

Histology

Tissues

- There are trillions of cells in the human body, but only about 200 different types.
- These cell types combine to form tissues
- Tissues are collections of specialized cells and cell products which perform body functions.
- The study of tissues is called HISTOLOGY.

There are 4 basic tissue types

1. Epithelial Tissue

- *Covers exposed surfaces
- *Lines internal passageways and chambers
- *Forms glands

2. Connective Tissue

- *Fills internal spaces
- *Provides structural support
- *Transports material in the body
- *Stores energy

3. Muscle Tissue

- *Contracts to perform movement
- *Generates heat

4. Neural Tissue

- *Carries information as electrical impulses

Epithelial Tissue

•An epithelium is a layer of cells that forms a barrier with specific properties.

•Epithelia covers every exposed surface and line all the bodies passageways to the outside, like:

Digestive, Respiratory, Reproductive, & Urinary tracts

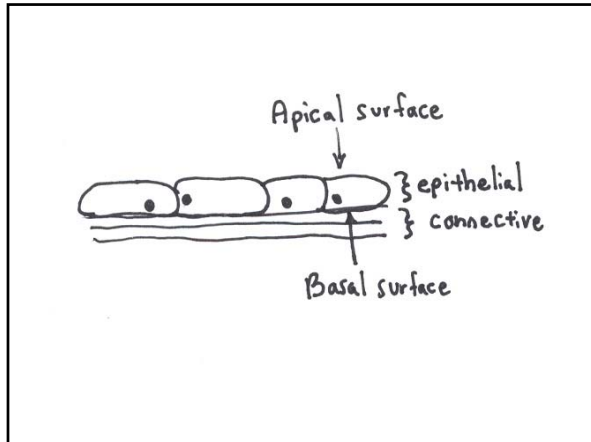
•Epithelia also lines internal cavities and passageways like:

Chest Cavity, Brain Case, Eye, Inner Ear,
Blood Vessels, & Heart

Important Characteristics

1. **Cellularity:** cells are bound close together.

2. **Polarity:** one side of epithelial cells is exposed (**apical**) and the other is attached (**basal**).
Organelles are usually spread unevenly between surfaces. This property is known as polarity.



3. Attachment: all are attached to basement membranes which in turn are attached to connective tissue.

4. Avascularity: epithelia contain no blood vessels, so the cells of this tissue must obtain nutrients by absorption through apical or basal membranes.

5. Regeneration: cells lost near the apical surface are continually being replaced by stem cells in the epithelium.

Function of Epithelial tissue

1. Provide Physical Protection
2. Control Permeability
3. Provide Sensation

4. Provide Specialized Secretions (glandular epithelium)

exocrine- secrete to outside of the body.
includes: digestive glands, sweat glands, mammary glands

endocrine- secretions released inside the surrounding interstitial fluid and blood.

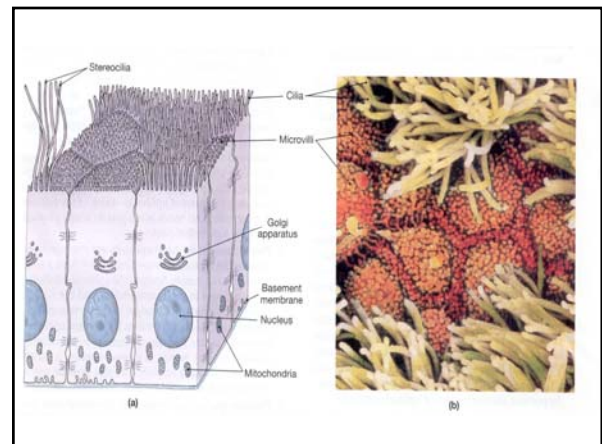
*These secretions are known as hormones.

Some epithelial cells have external appendages on the apical surface

Microvilli: (very short $\approx 1/6$ length of cilia)

Cilia: (≈ 250 / cell is typical) ciliated epithelium (respiratory tract) removes impurities.

Stereocilia: (very long $\approx 6x$ length of cilia) cannot actively move found in σ reproto. tract and receptor cells of inner ear.



Maintaining the integrity of Epithelia

3 factors involved:

1. intercellular connections
2. attachment to the basement membrane
3. epithelial maintenance and repair

Intercellular Connection

- Epithelial cells are firmly attached to each other.
- Connect also to basement membrane.
- Specialists in intracellular connection
 - they do this by using cell adhesion molecules (CAM's)
 - also use intercellular cement (hyaluronan most common type)

3 Major Cell Junctions

1. Tight Junctions

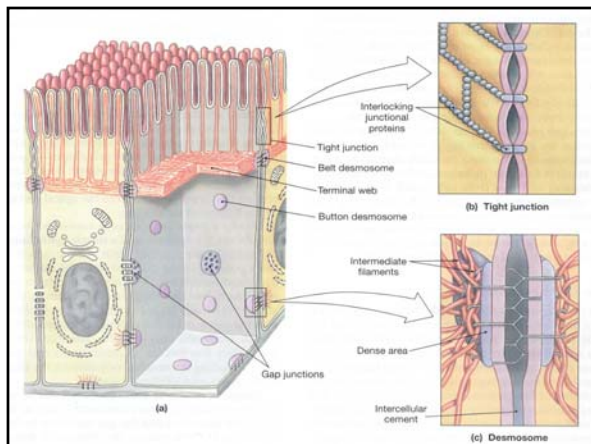
- partial fusion of cell membranes
- block passage of H₂O & solutes b/n. cells.

2. Desmosomes (Anchoring junctions)

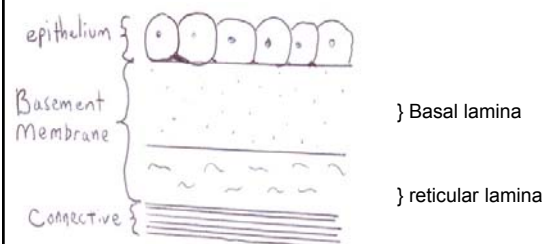
- dense area (CAM/proteoglycan complex)
- cytoskeleton connects dense areas
 - a. belt desmosomes (band that encircles the entire cell)
 - b. disk desmosomes
 - strong can resist stretching & twisting
 - abundant in superficial skin cells.

3. Gap Junctions (Communicating junctions)

- channel proteins called connexons rivet cell membrane of two adjacent cells together. Allow intercellular communication.
- very common in cardiac muscle.



Basement Membrane

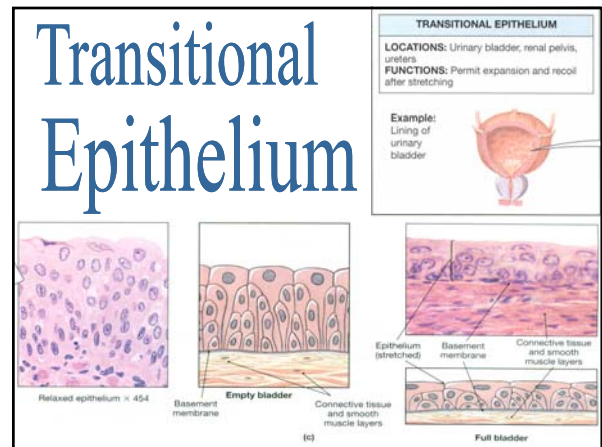
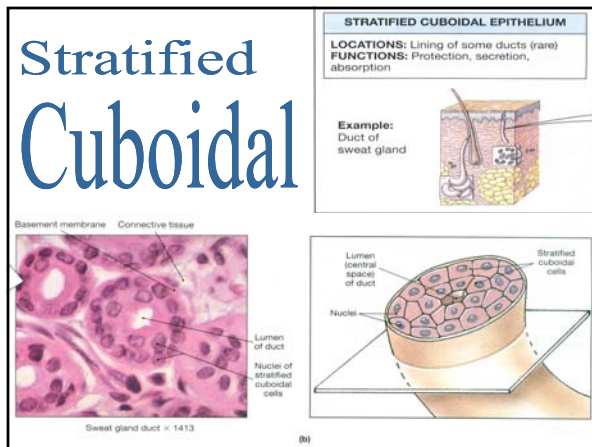
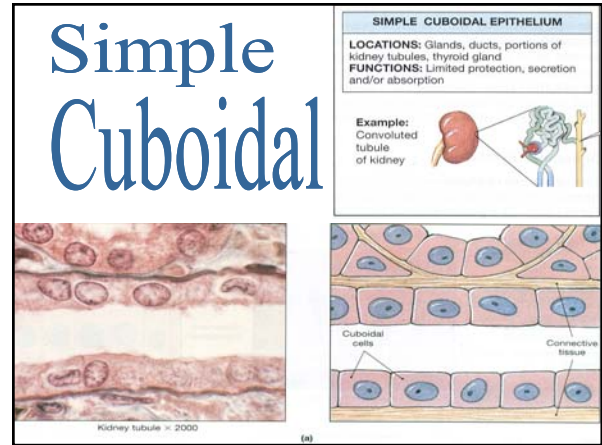
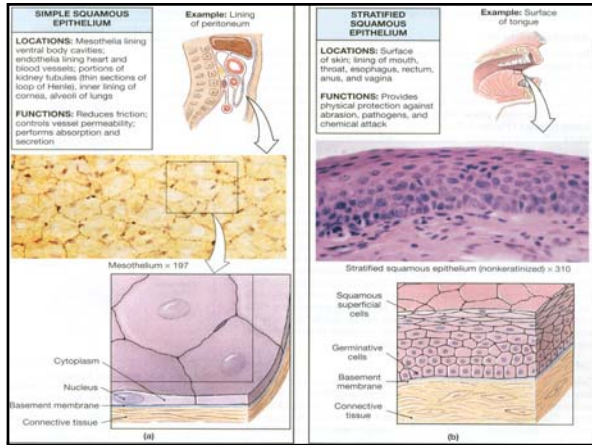
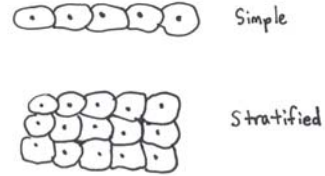


Epithelial Maintenance & Repair

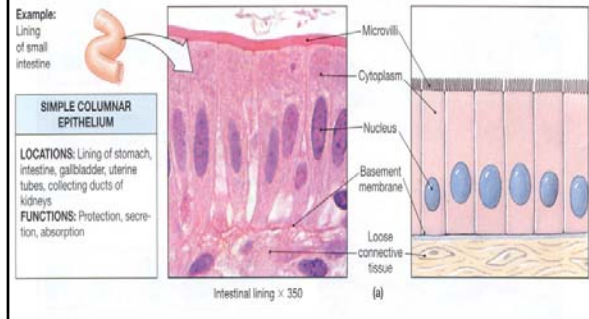
- Stem cells or germinative cells replace worn out or destroyed cells.

Simple vs. Stratified

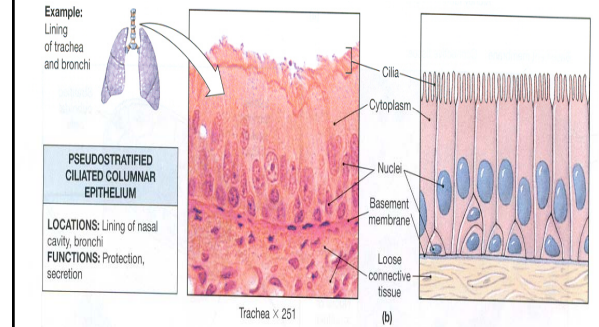
1. the look of it (nucleus stuff)
2. actuality



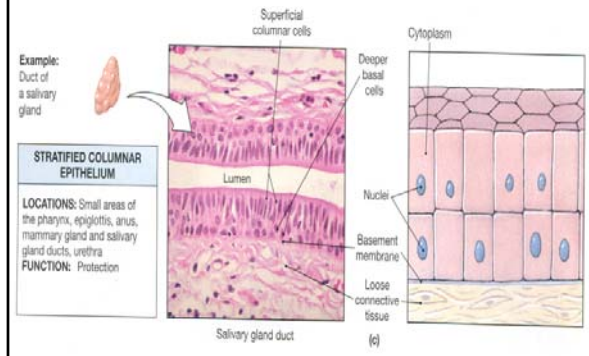
Simple Columnar



Pseudostratified Ciliated Columnar



Stratified Columnar



Glandular Epithelium

Endocrine glands: ductless, release hormones to interstitial spaces & blood

Exocrine Glands:

- most secrete in tubular passageways called ducts.
- ducts empty on to the surface of the epithelium.

Modes of Secretion

1. Merocrine: product released from secretory vessels through exocytosis. Golgi apparatus pinches off secretory vessels which migrate out of the cell.

- Mucus & sweat are two secretory products produced this way.

2. Apocrine secretions

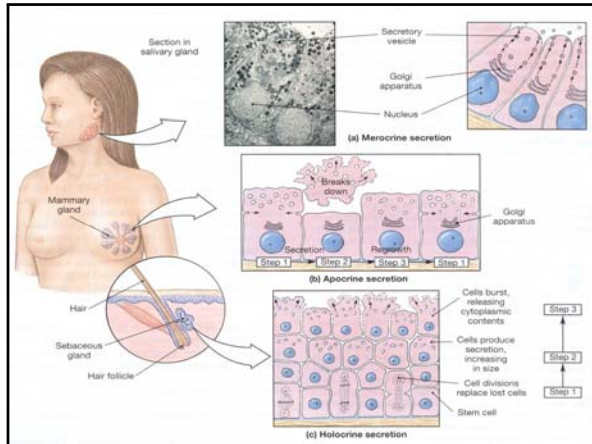
- Involves loss of cytoplasm as well as secretory product.

- Tends to be thicker

i.e.-underarm sweat, mother's milk (merocrine & apocrine)

3. Holocrine secretions

- Destroy the secretory cell
- Cell fills with the secretory product, then bursts
- Sebaceous glands assoc. w/ hair follicles, produce oil this way



Really only two types of secretory products

1. **serous** (watery & contain enzymes)
2. **mucous** (less watery and contain glycoproteins called mucins)

Connective Tissue

•includes things like bone, fat, & blood.

All connective tissues include:

1. specialized cells
2. extracellular protein fibers } matrix that surrounds cells.
3. a fluid known as ground substance

Functions include:

- Establish a structural framework
- Transporting fluids from one part of the body to another
- Protecting delicate organs
- Supporting, surrounding and interconnecting other tissue types