

Classification of tissues

Epithelial tissue

History

- Light microscopy
 - XVI: the Janssens – light microscope
 - XVII: G. Galilei, J. Kepler: optics
 - XVII: A. van Leeuwenhoek: the first microbiologist – protists, bacteria, sperm cells etc. (1 μm res.)
 - Zeiss, Abbe, Schott: (0.2 μm theor. res.)
 - Zernicke: phase contrast; Nomarski: DIC
- Electron microscopy
 - 30s XX: transmission ELMI (0.2 nm)
 - Scanning ELMI

Discoveries

- R. Hooke, XVII – cellula
- M. Malpighi, XVIII: capillaries, glomeruli, papillae
- J.E. Purkinje, XIX: protoplasm, nuclear membrane, P. cells & fibres, kinocilia, cell theory
- M. Schleiden, T. Schwann: cell theory
- R. Virchow: cellular pathology; Omnis cellula e cellula.
- S. Ramón y Cajal, C. Golgi, XIX/XX: neurohistology (Nobel Prize 1906)
- I. Metchnikov: phagocytosis (Nobel Prize 1908)

- The purpose in the present medicine
 - Integrating cell biology with microscopic anatomy and physiology
 - Pathology

Revision

- Cell junctions

- Tight junction (zonula occludens)
- Adherens junction (zonula adhaerens)
- Desmosome (macula adhaerens)
- Gap junction (nexus)

- Basal membrane

- Basal lamina
 - Lamina densa: type IV collagen, fibronectin
 - Lamina rara (lucida): laminin
- Fibroreticular lamina

Revision

- Apical cell surfaces
 - Microvilli
 - microvilli + glycocalyx = brush border
 - Stereocilia
 - Cilia (kinocilia)
 - 9 pairs + 2 microtubules
 - Inserted into basal bodies
- Basolateral cell surfaces
 - Basal/basolateral striation
 - Infoldings
 - Often also mitochondria

Tissue

- Textus = ἵστός
- An ensemble of similar cells of the same origin that carry out specific functions
- Cells and extracellular matrix → tissues → organs

Four basic types of tissues

- Epithelial
- Connective
- Muscle
- Nervous

Nervous tissue

- Origin: neuroectoderm
- Neurons and neuroglia, long processes
- Excitability, receiving, generating, and transmitting nerve impulses

Muscle tissue

- Origin: mesoderm/mesenchyme
- Smooth, skeletal and cardiac muscle
- Contractile cells, excitability

Conective tissue

- Origin: mesenchyme
- Conective tissue proper, cartilage, bone
- Fixed and wandering cells, amount of extracellular matrix, support and protection

Epithelial tissue

- Origin: germ layers
 - Ectoderm
 - Mesoderm
 - Entoderm
- Aggregated cells, very low amount of extracellular matrix, strong adhesion
- Avascular (blood vessels in the subepithelial connective tissue)
- Function (arbitrary; they may be combined)
 - Covering, lining surfaces & cavities
 - Absorption
 - Secretion
 - Contractility

Epithelial tissue

- Basal lamina, hemidesmosomes
- Epithelial polarity
 - Basal, basolateral membrane
 - Apical membrane
- Shape of nucleus correlates with the cell shape

Covering epithelia – shapes and layers

- Simple (one layer)
 - Squamous: mesothelium; Bowman's capsule, small ducts
 - Cuboidal: thyroid gland, distal canal of the nephron, intralobular ducts
 - Columnar: stomach, intestine, gall bladder, uterus, uterine tube
- Pseudostratified (nuclei at different levels, all cells adhere to the BL) columnar: nasal cavity, nasopharynx, trachea, larynx (!), bronchi, epididymic duct, deferent duct
- Stratified (layers ≥ 2)
 - Squamous
 - Keratinized: skin
 - Non-keratinized: oral cavity, oropharynx, oesophagus, vocal fold, vagina
 - Cuboidal: ovarian follicles
 - Columnar: conjunctiva
 - Transitional: urinary bladder

<http://www.lfp.cuni.cz/histologie>

- Exam tests and questions
- Description of schemes
- Slides for the final exam