Epithelia

LITTLE 'BIOPHYSICS OF EPITHELIUM' - GOOGLE IT!

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Epithelial tissue

Together with nervous tissue, muscle tissue and connective tissue, epithelial tissue forms one of the four tissue types in the human body. According to it's main function two types of epithelium are distinguished: Lining (or covering) epithelium and secretory (or glandular) epithelium. Cells of epithelial tissue can appear in diverse forms (polyhedral), suitably termed squamous, cuboidal or columnar. Nutrients and oxygen arrive from the underlying connective tissue (lamina propria) as the epithelial tissue itself is normally avascular. The cytoplasm of an epithelial cell shows polarity because internal organelles are unsymmatrically distributed. The shape of the nucleus corresponds more or less to the cell's shape. The basal pole is in vicinity to the connective tissue and the apical pole often faces a space. Contact regions to neighbouring epithelial cells are found at the lateral surfaces.

Basement membrane

Just beneath the basal pole lies the extracellular basement membrane. While as a whole visible under the light microscope, it's smaller subdivisions basal lamina (immediatly beneath to the cell membrane of epithelium) and reticular lamina can be only observed with the aid of an electron microscope. The contents of basal lamina (the protein laminin and collagen type IV) are produced by the epithelial cell, whereas collagen types III and VII of reticular lamina are products of connective tissue cells. The basement membrane links epithilial tissue to connective tissue and also controls passing substances.

Intercellular junctions

Contact between adherent epithelial cells is ensured by different types of intercellular junctions. Closest to the apical surface tight junctions (zonulae occludens) are encountered. Zonulae occludens bind the membranes of neighbouring cells tightly together and allow transcellular passage of molecules. Usually directly beneath are adherent junctions (or zonulae adherens). Similarly to the tight junctions they contribute to the firm bond between the epithelial cells (thus named anchoring junctions). Tissue stabilising is also achieved by desmosomes, while gap junctions rather establish communication between the cells. On the basal side hemidesmosomes guarantee the connection between epithelial cell and basement membrane.

Apical structures

On the apical surface exist several projecting structures which enlarge the membrane's surface and increase absorption. Such structures are microvilli, stereocilia and cilia. Because cilia are attached to the cytoskeleton (core of microtubules) this structure is moveable.

Types of epithelial cells

Covering (lining) epithelium

If the basement membrane is covered by one single cell layer, simple epithelium is observed. More layers of epithelial cells build the stratified epithelium. The cell shape can vary from squamous to cuboidal to columnar. In stratified cells the squamous type is most frequent. Pseudostratified epithelium only appears to be consisting of several cell layers.

Secretorial (glandular) epithelium

Many epithelial cells secrete specific products. Goblet cells or mucous cells release mucouslike substances. Serous glands produce large enzymes. A great amount of secreting epithelial cells form either:

1. Exocrine glands
2. Endocrine glands

Exocrine glands possess ducts carrying products to certain sites. The place of product release is named secretory portion and continues into the duct. The shape of the secretory portion can be alveolar (acinar) or tubular. Both ducts and secretory portions may or may not branch. An unbranched duct appears in simple glands, branched ducts are part of compound glands.

On the other hand endocrine glands are lacking ducts. Their secreted substances are hormones directly released into the blood oder interstitial fluid and correspondingly transported. One encounters three secreting types:

- Merocrine via exocytosis
- Holocrine: Entire terminally differentiated cells are released
- Apocrine: Apical, product filled areas are extruded

Recovery of epithelial tissue

Probably the best known example for epithelial's extraordinary ability to recover and repair itself is the liver. Considerably big amounts of damaged or lost regions can be nearly entirely replaced and renewed.

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