Epithelium (epithelial tissue)

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Tissue

Groups of similar cells working together

Classified into four types:

- Epithelial
- Connective
- Muscle
- Nerve

Epithelium

- Epithelial cells are closely packed cells, and form continuous sheets.
- Function

1. Protaction
2. Transcellular transport
3. Secretion
4. Absorption
5. Detection of sensations

Special Characteristics of Epithelium

Adjacent cells are bound together by cell junctions.

The lower surface of all types of epithelia rest on ***Basement membrane /Basal lamina***, a structureless material secreted by the cells.

Special Characteristics of Epithelium

Epithelial tissues are avascular (*no direct blood supply*). Nutrition depends on diffusion from underlying connective tissue.

Epithelial cells regenerate easily.

Classification of Epithelia:

Epithelium is divided into two types:

1. **Covering & Lining Epithelia.**
2. **Glandular Epithelia.**

Basement Membrane

- Noncellular layer that secures the overlying tissues
- Most epithelial tissues have a basement membrane

Epithelial Tissue Classifications

Epithelial tissue is classified according to the number of cell layers and the shape of each epithelial cell

Epithelial Tissue Classifications

Simple epithelium
- A single layer of cells

Stratified epithelium
- More than one layer of cells

Epithelial Tissue Classifications

Pseudostratified epithelium
- Contains a single layer of cells of varying heights
- All cells attach to the basement membrane, but some fail to reach the free surface, giving the appearance of multiple layers

Transitional epithelium
- Consists of layers of stratified cells that change shape from cuboidal to squamous when the organ is stretched

Epithelial Tissue Classifications

Shape of each epithelia

Squamous
- Flat sheets

Cuboidal
- Rows of square-shaped cells

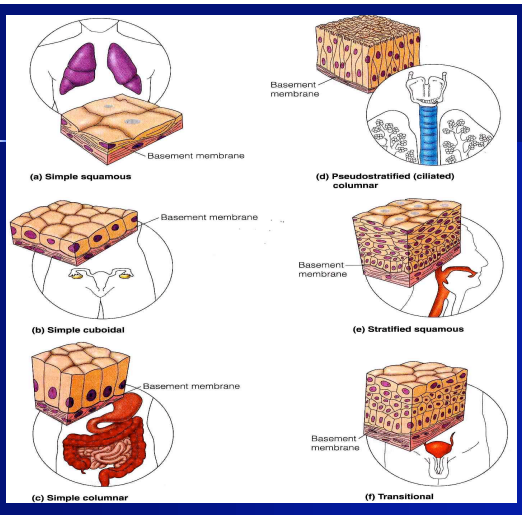
Columnar
- Rows of tall, thin cells

Epithelia are derived from the three embryonic germ layers

Ectoderm: epidermis and glands of skin, cornea, oral and nasal mucosae.

Endoderm: liver, pancreas, lining of the GI and respiratory.

Mesoderm: uriniferous tubules of kidney, lining of male and female reproductive system, endothelial lining of circulatory system.



Functions of Epithelium:

Protection
Absorption
Secretion
Exchange of gases, nutrients, & waste products

Simple Epithelia

Simple Epithelia

1) Simple Squamous Epithelium:

Composed of a single layer of flattened cells.

The term 'squamous' derives from the comparison of the cells to the scales of a fish.

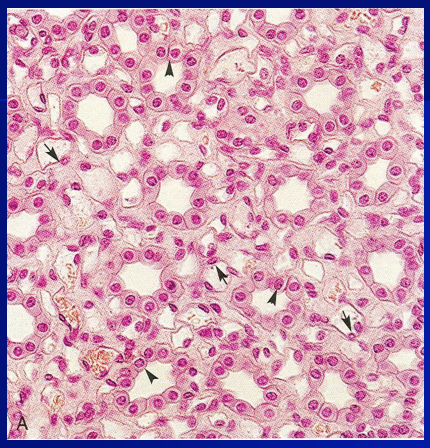
Simple Epithelia

2) *Simple Cuboidal Epithelium*:

- Consists of a single layer of square shaped cells (2D).
- Centrally placed nucleus.

Example:

Kidney tubules.



Simple Epithelia

3) *Simple Columnar Epithelium*

Single layer of tall column-like cells.

Goblet cells (mucus producing cells) may be seen in this type of epithelium.

Examples:

Stomach and intestines.

Simple Epithelia

4) Pseudostratified Columnar Epithelium

Single layer of cells but gives false impression of more than one layer of cells. (stratified).

There are tall cells that reach the surface with other shorter ones that don't.

Simple Epithelia

4) Pseudostratified Columnar Epithelium

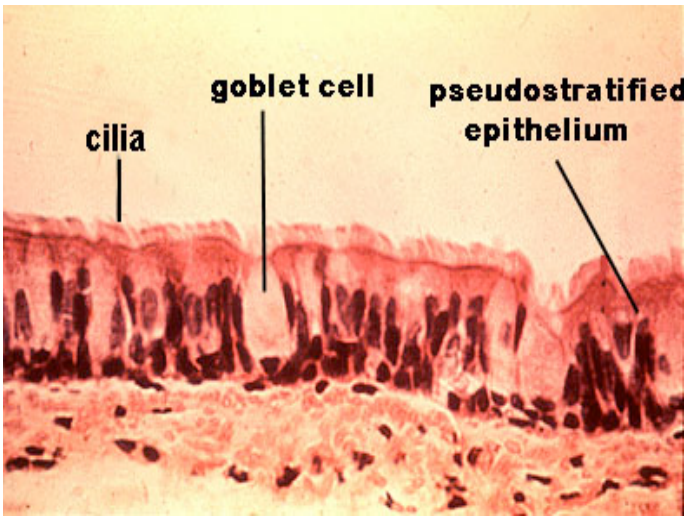
All cells rest on the same basement membrane.
The nuclei show different levels of height.

The higher cells may be ciliated.

Goblet cells are seen in respiratory epithelium.

Examples:

Trachea



Stratified Epithelia

Stratified epithelia are described according to the shape of their superficial cells.

Consists of two or more cell layers.

Their main function is protection.

1) Stratified Squamous Epithelium

(Keratinized & nonkeratinized)

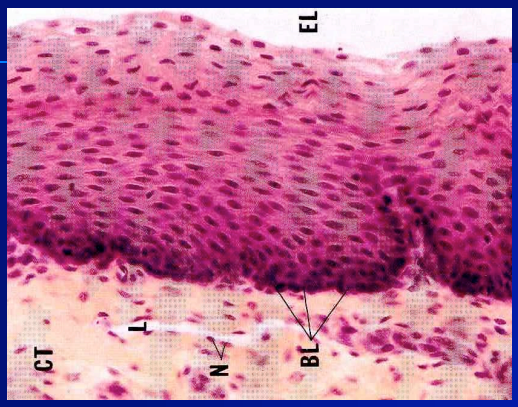
Stacked epithelial cells with the surface cells being flat.

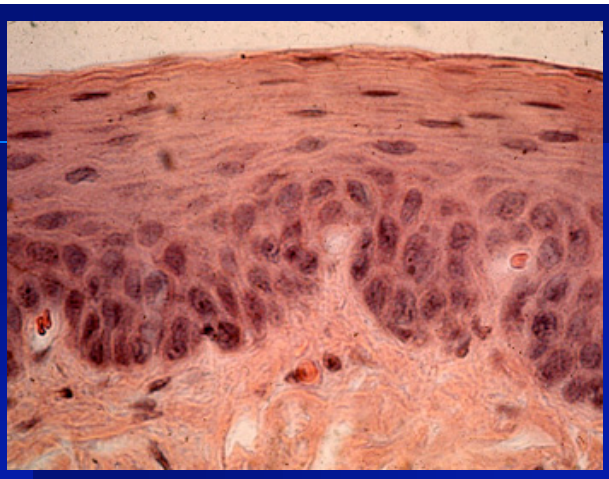
The cells at the base are cuboidal or columnar.

The intermediate cells are polygonal.

The basal and intermediate cells maintain the ability to divide.

Cells at the surface are dead and lack nuclei.





2) Stratified Cuboidal & Columnar Epithelium:

Usually have two cell layers with surface cells cuboidal or columnar.

The basal cells vary in size & shape.

Examples:

Ducts of the large exocrine glands such as salivary glands (columnar), sweat glands (cuboidal).

3) Transitional Epithelium:

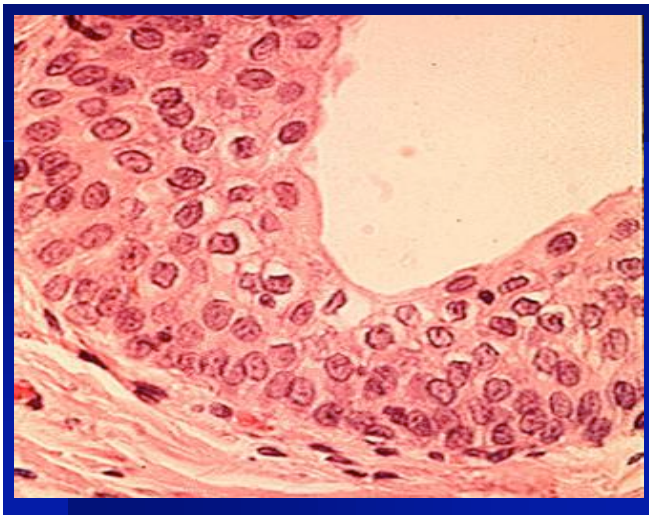
Is a modified type of *Stratified Squamous epithelium.*

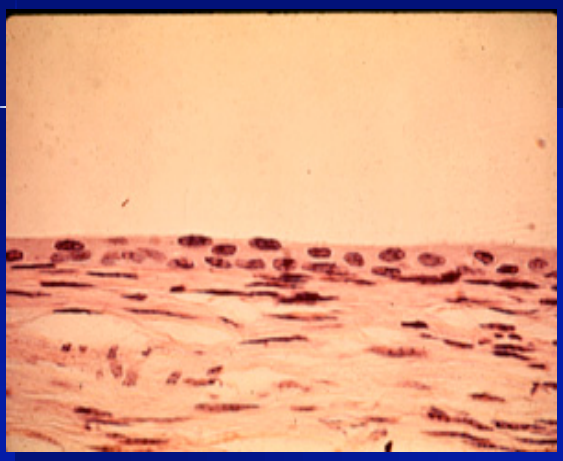
Present in the urinary system organs. In the relaxed state, it shows 5-8 layers.

3) Transitional Epithelium:

Basal cells are cuboidal or columnar, intermediate cells are polygonal, and surface cells are rounded.

When the epithelium is stretched, it appears 2-3 layers thick and the surface cells appear flattened.



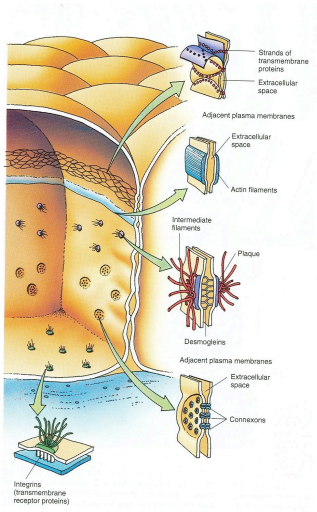


Junctional complexes

Occluding junctions (tight junction)

Anchoring junctions

Communicating junction



Renewal of epithelial cells

Skin 28 days

Small intestine 4-6 days

Others renewed periodically until adulthood