

Co and Benjamin
Laboratory Manual in Animal Histology
2nd Ed

Laboratory Manual in Animal Histology (Biology 134)



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EXERCISE 2: THE EPITHELIAL TISSUE

Introduction

The epithelial tissue is a protective tissue that covers the external body surfaces and lines the internal organs. It also mediates a wide range of activities such as absorption, diffusion, excretion, secretion and sensation. This variety in morphology and function is attributed to the fact that this tissue is the only group derived from the 3 embryonic germ layers (ectoderm, mesoderm and endoderm).

Epithelial tissues possess a sheet-like extracellular structure known as the *basement membrane* which functions for support. The basement membrane is relatively thicker and is visible under the light microscope.

Traditionally, epithelia are classified into 2 groups based on their function and structure: *membrane and glandular*. Membrane epithelium usually functions for protection, excretion and absorption while glandular epithelium functions for secretion of substances.

Objectives

At the end of the exercise, the student should be able to:

1. name and differentiate the types of epithelial tissues;
2. identify and differentiate the modifications present;
3. relate the structure of the tissues with their function; and,
4. identify the specific organs where these tissues can be found.

A. Membrane Epithelium

This type of epithelium is composed of cells that are usually organized into layers. They are categorized according to the number of cell layers (*simple and stratified*) and the shape of the component cells (*squamous, cuboidal, and columnar*). In studying the membrane epithelium, label and take note of the following:

- ❖ Shape of the nucleus (round or oval)
- ❖ Location of the nucleus (central or basal)
- ❖ Glandular derivative
- ❖ Surface modification (cilia, stereocilia, brush border), thickness and composition of basement membrane

a.1. Simple Epithelium

a.1.1. Simple squamous- kidney slide, artery and vein.

Under the LPO, look at the parietal layer of the Bowman's capsule and the flattened, irregularly shaped cell lining the structure. This is the *mesothelium*.

Get a cross section of an artery and vein and take a look at the innermost layer of the blood vessels. The cells in this region are termed as *endothelium* which can be recognized by their nuclei bulging into the lumen of the vessel. **How would you primarily differentiate the mesothelium from the endothelium?**

a.1.2. Simple cuboidal- cross section of the kidney.

Look for the clear, round bodies. These are the kidney tubules. Study the square shaped cells bordering the spaces of the tubules. This lining is made up of cuboidal epithelium. The cell comprising this epithelium is characterized by having a small amount of cytoplasm and a round nucleus.

a.1.3. Simple columnar- cross section of the small intestine.

Take note of the tall, elongated cells in the innermost region of the intestine. The part of the cell which contacts the basement membrane is referred to as *basal*; it contains the elongated nucleus. The part of the cell near the surface is referred to as *apical*. **What are the 2 types of cells comprising the columnar epithelium of the intestine?**

a.1.4. Pseudostratified- cross section of trachea

The component cells are usually single layer but the form and position of their nucleus vary, thus, it appears as though they are stratified. **What are the three types of cells found in the pseudostratified epithelium of the trachea?**

This time, study a cross section of the ductus epididymis. **What surface projection can be seen in this epithelium?**

a.2. Stratified Epithelium

a.2.1. Stratified squamous keratinized- transverse section of human skin.

Take note of the cells comprising the epidermis, the upper region of the skin.

a.2.2. Stratified squamous non-keratinized- cross section of the tongue. How does this differ from that of keratinized epithelium of the skin?

a.2.3. Stratified cuboidal- focus on the duct of the sweat gland on the lower portion of the dermis of the skin. The ducts appear more basophilic than the secretory portion.

a.2.4. Stratified columnar- large duct of salivary glands. **How many layers of cells do you find?**

a.3. Transitional Epithelium-cross section of the urinary bladder.

Note that the epithelium appears to be four to five cells deep which usually vary in morphology. The cells on the surface are dome shaped.

How many nuclei can be seen in the cells comprising this layer?

Immediately under the surface cells are pear-shaped cells which appear to be slightly smaller than the surface cells. The deepest cells are the smallest and their nucleus appears to be more crowded.

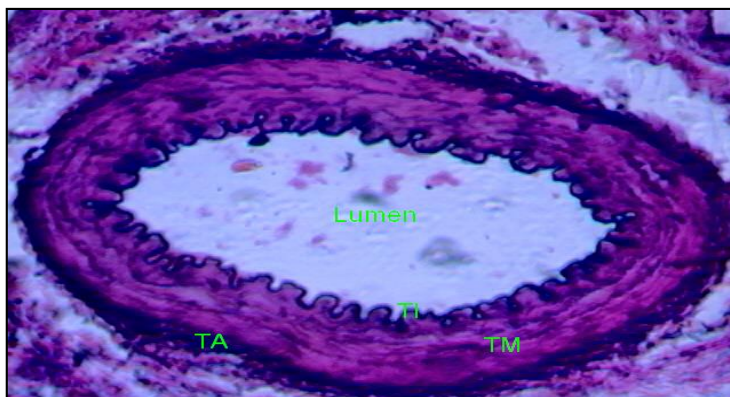
B. Glandular Epithelium

This type of epithelium is specialized in producing fluid secretions differing in composition from blood and intercellular fluids. Glandular epithelium is classified based on several criteria: number of cells (unicellular and multicellular), presence or absence of ducts (endocrine and exocrine) and type of secretory cells (serous, mucus or mixed). Draw and label examples of the different types of glandular epithelium.

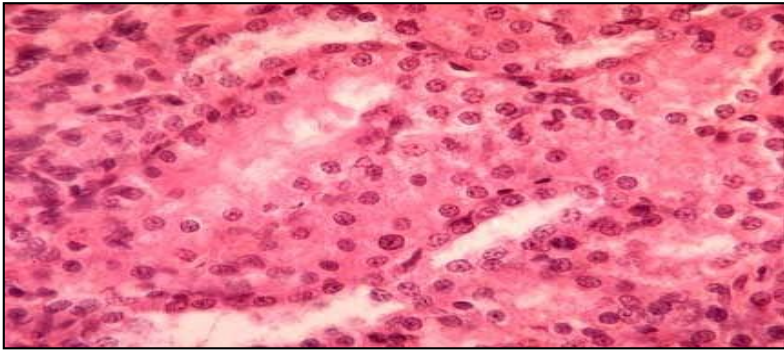
Goblet Cell – the only unicellular gland found among the intestinal cells or columnar cells of the trachea. It has a foamy cytoplasm and is flask-shaped. Find the nucleus at the basal region.

Multicellular glands are those of the salivary glands, sweat and sebaceous glands. They are dealt with in the systems where they belong.

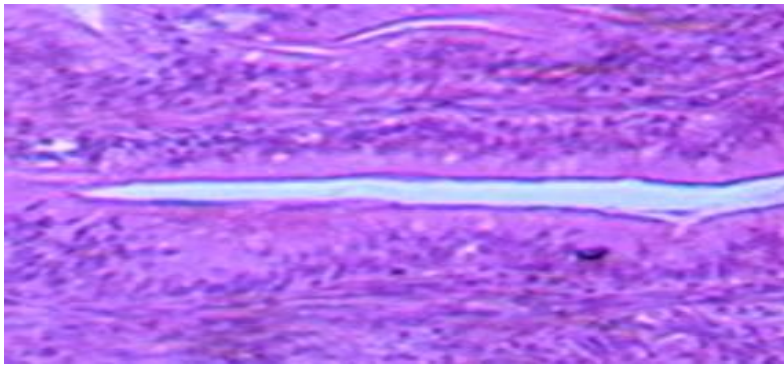
Illustrations



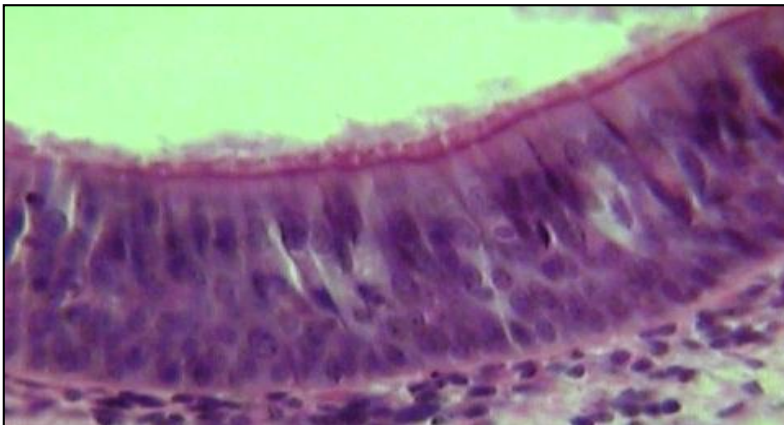
Endothelium



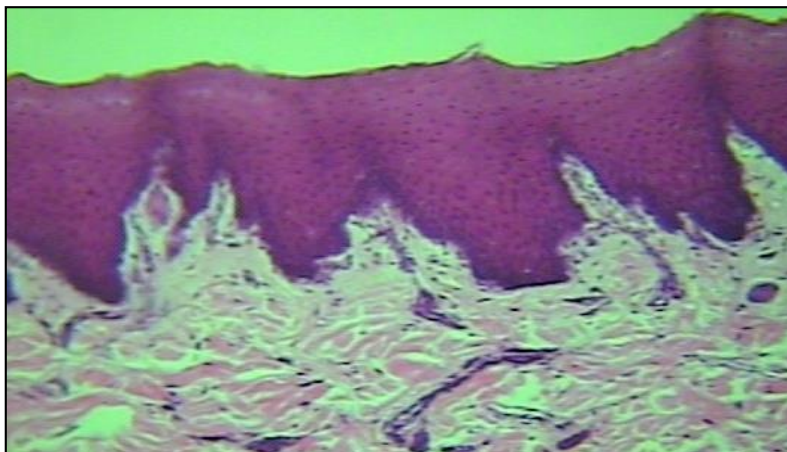
Simple cuboidal epithelium



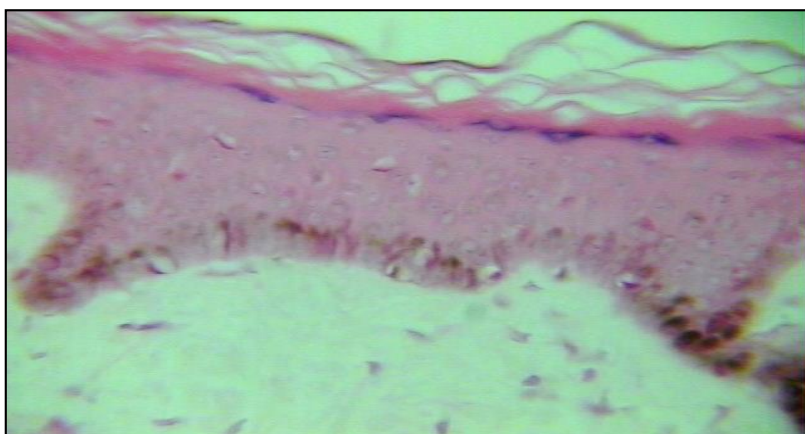
Simple columnar epithelium



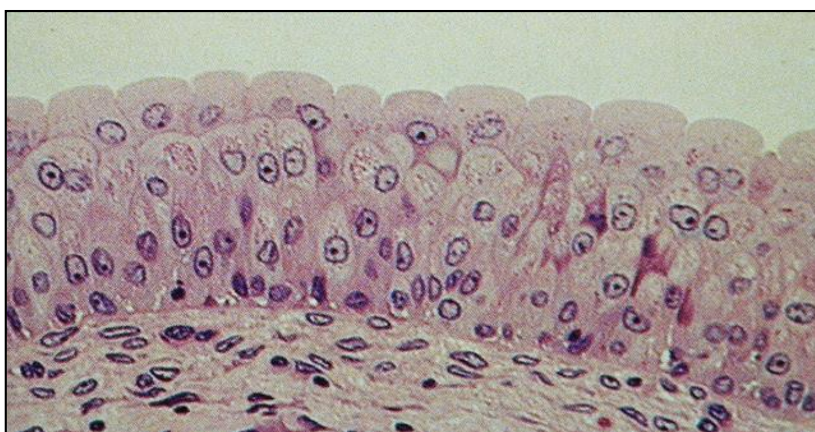
Pseudostratified ciliated columnar epithelium



Stratified squamous non-keratinized



Stratified squamous keratinized



Transitional epithelium

Guide Questions

1. Differentiate between membrane and glandular epithelium.

2. What are epithelioid cells? In what organs are they found?

3. What surface modifications are found in the epithelial tissue? To what structures do they correspond under the electron microscope?
