

EDUCATIONAL AND METHODOLOGICAL COMPLEX OF DISCIPLINE
OACH1201 "The Human Body (Medical terminology included)"
Specialty "B086"
Educational program "General medicine"
Course – 1
Semester – 1
Number of credits – 4
Almaty 2020

Lecture 1

Tissue of Human body

LECTURE OUTLINE

- I.** Human tissue.
 - The main classes of classification of adult tissue.
 - Germ layers of human tissues.
 - The structure and location of epithelial tissue, connective tissue, muscle tissue, nervous tissue.
- II.** Three-dimensional shape of the structure, two-dimensional section of the tissue

LEARNING OUTCOMES

1. define the tissue
2. name the tissue of the embryonic origin.
3. describe the classification of the surface epithelium.
4. describe the classification of the glandular epithelium.
5. name the tissues functions.
6. describe the tissue as 3 dimensional structure

The tissue is a historically developed system of cells and non-cellular structures possessing the structural generality and performing certain functions. There are 4 groups of tissues: epithelial, connective, muscular and nervous. Tissue development, or *histogenesis*, is the formation of a tissue embryo and its transformation into the mature tissue. Tissues are formed at the end of embryogenesis gastrulation as a result of differentiation of embryonic material. Tissue differentiation (*histogenesis*) is *the formation of tissue from tissue germs*. The germ tissue differentiation is expressed in different cell needs: some genes are excluded from the transcription process but others remain active. The epiblast above the neural tube is called the dermal (skin) ectoderm; it produces the stratified squamous epithelium of the skin, cornea, oral cavity and anus. The mesoderm can be dorsal (back) and ventral (abdominal). The dorsal mesoderm is segmented into somites. The ventral *mesoderm* splits into 2 layers: *parietal* (near the ectoderm) and *visceral* (near the entoderm). Between them the *celom* (these secondary cavity of the body) is formed. *The ventral mesoderm* and the celom form splanchnotom. It is connected with the somites by means of segmented legs that form nephrogonotom – the germ of the urinary and genital systems. The *ventral mesoderm* layers form

serosa – *peritoneum*. The *internal peritoneum layer* grows together with the wall of internal organs. The *external layer* forms the abdominal wall. The *somites* differentiate into 3 germs: *dermatom* – the germ of the skin connective tissue, *sclerotom* – the skeletal tissue germ (cartilages, bones), *myotom* – the skeletal muscle germ. The cells with processes (expelled from all the germinal layers, basically from the mesoderm, and filling all intervals between the germinal layers) form the embryonic tissue – *mesenchyme*. It is the source of development of the connective tissue, vessels, blood, lymph and smooth muscle tissue.

The epithelial tissue (epithelium) is the cellular tissue that lines the organ cavities, covers the body surface and forms the glands. The basic features of epithelium are as follows:

1. Cells form a continuous layer.
2. The connective tissue always lies under the epithelium. It carries out a trophic and protective functions.
3. Epithelium is located on the basement membrane which unites all epithelial cells into a layer, separates the epithelium from the connective tissue.
4. Epithelial cells are differentiated in a polar manner. The basal pole is attached to the basement membrane. The apical pole is turned to the environment. The apical surface can have special organoids.
5. Epithelium has ability for regeneration.

Classification. There are simple and stratified epithelia. In the *simple epithelia* all cells are connected with the basement membrane (1 – squamous (flat), cuboidal, columnar, 2 – pseudostratified (nuclei at different levels)). In the *stratified epithelia* (many cell layers) only the basal layer of cells is connected with the basement membrane: 1 – stratified, squamous, keratinized (epidermis), 2 – squamous, nonkeratinized, 3 – transitional (urothelium).

Exocrine glands produce *serous and mucous secretion* and consist of the secretory part and the duct. Endocrine glands produce special substances, hormones, and discharge them into the blood, lymph or tissue.

Visualizing tissue structures in three-dimensions (3D) is crucial to understanding normal and pathological phenomena. However, staining and imaging of thick sections and whole mount samples can be challenging. For decades, researchers have serially sectioned large tissues and painstakingly reconstructed the 3D volume.

Visualization of the three-dimensional (3D) cellular and tissue environment has become more and more crucial in understanding normal and pathological biological phenomena.

Questions for self-control:

1. What is the tissue?
2. What types of tissues do you know?
3. Name the tissue of the mesenchyme origin.
4. What is embryonic induction? Name its types.
5. Name the types of epithelium.
6. Describe the classification of the covering epithelium.
7. Describe the classification of the glandular epithelium.
8. What types of gland secretion do you know?

REFERENCES

- Leslie P. Gartner: Color Atlas and Text of Histology. - 7th Edition. - Wolters Kluwer, 2017. ISBN 1496346734, 9781496346735
- Victor P. Eroschenko, Atlas of Histology with Functional Correlations 13th Edition, LWW, 2017

Lecture 6

Human Tissue IV-V

Connective Tissue. Tissues and Organs of the Skeletal System. Histology of Osseous Tissue

LECTURE OUTLINE

- General features of Connective Tissues.
- Components of connective tissue
- Connective Tissues Types.
- Functions of connective tissue.
- Bone. General features of Bone.
- Types of Bone tissue
- Histogenesis of Bone tissue

LEARNING OUTCOMES

1. list the features of connective tissue that distinguish it from other basic tissues.
2. define the structure and functions of the cell types found in connective tissue
3. recognize connective tissue cells and tissue types in micrographs
4. describe bone as a connective tissue in terms of its cells, fibers, ground substance.
5. identify bone types, cell types in micrographs of bone tissue
6. compare the 2 processes of bone histogenesis in terms of embryonic tissue of origin, structure of the mature tissue.

Connective tissues consist of cells and intercellular substance, the amount of which is more than that of cells. Classification. Connective tissues are divided into 2 groups: proper connective tissues and skeletal ones. Proper connective tissues are divided into fibrous tissues and those with special properties. A fibrous tissue can be *loose* and *dense*. Dense tissues are divided into regular and irregular. Tissues with special properties can be of 3 types: reticular, adipose, mucoid. Skeletal tissues are divided into cartilage tissues and bone tissues. Cartilage tissues are of 3 types: hyaline, elastic and fibrous. Bone tissues are of 2 types: reticulo-fibrous and lamellar.

The functions of connective tissues:

1. Basic – make capsules of organs, tendons, fascia, and skeleton.
2. Trophic – metabolism between blood and cells.
3. Protective – a mechanical protection, durability of organs, phagocytosis by macrophages, participation in inflammation and immunity.
4. Hemopoietic – a microenvironment for hemopoietic cells.
5. Plastic – adaptation of the organs at changing conditions due to metabolic changes, participation in regeneration

THE CELLS of the connective tissue are various and mobile. Main resident cells (living in a tissue) are fibroblasts, histiocytes and macrocytes. Resident cells which are small in number are low differentiated cells, lipocytes, melanocytes. There are endotheliocytes in vessels. Plasmocytes and leucocytes are brought by blood. During the immune response lymphocytes, plasmocytes, eosinophiles, basophiles prevail, and at an acute inflammation – neutrophiles.

Plasmocytes have a dense nucleus and basophilic cytoplasm which contains a light «yard» near the nucleus, that is the site where Goldcomplex is located.

THE BONE TISSUE is a calcified tissue composed of three major cell types and calcified bone matrix consisting of 67 % of salts and 33 % of organic substances. There are collagenic fibers and a little basic substance in organic substances. In embryos the *osteoblasts* build bones, and in adults – renew them. They lie on the surface of bone structures. The cells are large, 18–20 microns, have different forms, the nucleus is light, the cytoplasm is basophilic with well-developed organelles and a high activity of alkaline phosphatase which forms the insoluble Ca phosphate. The bone tissue *develops* in 2 ways: 1 – direct osteogenesis from mesenchyme or intramembranous ossification; 2 – indirect osteogenesis at the place of a bone cartilage model or endochondral ossification. At first the bone tissue is rough fibrous, then it is reconstructed into thin fibrous (plates) bone tissue.

Questions for self-control:

1. What are the connective tissue components?
2. Describe the classification of the connective tissues.
3. Name the connective tissue functions.
4. Name the cell composition of the connective tissue.
5. What types of fibers do you know?
6. What types of collagen do you know?
7. What are the bone tissue components?
8. Name the bone cells and their functions.
9. What osteogenesis types do you know?

REFERENCES

1. Leslie P. Gartner: Color Atlas and Text of Histology. - 7th Edition. - Wolters Kluwer, 2017.
2. Victor P. Eroschenko, Atlas of Histology with Functional Correlations 13th Edition, LWW, 2017