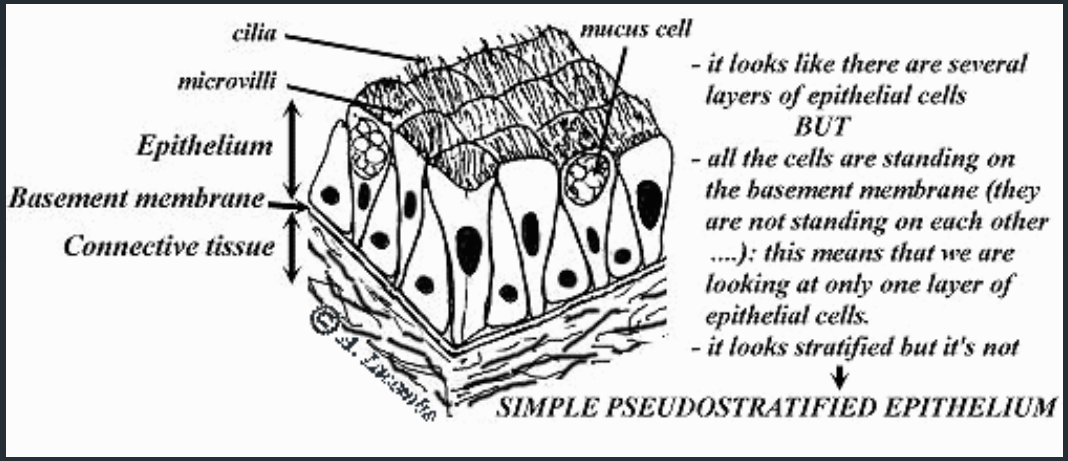
**Location:** Nonciliated type in male's sperm-carrying ducts and ducts of large glands; ciliated variety lines the trachea, most of the upper respiratory tract.




**Photomicrograph:** Pseudostratified ciliated columnar epithelium lining the human trachea (570x).

# Pseudo-stratified ciliated columnar epithelium




**Description**: **single layer of cells of differing heights**, but some don't reach the free surface. Nuclei are seen at many different levels. They contain goblet cells and cilia.

**Function:** secretion & propulsion of mucus

**Locations:** I the trachea & most of the upper respiratory trac

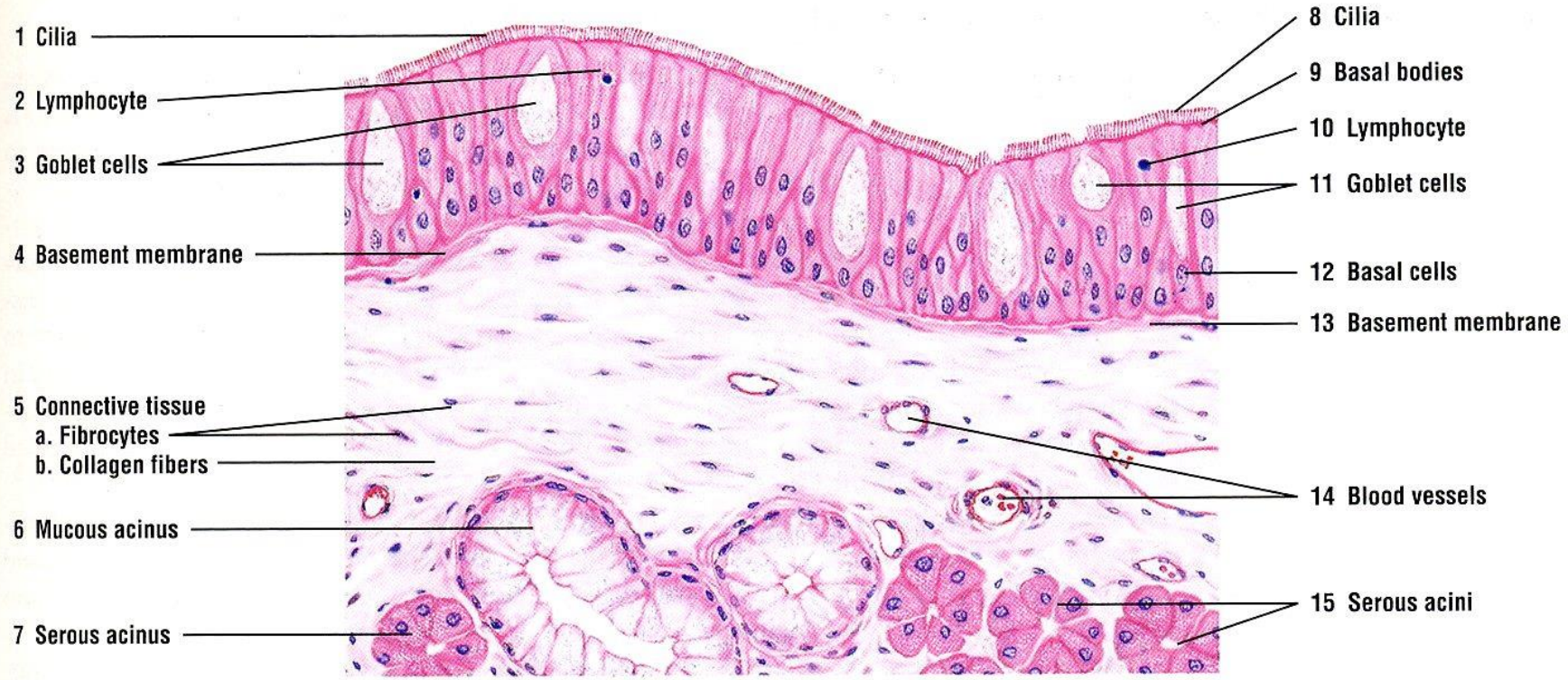
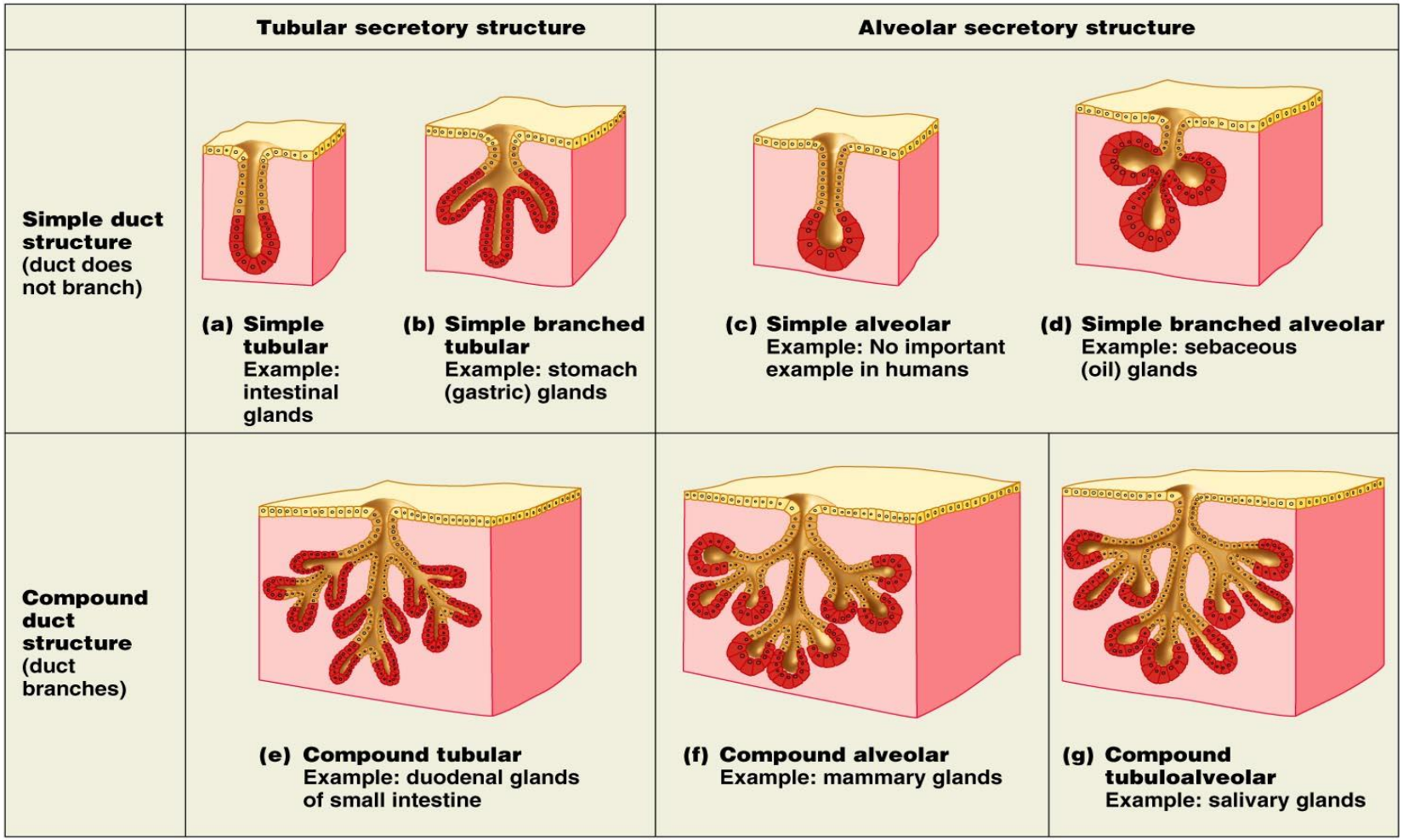
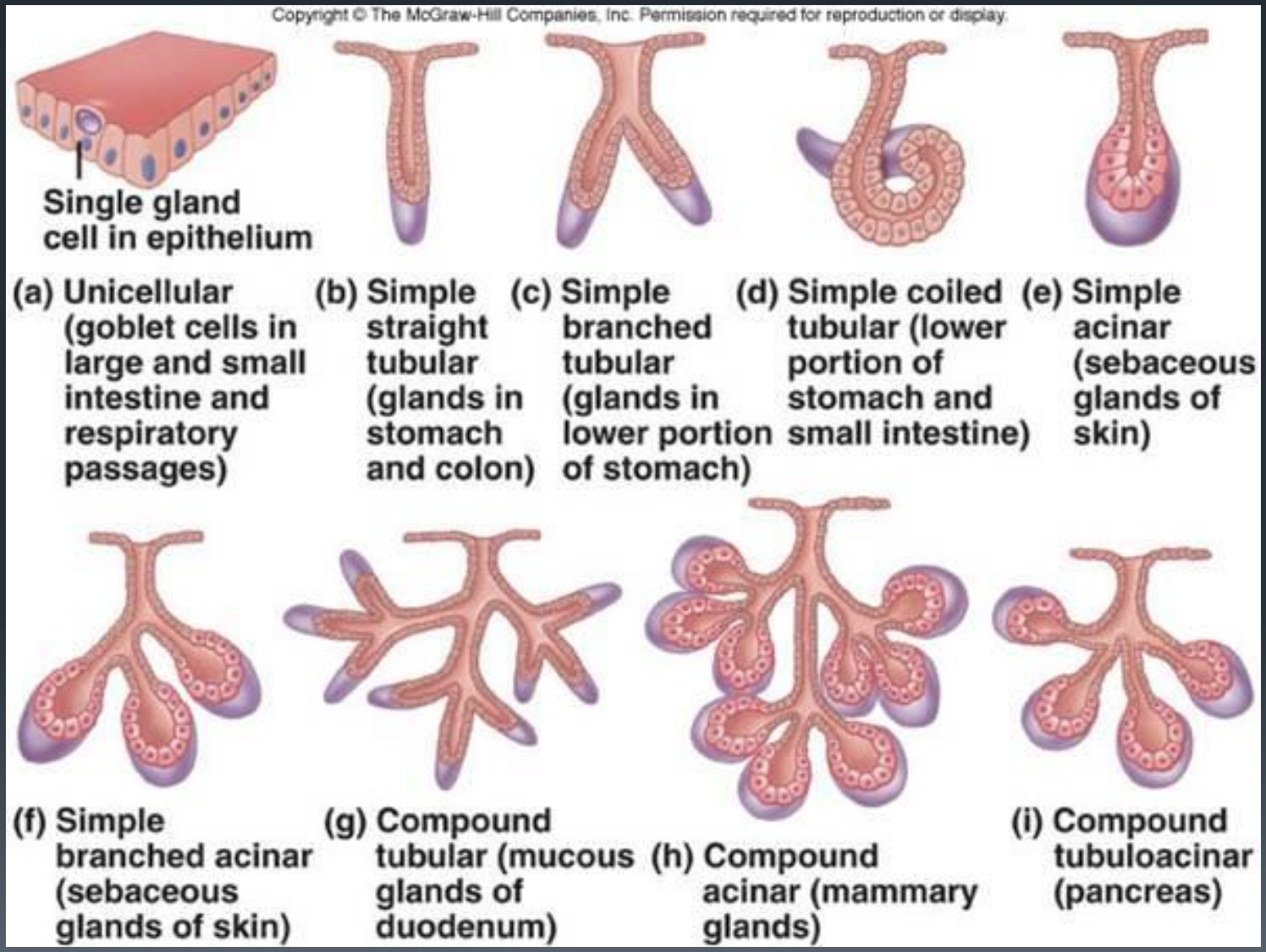
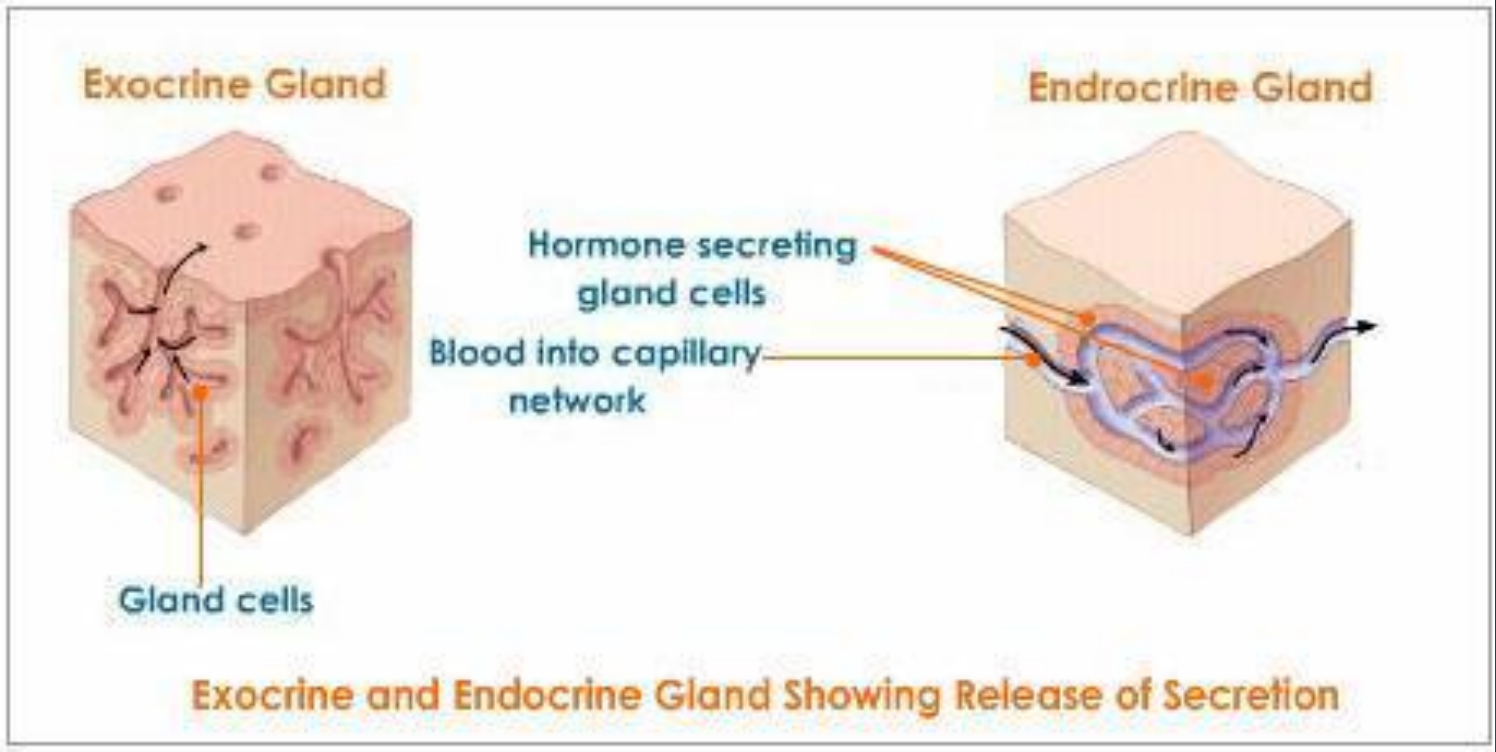



**FIGURE 2.6** ■ Pseudostratified columnar ciliated epithelium: respiratory passages (trachea). Stain: hematoxylin and eosin. High magnification.

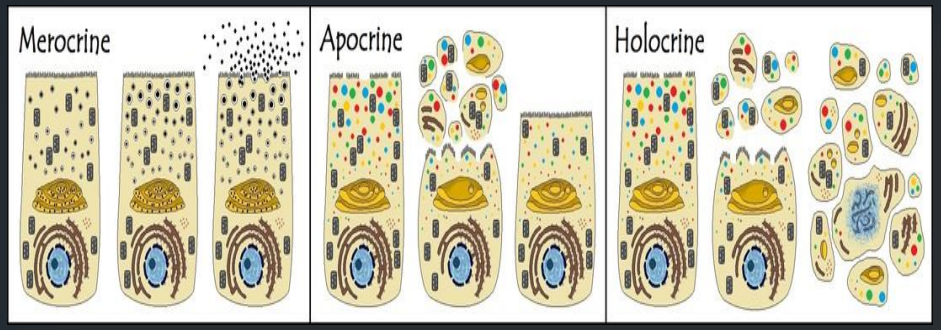
# Glandular epithelium

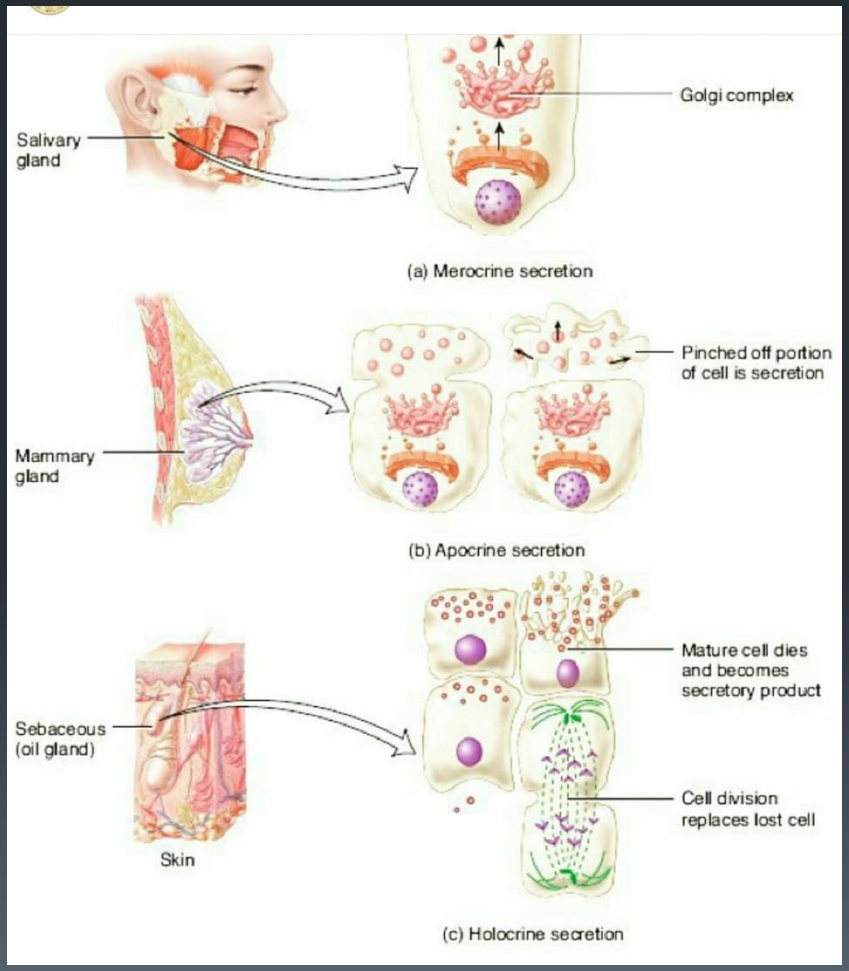







Exocrine and Endocrine Gland Showing Release of Secretion


Merocrine
Apocrine
Holocrine


Salivary gland
Golgi complex
(a) Merocrine secretion
Mammary gland
Pinched off portion of cell is secretion
(b) Apocrine secretion
Sebaceous (oil gland)
Skin
Mature cell dies and becomes secretory product
Cell division replaces lost cell
(c) Holocrine secretion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