Daily warm-up Tuesday, October 28th

What is a substrate and active site in regard to enzymes?

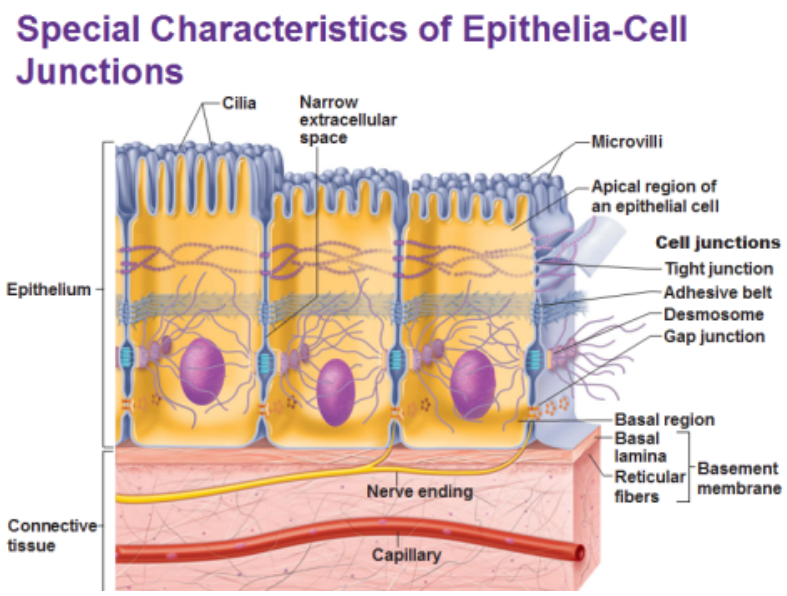
HW:
-Read pg. 133-140 in Ch. 5

Turn in:
-Nothing

Epithelial Tissue

Characteristics

-Cellularity- almost all cells
-Polarity
    -Apical surface
    -Lateral surface
    -Basal surface
-Attachemnt
-Avascularity
-Innervation
-High regeneration capacity



Functions of Epithelial Tissue

-Protection
-Selective permeability
-Secretions
    -Exocrine glands
-Sensations

*Why might epithelial tissue have avascularity?

Specialized Structure of Epithelial Tissue

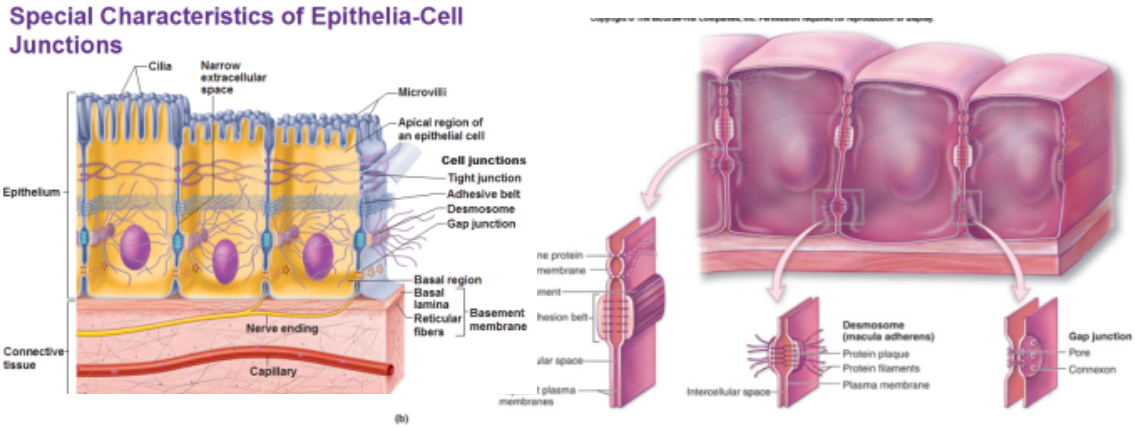
-Rests on a layer of connective tissue

-Basement membrane lies between the two

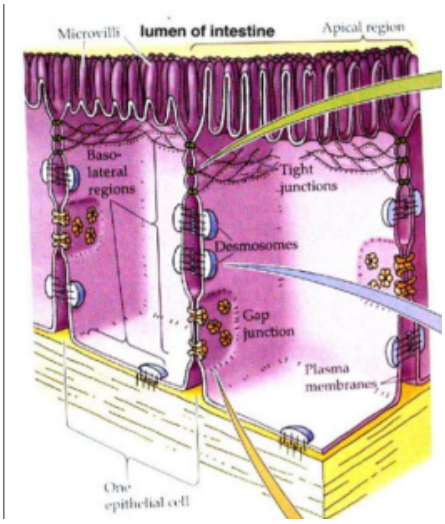
-Extracellular (proteins, carbohydrates, collagen fibers)

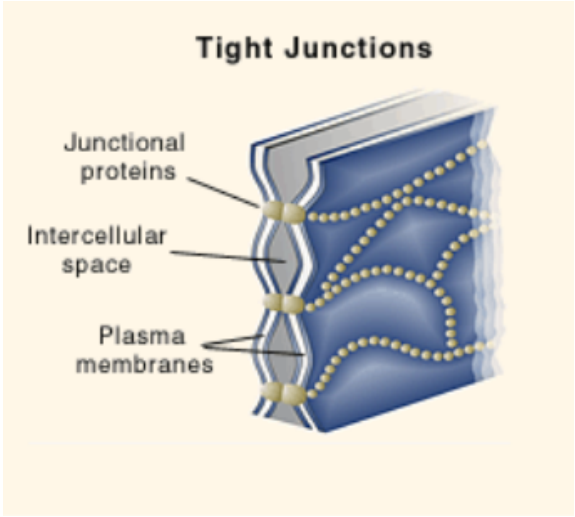
-Intercellular Junctions (4 types)

-Tight, adhering, desmosomes, and gap junctions



Tight Junction





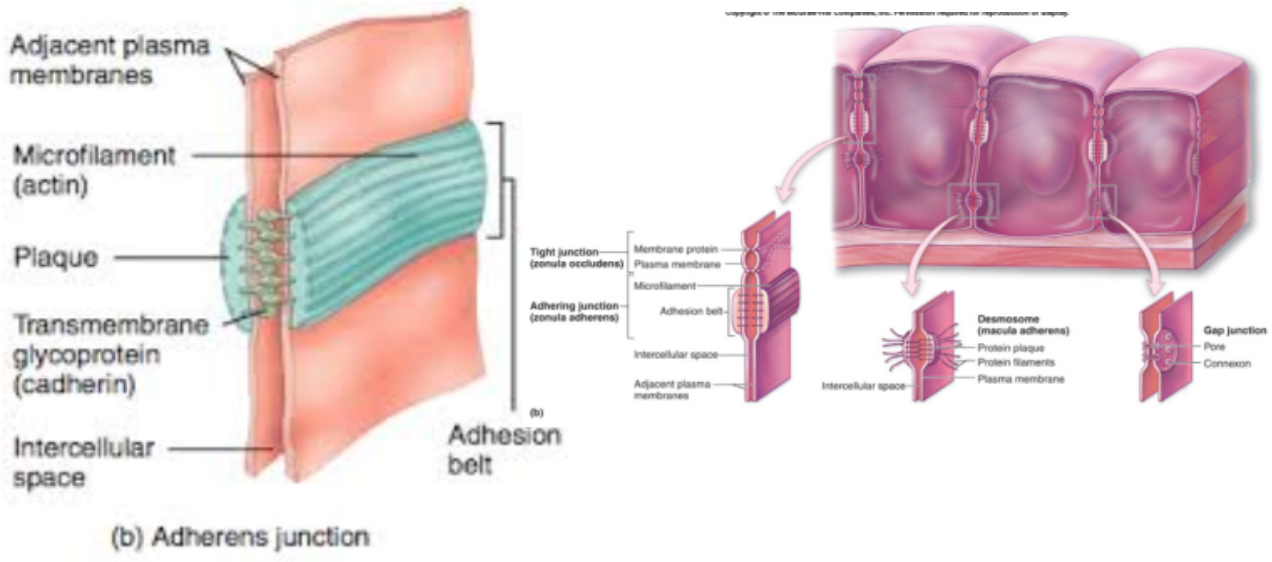
-Block the flow of fluid between epithelial cells

Adhering Junction

-Extensive zones of microfilaments extend from the cytoplasm into the plasma membrane

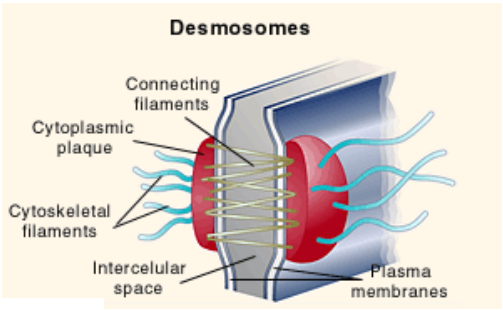
-Usually found below the tight junctions

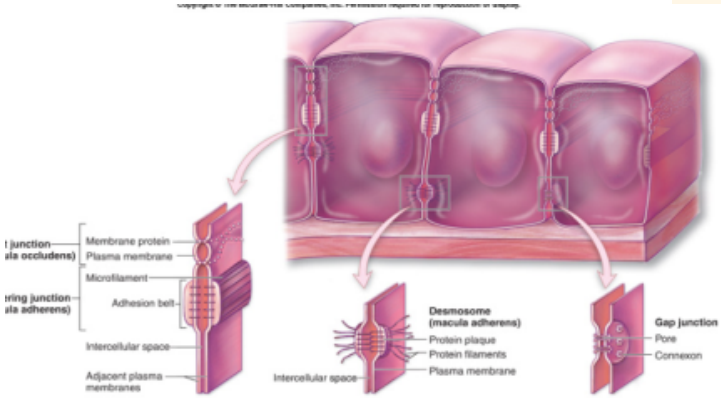
-Passageway between cells for materials that have already passed through apical surface



Desmosomes

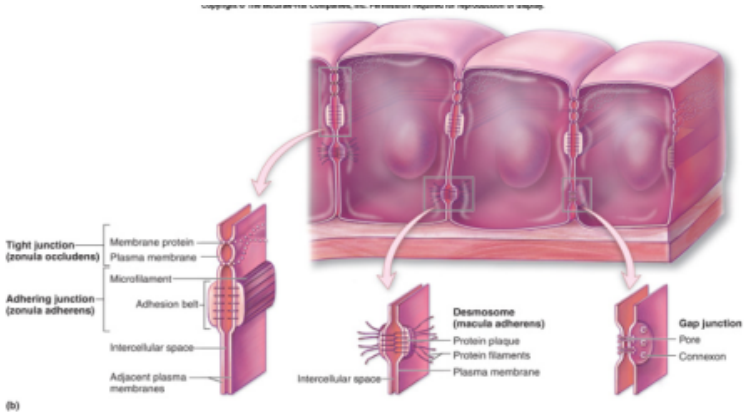
-Like a button or snap between two cells
-Attaches cell to neighboring cells at potential stress points
-Provides strength to the cell

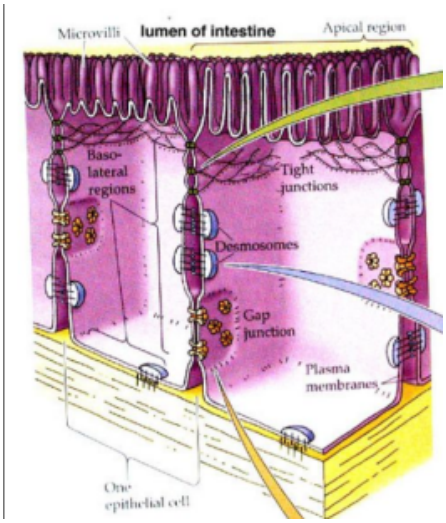




Gap Junctions

-Passageways for small molecules between cells through pores.
Ex. Ions, amino acids, glucose,



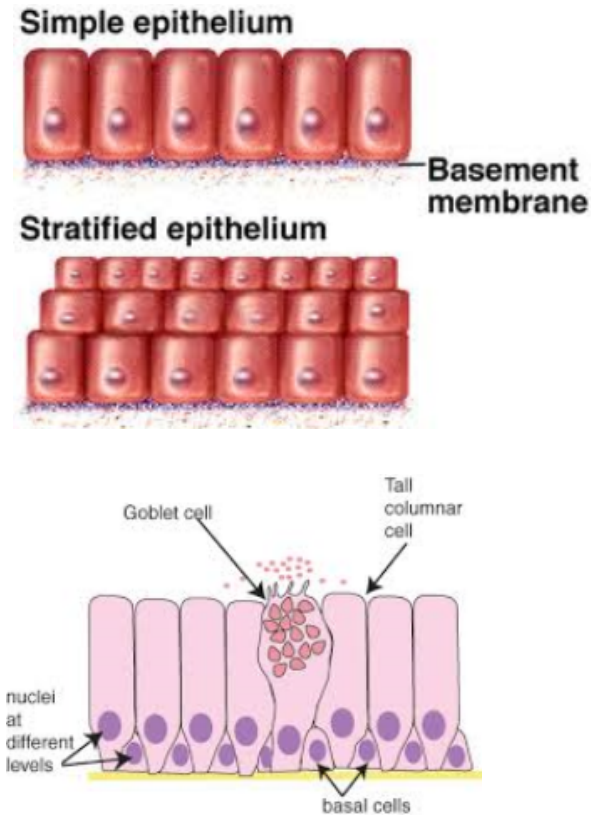


Classification of Epithelial Tissue

Indicated by a two-part name
- -First part of the name refers to the *number* of epithelial cell layers
- -Second part describes the *shape* of the cells at the apical surface of the epithelium

Classification by Number of Cell Layers

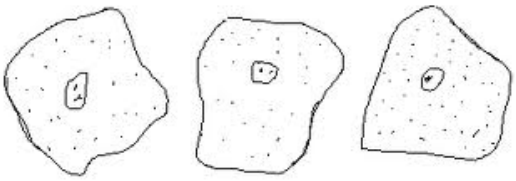
1. Simple epithelium
   - -One cell layer thick
   - -All cells in direct contact with basement membrane
   - -Found where stress is minimal and where filtration, absorption, or secretion is primary function.
     - -Ex. air sacs of lungs, intestines, blood vessels
2. Stratified epithelium
   - -Two or more layers
     - -Only the cells in the deepest (basal) layer are in contact with the basement membrane
   - -Strength, protection of underlying tissue
   - -Found in areas where more stress (wear and tear)
     - -Ex. esophagus
   - -Cells in basal layer regenerate
3. Pseudostratified epithelium
   - -Looks layered because of different locations of nuclei, but all cells connected to basement membrane


Simple epithelium
Basement membrane
Stratified epithelium
Goblet cell
Tall columnar cell
nuclei at different levels
basal cells

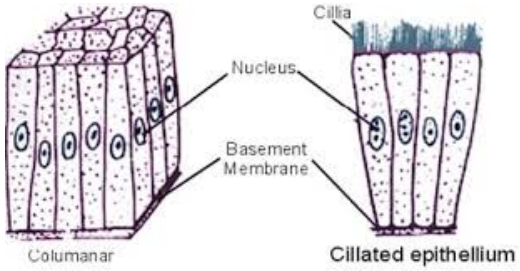
Classification by Cell Shape

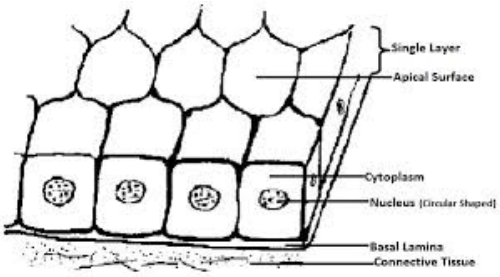
-Cells at apical surface

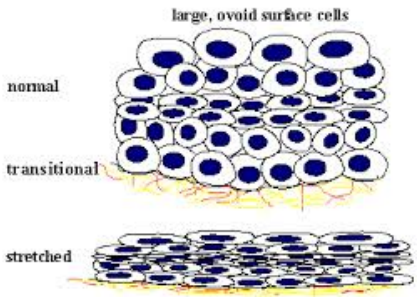
- 1. Squamous- flattened discs
  2. Cuboidal- about as tall as they are wide
  3. Columnar-slender and tall
  4. Transitional- change shape

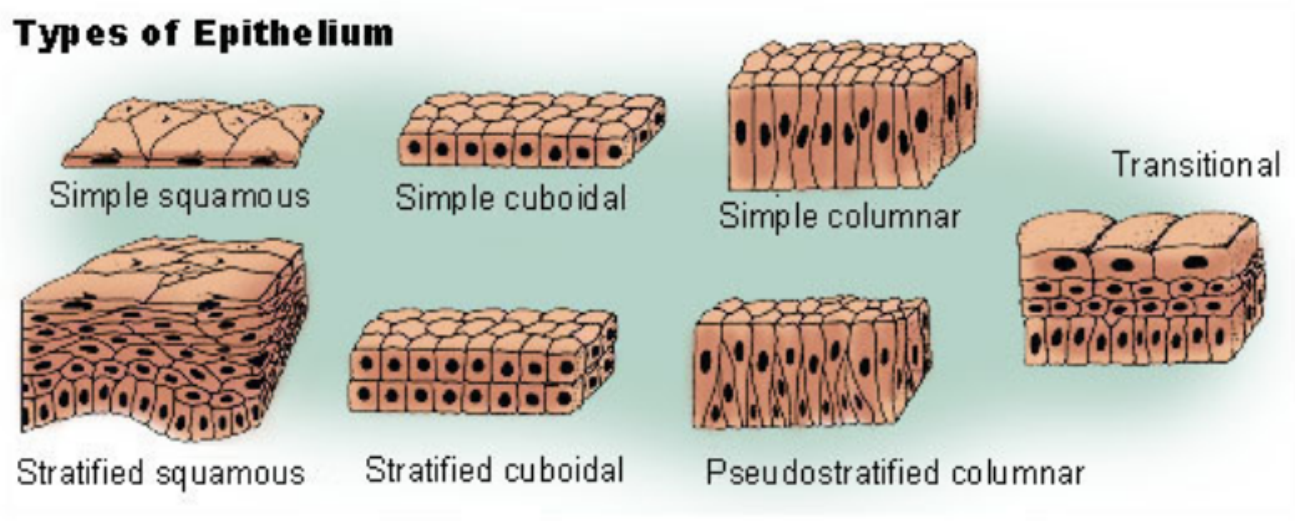


Squamous Epithelial Cells









Pseudostratified ciliated columnar epithelium vs. Pseudostratified nonciliated columnar epithelium

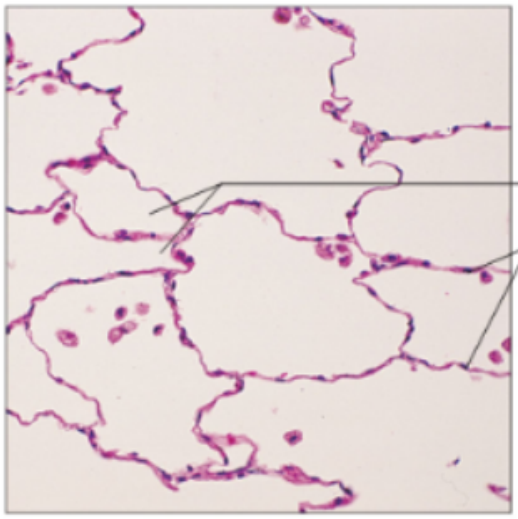
Simple Squamous Epithelium

(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).



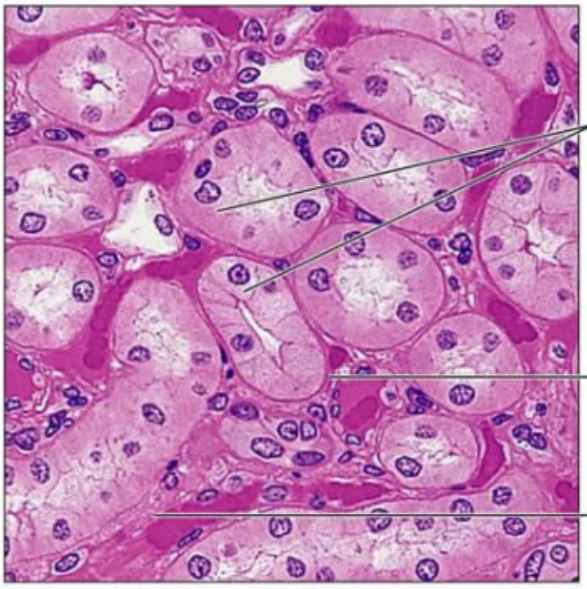
Photomicrograph: Simple squamous epithelium forming part of the alveolar (air sac) walls (200×).

(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.

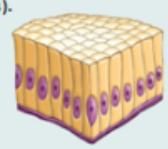


Photomicrograph: Simple cuboidal epithelium in kidney tubules (400×).

Simple Columnar Epithelium

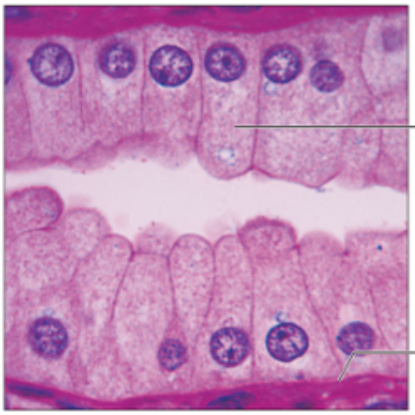
(c) Simple columnar epithelium

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.



Photomicrograph: Simple columnar epithelium of the stomach mucosa (1150×).

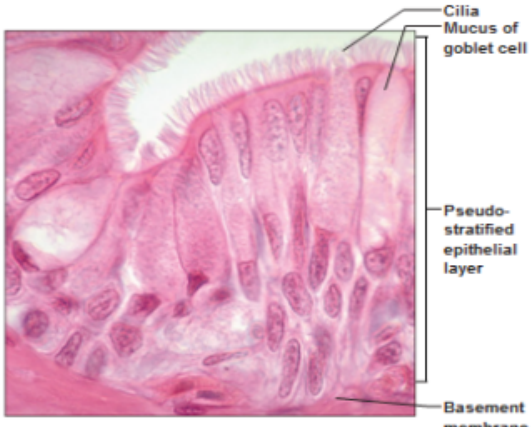
Pseudostratified Ciliated Columnar Epithelium

(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 mucus-secreting goblet cells and bear cilia.

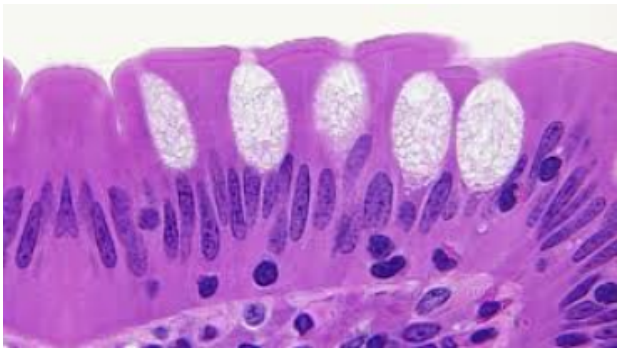
Function: Secretion, particularly of mucus; propulsion of mucus by ciliary action.

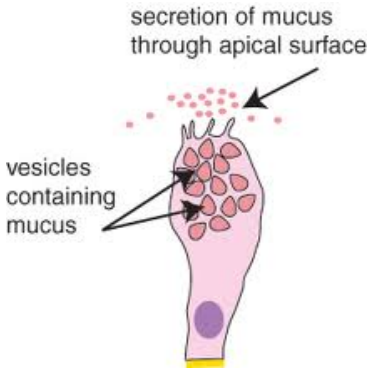
Location: Nonciliated type in male's sperm-carrying ducts and ducts of large glands; ciliated variety lines the trachea, most of the upper respiratory tract.



Photomicrograph: Pseudostratified ciliated columnar epithelium lining the human trachea (780×).

Goblet Cell

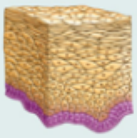



secretion of mucus
through apical surface
vesicles
containing
mucus

Stratified Squamous Epithelium

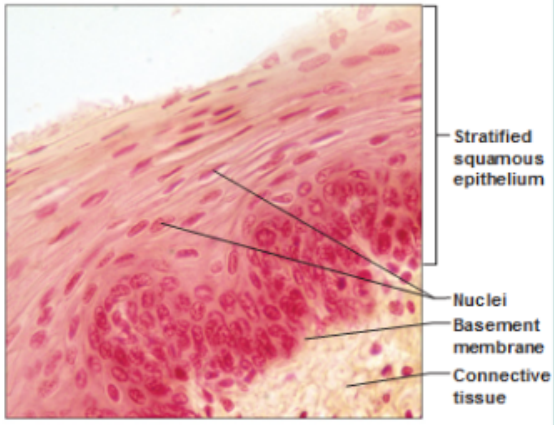
(e) Stratified squamous epithelium

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, urethra and anus; keratinized variety forms the epidermis of the skin, a dry membrane.

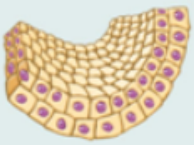


Photomicrograph: Stratified squamous epithelium lining the esophagus (430×).

Stratified *Cuboidal* Epithelium

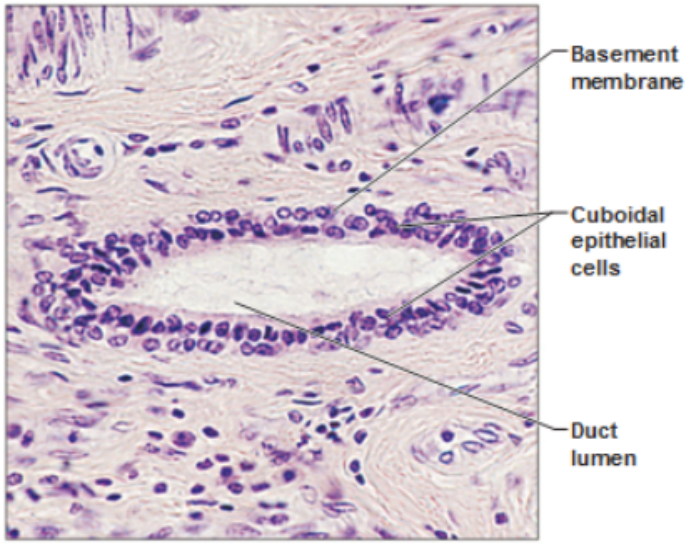
(f) Stratified cuboidal epithelium

Description: Generally two layers of cubelike cells.



Function: Protection

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

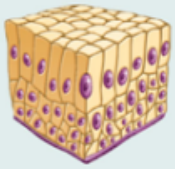


Photomicrograph: Stratified cuboidal epithelium forming a salivary gland duct (285×).

Stratified Columnar Epithelium

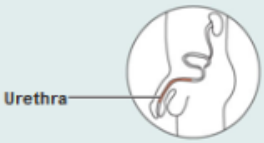
(g) Stratified columnar epithelium

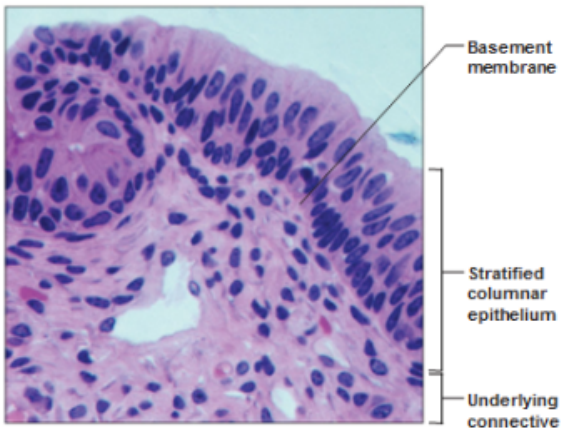
Description: Several cell layers; basal cells usually cuboidal; superficial cells elongated and columnar.



Function: Protection; secretion.

Location: Rare in the body; small amounts in male urethra and in large ducts of some glands.



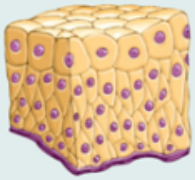


Photomicrograph: Stratified columnar epithelium lining of the male urethra (315×).

Transitional Epithelium

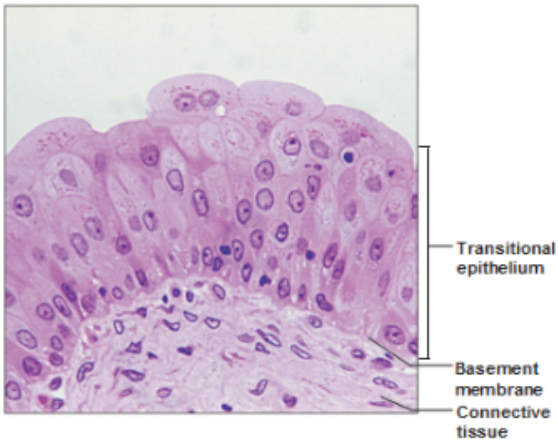
(h) Transitional epithelium

Description: Resembles both stratified squamous and stratified cuboidal; basal cells cuboidal or columnar; surface cells dome shaped or squamous-like, 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 the bladder, relaxed state (390×); 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.

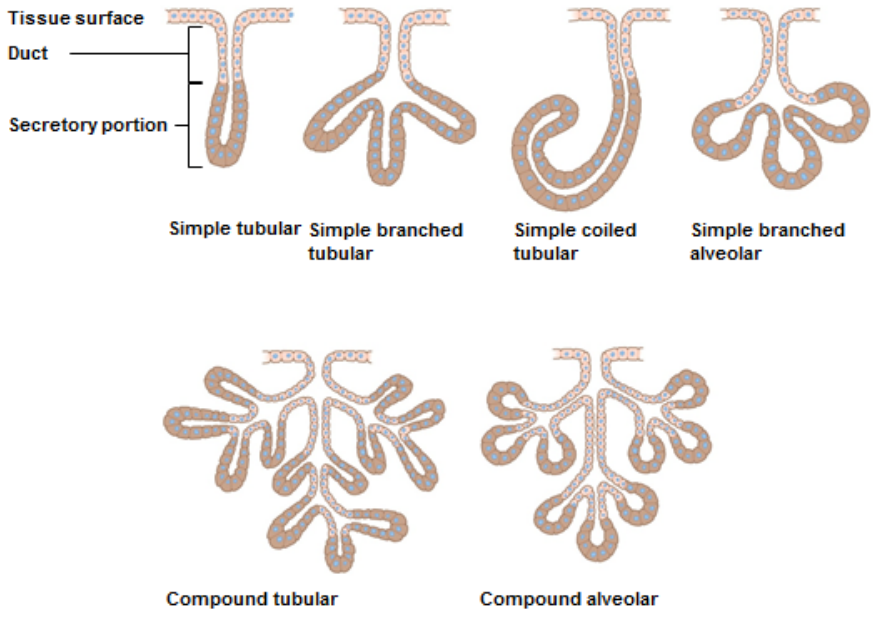
Everything urine-related because it stretches (transitions) with pressure.

Glandular Epithelium

- Composed of cells that are specialized to produce and secrete substances

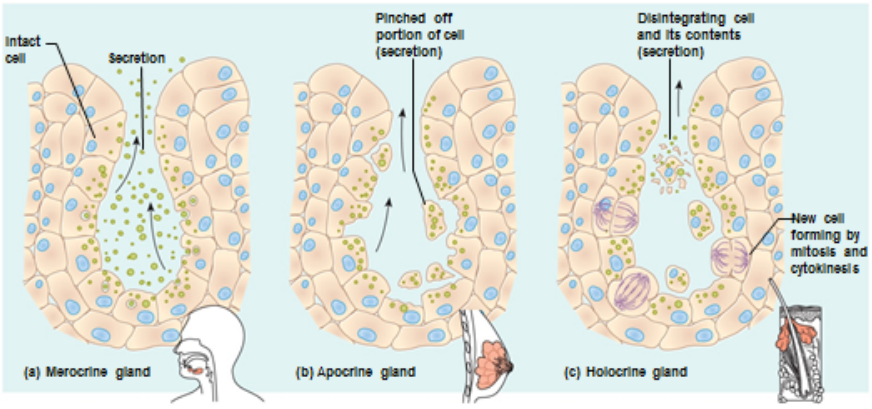
- There are two (2) types:
  - Endocrine glands are ductless (key word: hormone)
  - Exocrine glands have ducts
    - Unicellular exocrine gland:
      - Composed of one cell
      - Goblet cell
    - Multicellular exocrine gland:
      - Composed of many cells
      - Sweat glands, salivary glands, etc.
      - Simple and compound

Structural Types of Exocrine Glands



Types of Glandular Secretions

- **Merocrine Glands**
  - Fluid product
  - Salivary glands
  - Pancreas gland
  - Sweat glands
- **Apocrine Glands**
  - Portions of cells
  - Mammary glands
  - Ceruminous glands (earwax)
- **Holocrine Glands**
  - Whole cells
  - Sebaceous glands (oil)



11