

Lecture 1

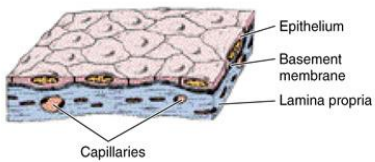
Histology

Histology: is the study of the tissues of the body and of how tissue are arranged to constitute organs.

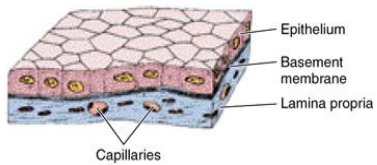
The human body is composed of four tissues are organized:

1. Epithelial tissue
2. Connective tissue
3. Muscular tissue
4. Nervous tissue.

A Simple squamous epithelium



B Simple cuboidal epithelium



C Simple ciliated columnar epithelium

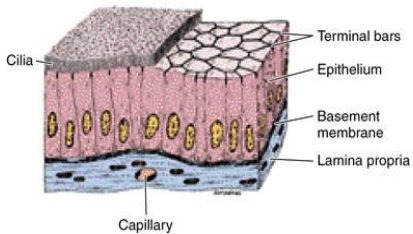


Figure. Diagrams of simple epithelial tissue.

A: Simple squamous epithelium.

B: Simple cuboidal epithelium. C: Simple ciliated columnar epithelium.

All are separated from the subjacent connective tissue by a basement membrane. In C, note the terminal bars that correspond in light microscopy to the zonula occludens and the zonula adherens of the junctional complex.

Tissues are made of cells and extracellular matrix, two components that were formerly considered separate entities. The extracellular matrix consists of many kinds of molecules, some of which are highly organized and form complex structures, such as collagen fibrils and basement membrane.

The main functions formally attributed to the extracellular matrix were:

1. To furnish mechanical support for the cells,
2. To transport nutrients to the cells,
3. To carry away catabolites and secretory products.

Recent work has shown that, although the cells produce the extracellular matrix they are influenced and sometimes controlled by molecules of the matrix.

Each of the fundamental tissue is formed by several kinds of cells and typically by specific association of cells and extracellular matrix. These characteristic associations facilitate the recognition of the many subtype of tissues by student. These tissues do not present in isolation but rather in association with one another and in variable properties forming different organs of the body and allowing the functioning of each organ and of the organism as a whole.

Each tissue is composed of several cell types there are about 200 different types of cells in the human body

The small size of cells and matrix component makes histology dependent on the use of microscopy. Advanced in chemistry, physiology, immunology and pathology and the interaction among these fields are essential for a better knowledge of tissue biology.

Epithelium

Introduction

The epithelia are a diverse group of tissues, (with rare exception), line all body surface, cavities and tubes, epithelia thus function as interface between biological compartments.

Epithelial interfaces are involved in a wide range of activities such as absorption, secretion and protection and all these major functions may be exhibited at a single epithelial surface. For example, the epithelial lining of the small intestine is primarily involved in absorption of the products of digestion, but the epithelium also protects itself from noxious intestinal contents by the secretion of a surface coating of mucus.

Surface epithelia consist of one or more layers of cells separated by a minute quantity of intercellular material and closely bound to one another by a variety of specialization of the cell membrane. All epithelia are supported by a basement membrane (basal lamina) of variable thickness. Basement membrane separate epithelia from underlying connective tissues and are never penetrated by blood vessel, epithelia are thus dependent on the diffusion of oxygen and metabolites from underlying tissues. Basement membranes consist of a condensation of glycoprotein ground substance reinforced by reticular fibers which merge with those of the underlying connective tissue.

Epithelia are classified according to three morphological characteristics:

1. The number of the cell layer :a single layer of epithelial cell is termed ***simple epithelia*** , whereas epithelia composed of more than one layer are termed ***stratified epithelia***

2. The shape of the component cells when seen in section taken to the epithelial surface: in stratified epithelia the shape of the outermost layer of cells determines the descriptive classification.
3. The presence of surface specializations such as cilia and keratin: an example is the epithelial surface of skin which is classified as stratified squamous keratinizing epithelium since it consist of many layer of cell, the surface cells of which are flattened (squamous) in shape and covered by an outer layer of the proteinaceous materials, keratin.

Epithelium which is primarily involved in secretion is often arranged into structures called glands. Glands are merely invaginations of epithelial surface which are formed during embryonic development by proliferation of epithelium into the underlying connective tissue. Those glands which maintain their continuity with epithelial surface via a duct are called ***exocrine glands*** and secrete on to the free surface. In some cases, the duct degenerates during development to leave isolated islands of epithelial secretory tissue deep within other tissues. These glands, known as ***endocrine*** or ***ductless glands***, secrete directly into the bloodstream and their secretions are known as hormones, in addition, some endocrine glands develop by migration of epithelial cells into connective tissues, without the formation of a duct.

Simple epithelia

Simple epithelia are defined as surface epithelia consisting of single layer of cells. Simple epithelia

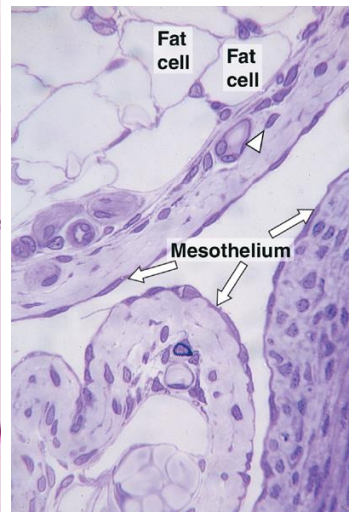
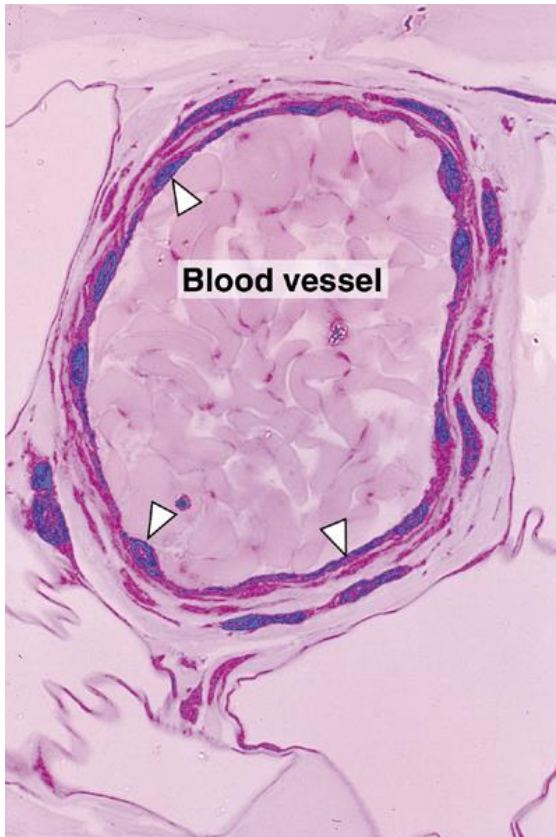
Are almost found on absorptive or secretory surfaces, they provide little protection against mechanical abrasion and thus are almost never found on surface subject to such stresses. The cell comprising Simple epithelia range in shape from extremely flattened to tall columnar depending on

their function. For example flattened Simple epithelia present in little barrier to passive diffusion and therefore found in sites such as the lung alveoli and the lining of blood vessels. In contrast, highly active epithelia cell, such as the cells lining the small intestine, are generally tall since the must accommodate the appropriate organelles. Simple epithelia may exhibit a variety of surface specialization, such as microvilli and cilia, which facilitate their specific surface functions.

1-Simple squamous epithelium:

Simple squamous epithelium is composed of flattened irregularly shaped

cells forming a continuous surface this may be referred to as ***pavemented epithelium***, the term squamous derived from the



Section of a vein containing red blood cells. All blood vessels are lined with a simple squamous epithelium called endothelium (arrowheads). Pararosaniline–toluidine blue (PT) stain. Medium magnification.

Comparison of the cells to the scales of a fish. Like all epithelia, this delicate lining is supported by an underlying basement membrane.

Simple squamous epithelium is found lining surface involved in passive transport (diffusion) of either gases (as in the lungs) or fluids (as in the walls of blood capillaries). Although these cells appear simple in form they have a wide variety of important roles. The cells frequently have specialized surface receptors that control secretion of locally acting chemical messengers.

2- Simple cuboidal epithelium

Simple cuboidal epithelium represents an intermediate form between simple squamous and Simple columnar epithelium, the distinction between tall cuboidal and low columnar is often arbitrary and is of descriptive value only in section perpendicular to the basement membrane, the epithelial cells appear square, leading to its traditional description as cuboidal epithelium, on surface view, however, the cells are actually polygonal in shape. The nucleus is usually rounded and located in the centre of the cells. Simple cuboidal epithelium usually lines small ducts and tubules which may have excretory, secretory or absorptive function, examples are the small collection ducts of the kidney, salivary gland and pancreas.

3-Simple columnar epithelium

Simple columnar epithelium is similar to Simple cuboidal epithelium except that the cells are taller and appear columnar in section at right angles to the basement membrane. The height of the cells may vary from

low to tall columnar depending on the site and /or degree of functional activity. The nuclei are elongated and may be located towards the base, the centre or occasionally the apex of the cytoplasm, this is known as **polarity**. Simple columnar epithelium is most often found on highly absorptive surfaces such as in the small intestine, although it may constitute the lining of highly secretory surfaces such as that of the stomach.

4- Pseudo stratified columnar ciliated epithelium:

Another variant of Simple columnar epithelium is described in which the majority of cells are also usually ciliated. The term **pseudo stratified** is derived from the appearance of this epithelium in section which conveys the erroneous impression that there is more than one layer of cells. In fact, this is a true simple epithelium since all the cells rest on the basement membrane. The nuclei of these cells, however, are disposed at different levels, thus creating the illusion of cellular stratification. Not all the ciliated cells extend to the luminal surface, such cells are capable of cell division providing replacement for cells lost or damaged. Pseudo stratified columnar ciliated epithelium may be distinguished from true stratified epithelia by two characteristics firstly, the individual cells of the pseudo stratified epithelium exhibit polarity, with nuclei being mainly confined to the basal two –thirds of the epithelium. Secondary, cilia are never present on stratified epithelia. Pseudo stratified epithelium is almost exclusively confined to the larger airways of the respiratory system in mammals and is therefore often referred to as **respiratory epithelium**

