Department of biology

2025-2026

((Theoretical Histology))

Stage (-3-)

LEC- ((5))

Stratified Epithelium

By

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B) Stratified Epithelium:

Stratified epithelium is a multilayered epithelium.

• Only the basal cell layer rest on basal lamina.

• Regenerate from below.

• Major role is protection.

• **Are named according to the shape of cells at apical layer as follows:**

1. Stratified squamous epithelium

2. Stratified cuboidal epithelium

3. Stratified columnar epithelium

4. Transitional Epithelium

General features

♥ Consists of several layers of cells.

♥ Basal cell layer consists of cuboidal or columnar cells that rest on basal lamina.

♥ Cells above basal layer gradually decrease in size and become flat (squamous).

♥ Nuclei of the superficial layer are elongated and flat.

1- Stratified Squamous Epithelium

Specific two type:

A. **Keratinized** – contain the protective protein keratin

Surface cells are dead and full of keratin, do not have nuclei.

B. **Non-keratinized** – forms moist lining of body openings.

A- Keratinized stratified squamous epithelium

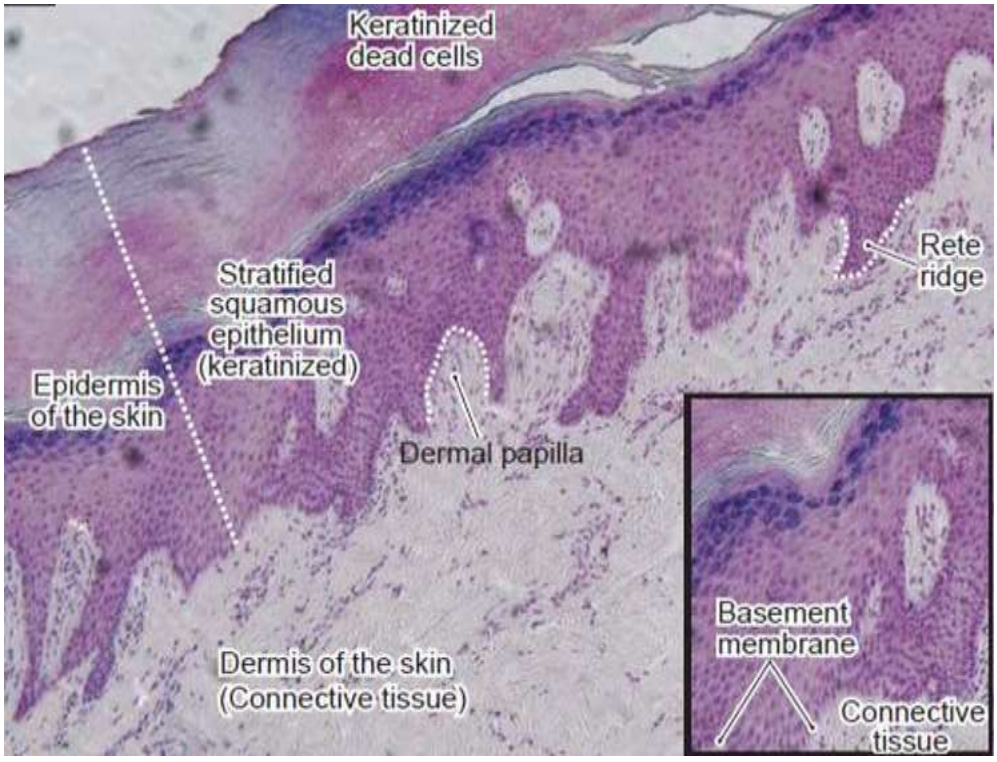
The surface layer consists of dead cells lacking nuclei and containing plates of the protein keratin, which strengthens and waterproofs the tissue.

Location: - Found in areas exposed to air and subject to abrasion, such as **epidermis of skin**. and some mucocutaneous junctions (**lips and distal anal canal**).

B- Non- Keratinized stratified squamous epithelium

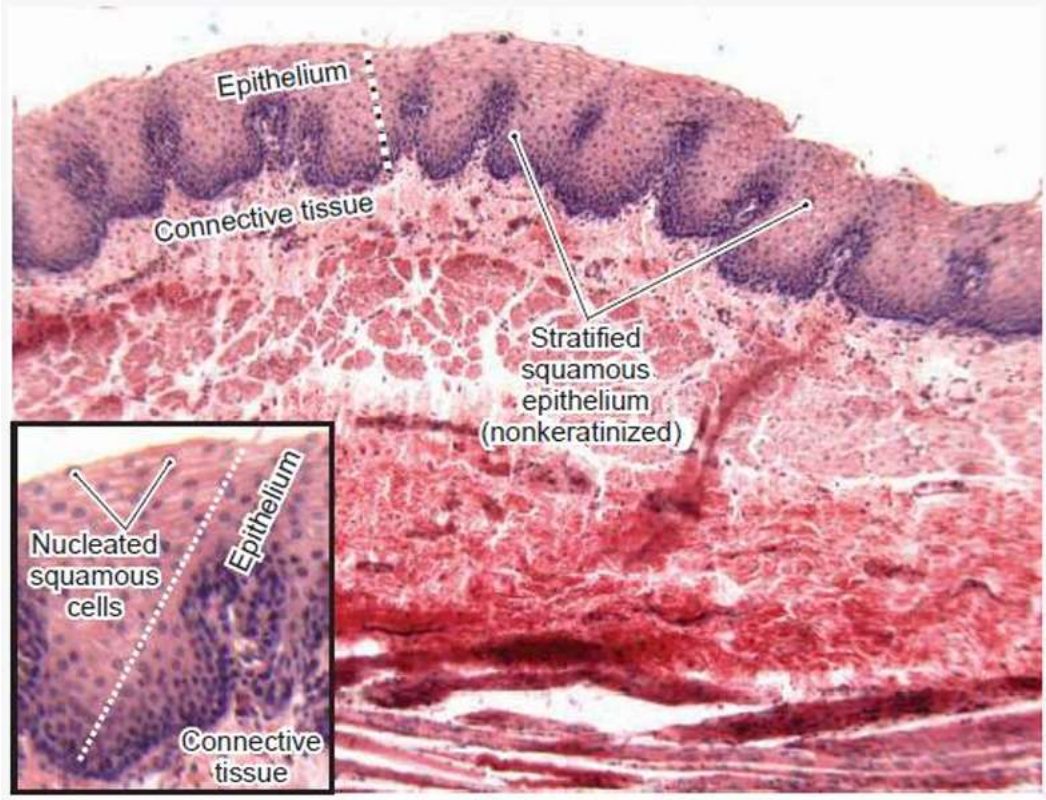
Surface squamous cells retain nuclei and lack keratin.

Location: - Lines most of the **oral cavity**, **pharynx**, **epiglottis**, **vocal cords**, e**sophagus**, **anal canal**, **vagina**, **parts of the male and female urethra, and cornea.**



Stratified squamous epithelium (Keratinized) in palm of the hand (thick skin), H&E. Thick skin (palms and soles) and thin skin (most other body surfaces) are covered by keratinized stratified squamous epithelium. Skin includes epidermis (stratified

squamous epithelium) and dermis (connective tissue). The top layer of the keratinized stratified squamous epithelium consists of dead cells (corneocytes), which lack nuclei. This tough keratinized layer resists friction and is impermeable to water.



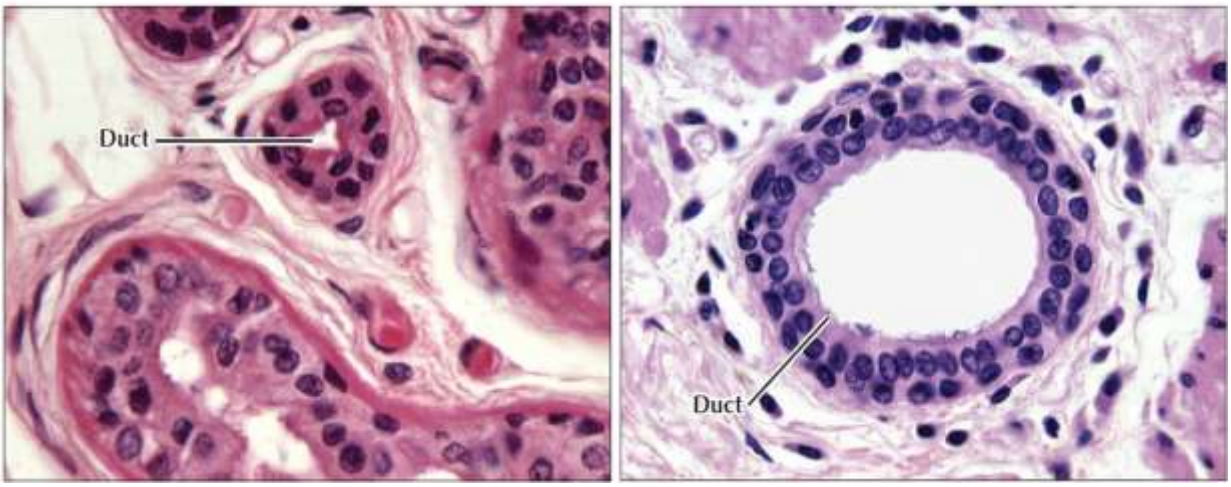
Stratified Squamous Epithelium (non keratinized) in esophagus. H&E. Stratified squamous epithelium, epithelium (non-keratinized) is usually wet on its surface and is found lining the mouth, oral pharynx, esophagus, and vagina. Non-keratinized stratified squamous epithelium is similar to keratinized squamous epithelium, but the flattened surface cells retain their nuclei (alive cells), and there is no keratinization of these cells.

2- Stratified Cuboidal and Columnar Epithelia tissue:

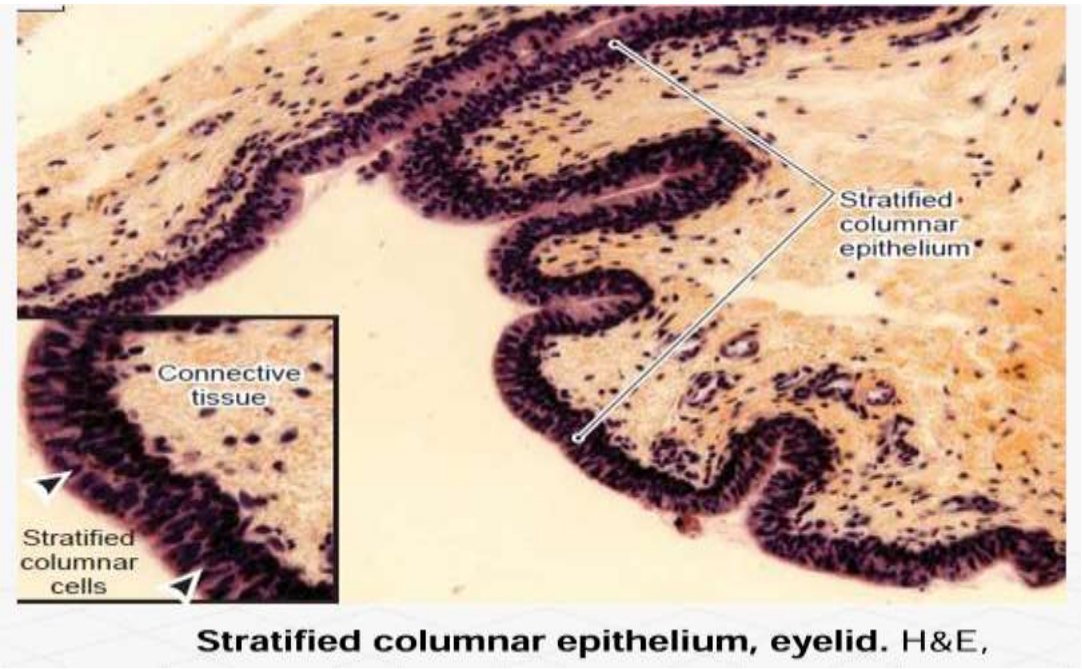
Structure and Function

- ♥ Are both relatively rare.
- ♥ Stratified cuboidal epithelium occurs in the excretory ducts of salivary and sweat glands.

- Stratified columnar epithelium is **seen** in the **conjunctiva** lining the **eyelids**, where it is **both protective and mucus secreting.**
- Stratified cuboidal epithelium is lined **large duct of salivary glands** and **sweat glands.**



Stratified cuboidal epithelium forms of glands of sweat gland (left). And esophageal mucous gland (right), it consist of double layer of cells



Stratified columnar epithelium, eyelid. H&E,

3- Transitional Epithelium:

Structure and Function

- Multilayered transitional epithelium.
- It is restricted to lower parts of the **urinary tract**, where it lines the renal pelvis, **ureters**, **urinary bladder**, and part of the **urethra so is called urothelium.**
- It rapidly adapts to contraction and distention; it changes from epithelium with five to seven cell layers (empty state) to a thinner epithelium with only two or three cell layers (distended state).
- Urothelium acts as a barrier and protects tissues from noxious effects of urine, but it can also stretch to accommodate urine volume.

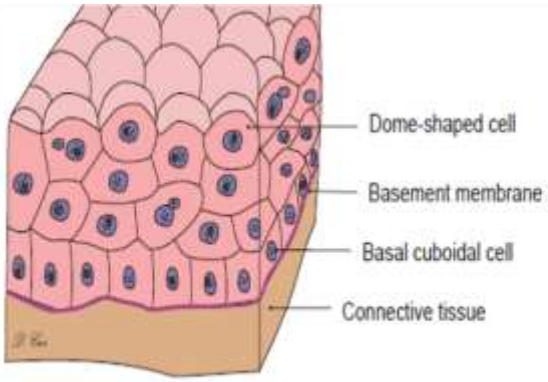


Figure 3-17B. Transitional epithelium (relaxed).

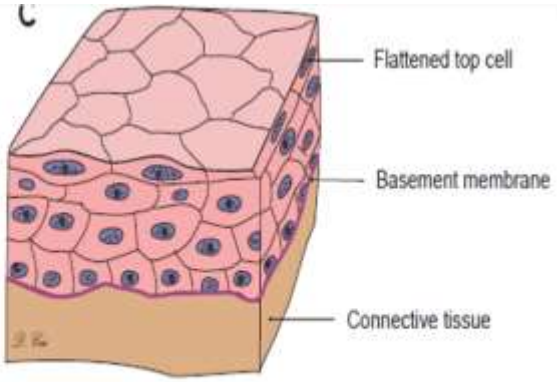


Figure 3-17C. Transitional epithelium (distended).

Relaxation state

The relaxed, normal transitional epithelium is composed

of four to five layers of cells. The cells located basally are smaller, low columnar or cuboidal cells. By contrast, the cells located in the most superficial layer are larger and exhibit a rounded, dome shape that bulges into the lumen.

Distention state

Transitional epithelium in the distended state is shown. These cells change shape according to the degree of distention of the bladder. When the transitional epithelium is stretched, the top dome-shaped cells become flattened squamous cells and the epithelium becomes thinner.

• Gland tissue:

Gland: A gland is an organ of secretion made of specialized secretory cells derived from surface epithelium on which it opens.

CLASSIFICATION OF GLANDS

A. Based on the site of secretion:

1. Exocrine gland – secretes its products onto a surface through ducts, e.g. *salivary glands.*

2. Endocrine gland – secretes its products into the bloodstream, e.g. *thyroid glands and pancreases gland*.

3. Paracrine gland: secretes its products into the local extracellular space affecting the surrounding cells, e.g. enteroendocrine cells of gastrointestinal tract (GIT).

B. Based on the number of cells:

1. Unicellular gland – composed of a single cell, e.g. *goblet cells* in the respiratory and intestinal tracts.

2. Multicellular gland – composed of many cells, e.g. all glands other than goblet cells.

C. Based on the number of ducts and shape of secretory end piece:

1. Simple gland – has one excretory duct. e.g. parotid gland.

2. Compound gland – has minor and major excretory ducts. e.g. sublingual gland.

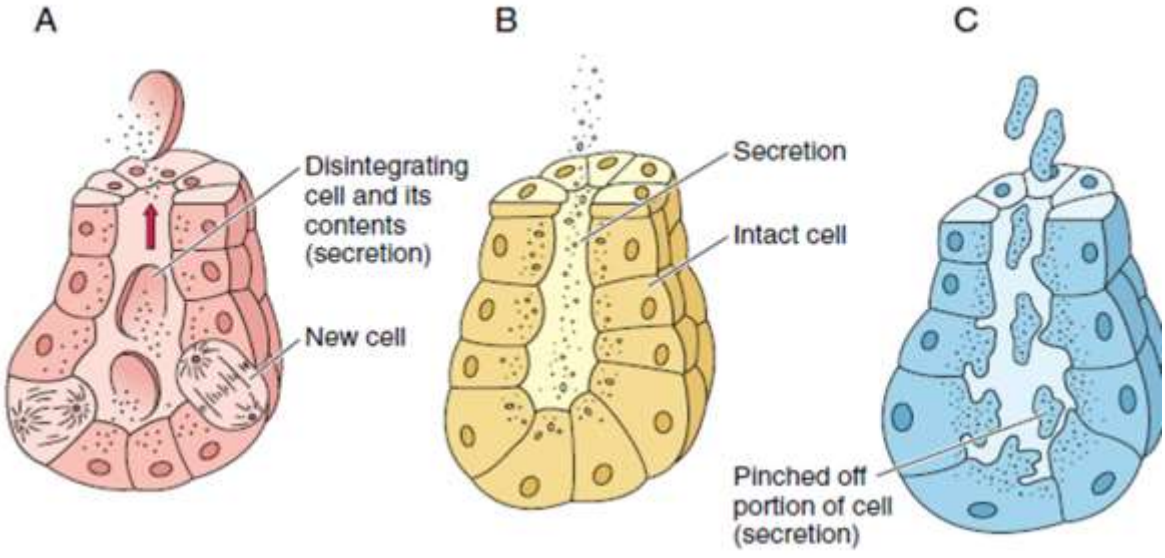
D. Based on the mode of secretion :

1. Merocrine gland: secretory cells release their contents by exocytosis **(no loss of cytoplasm)**, e.g. most of the compound glands.

2. Apocrine gland: apical part of the cytoplasm of the secretory cells is lost in the process of secretion **(partial loss of cytoplasm)**, e.g. lactating mammary gland, sweat gland in the axilla and external genitalia.

3. Holocrine gland: secretory cells burst out pouring their contents, resulting in the death of the cells **(complete loss of cytoplasm)**, e.g. sebaceous gland, tarsal gland.

4. Cytocrine gland – cells are released as secretion, e.g. testis (spermatozoa).



E. Based on the nature of secretion:

1. Serous gland – secretes thin watery material rich in enzymes, e.g. parotid salivary gland.

2. Mucous gland – secretes thick viscous material for protection and lubrication, e.g. sublingual salivary gland.

3. Mixed gland (seromucous) – secretes watery and viscous material from both, serous and mucous acini, e.g. submandibular salivary gland.