**Faculty of Preventive Medicine**

**General histology**

**Syllabus**

**Autumn semester**

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| EDUCATIONAL PROGRAM (SILLABUS) of Azerbaijan Medical University  GENERAL HISTOLOGY | **"CONFIRM" Head of the Department of Histology, Cytology and Embryology Gasimov E.K.**  **Signature** \_\_\_\_\_\_\_\_\_\_\_\_\_\_  16.09.2020 |

**FACULTY: 070101** Preventive Medicine

**SUBJECT CODE:** İPF- B06

**SUBJECT TYPE:** Mandatory

**SEMESTER OF LEARNING THE SUBJECT:** S1

**SUBJECT CREDIT:** 4 credits

**FORM OF LEARNING THE SUBJECT:** Full-time

**LEARNING LANGUAGE:** Azerbaijani, Russian, English

**ОБУЧАЮЩИЕ ПРЕДМЕТУ** Teaching staff of the department

**CONTACT PHONE NUMBERS OF THE DEPARTMENT:**012 595-25-65

**E – MAİL:** eldar49@ rambler.ru [department\_histology@amu.edu.az](mailto:department_histology@amu.edu.az)

**PREREQUISITES:** No subject to be studied before studying the subject

**CORREQUESITES:** Teaching the subject "Human Anatomy" must be carried out in parallel with the teaching of this subject.

**POST-REQUISITES:** Students who have not completed a semester in cytology, embryology and histology should not be allowed to study pathological anatomy.

**DESCRIPTION OF THE SUBJECT:**

This subject describes in detail the emergence, definition, tasks and methods of research in cytology and embryology as separate independent sciences. In addition, the main components of the cell such as the cell membrane, the constituent proteins of the cell membrane (spectrin, ankyrin, protein 4.1, adduxin, etc.), cell elements - filaments (actin), intermediate filaments (cytokeratin, vimentin, desmin, glial acidic fibrillar protein, neurofilament proteins, nuclear lamina), intermediate filaments, neurofilament proteins, nuclear lamina), the chemical composition of microtubules, properties and functions of the ultrastructural structure.

Detailed information on histological and ultrastructural features, cytogenesis and functions of membrane (mitochondria, smooth endoplasmic reticulum, rough endoplasmic reticulum, Golgi complex, lysosomes, endosomes, peroxisomes), membraneless organelles (cell center, ribosomes, proteasomes) and inclusions.

Along with the structure and functions of the components of the nucleus (nuclear envelope, chromatin, nucleolus and nucleoplasm), the storage and transmission of genetic information from generation to generation, as well as the regulation of protein synthesis, cell cycle, meiosis and mitosis, are studied.

Explain the topic and tasks of human embryology, medical embryology - the main directions of development and the role in modern medicine, gametogenesis, fertilization, implantation, the formation of germ layers (endoderm, mesoderm and ectoderm), the main stages of histo- and organogenesis, critical periods in the formation of organs and systems .

Tissues as a system of cells and their derivatives, their morphofunctional (group) and genetic (species) classification, histogenesis, structural and functional characteristics, concepts of cell populations and differentials, types of physiological regeneration, tissue variability limits, metaplasia and its capabilities are taught based on actual materials.

**THE TASK OF THE SUBJECT:**

Microscopic and ultrastructural features of the types of cells and tissues that make up the human body, the molecular mechanism of fertilization, the formation of germ leaves, the main stages of organogenesis and systemogenesis, morphological foundations of the master plans of human organs and systems, their histological and ultrastructural features, the study of the stages of development of organs and systems and the most frequent variations and anomalies in the prenatal and postnatal period.

**RESULTS OF STUDYING THE SUBJECT:**

While teaching this subject, students must master the principles of various microscopic techniques and work freely with a light microscope, recognize and

describe electron diffraction patterns and histological sections of organs and tissues, and detect changes in cells and tissues during pathological processes.

**PLAN OF LECTURE**

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| № | tOPICS | hour |
|  | Cytology - as a general biological and medical science. Cell theory: stages of formation, basic provisions, significance in biology and medicine. The main compartments of the cell. The structure and function of the cell membrane.Кортикальная цитоплазма и элементы цитоскелета. Механизм движения клетки. | **2** |
|  | Cell center. Mitochondria, endoplasmic reticulum. Golgi complex. Endosomes. Lysosomes and lysosomal storage diseases. | **2** |
|  | The nucleus of the cell. Chromatin structure. Core. Nuclear and mitochondrial genomes, a summary of gene expression. Types of cell cycle and cell division. Cell aging and death. The concept of clinical cytology. | **2** |
|  | Embryology as part of "biological development". Progenesis, human germ cells. The main stages of human prenatal ontogenesis. Fertilization. Zygote. Potentiality. Induction. Morulation, morula in humans. Blastulation, human blastula. Implantation. | **2** |
|  | Gastrulation. Formation and differentiation of germ layers and axial organs. 2-8 weeks of human embryo. The concept of critical periods and embryotropy. | **2** |
|  | Histology as a fundamental biomedical discipline. Tissues: definition, classification, components, histogenesis. Epithelial tissues: classification, morphological and functional characteristics. Covering epithelium.Секреторный эпителий. Механизм и стадии секреции. Межклеточные связи. | **2** |
|  | Mesenchyme, its derivatives. Blood. Brief description of embryonic and postembryonic hematopoiesis. Structural features, classification and histogenesis of cellular and non-cellular elements of the connective tissue proper. Connective tissue with special properties. | **2** |
|  | Skeletal tissues - cartilage and bone: classification, morphofunctional features, the main stages of chondro- and osteohistogenesis. | **2** |
|  | . Contractile cells and tissues: classification. Neuromuscular tissue. Smooth muscle tissue: histogenesis, innervation, vascularization. Striated muscle tissue: skeletal muscle tissue, histogenesis, morphofunctional characteristics, innervation and vascularization. Muscle as an organ. Brief information about the cardiovascular muscle. Muscle tissue growth and regeneration. | **2** |
|  | Nerve tissue: histogenesis, structural and functional features. Neurocytes. Glyocytes. Nerve fibers. Generation and transmission of nerve impulses. Modern concepts of nervous tissue. Nerve endings. Synapses. | **2** |

**Totally: 20 hours**

**PRACTICAL LESSONS FOR GENERAL HISTOLOGY**

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| № | Topics | hour |
|  | Histological technique. Microscopes, research methods. | 2 |
|  | General morphology of eukaryotic cells. Chemical composition and ultrastructure of the cell membrane. Cell membrane: selective permeability. | 2 |
|  | Cell membrane: endocytosis and exocytosis. Receptor function of the cell membrane. Second messsengares. | 2 |
|  | Cytoskeleton. Chemo-mechanical converters. | 2 |
|  | Cell organelles: Cell center. Mitochondria. Ribosome. Endoplasmic reticulum. | 2 |
|  | Golgi complex. Endosome. Lysosome. Proteasome. Peroxisisome. Cytoplasmic inclusions. | 2 |
|  | General information about the nucleus. Nuclear envelope. Nucleoplasm. Chromatin. Nucleus. | 2 |
|  | Cell cycle. Mitosis. | 2 |
|  | Progenesis. Meiosis. The structure of the germ cells. Fertilization. Cleavage of the zygote. Morula. | 2 |
|  | Blastocyst. Implantation. Second week of development. Gastrulation. Formation of germ layers. Formation of axial embryonic organs. | 2 |
|  | Differentiation of ectoderm. Differentiation of mesoderm and endoderm. | 2 |
|  | Brief description of the processes occurring at 4-8 weeks of development. Extraembryonic organs. Brief description of the fetal period. | 2 |
|  | Covering epithelium. Simple epithelium. Intercellular communication. Stratified epithelium. Secretory epithelium. Exocrine glands. | 2 |
|  | **MİD-TERM EVALUATION** | 2 |
|  | Mesenchyme. Derivatives of mesenchyma. Blood. Lymph. | 2 |
|  | Fibrous connective tissue. Dense fibrous connective tissues and connective tissues with special properties. | 2 |
|  | Cartilage tissue. Chondrogenesis. Bone tissue. Osteohistogenesis. | 2 |
|  | Striated skeletal muscle tissue. Cardiac and smooth muscle tissue. | 2 |
|  | Nervous tissue. Neurocytes. Glyocytes. Nerve fibers. Synapses. Nerve endings. | 2 |
|  | **QUİZ 2** | 2 |

**Totally: 40 hours**

**EVALUATION:**

It is possible to collect the necessary 100 points for obtaining a loan in this subject as follows:

50 points - before the exam

Including:

10 points - for attendance

10 points - for references

20 points - for intermediate assessment

10 points-gained in the classroom seminars.

Quizes will be held twice a semester. If you do not participate in the colloquium, 0 (zero) points will be recorded in the journal.

50 points - will be collected on the exam

The exam will be conducted by test method. The test will consist of 50 questions. Each question is one point. For incorrectly answered questions, points are removed from correctly answered questions.

**THE NOTE:**

If the exam does not score at least 17 points, the points earned prior to the exam will not be awarded. The points earned during and before the exam are added up and the final total is estimated as follows:

A-“excellent” -91-100

B-“very good” -81-90

C-“good” -71-80

D-“satisfactory” -61-70

E-“acceptable” -51-60

F-“ unsatisfactory” - less than 51

**REFERENCES:**

During the semester, 2 free works are given. The performance of each is estimated with 5 points.

**References for General histology**

1. Histological techniques and methods of investigation.

2. The cell as a morpho-functional unit of prokaryotic and eukaryotic organisms. Cell theory. Main cell compartments.

3. Theories of the structure of the cell membrane. Fluid-mosaic model. Chemical composition of plasmalemma: lipids, proteins and carbohydrates.

4. Selective permeability: pumps, gated and ungated ion channels, carrier protein.

5. Endocytosis: phagocytosis and pinocytosis. Exocytosis.

6. The receptor function of the plasmalemma. Membrane and nuclear receptors. Secondary messengers.

7. Ectoplasm - cortical cytoplasm. Endoplasm. Cytoskeleton: thin and intermediate filaments. Cytoskeleton: microtubules and associated proteins. Motor proteins. Cilia and flagella.

8. Centrosome: structure and functions. Mitochondria: structure and functional features. Mitochondrial DNT.

9. Golgi complex: structure and functions. Lysosomes: their formation, structure, classification and functions.

10. Smooth and granular endoplasmic reticulum: structure and function. Ribosomes. The process of protein synthesis: stages, regulation. Signal theory of protein synthesis.

11. Endosome, peroxisome and proteasome: their structure, functions. Cytoplasmic inclusions.

12. Interphase nucleus: structure and functions. Nuclear membrane, nuclear pores. Nucleoplasm. The nucleolus.

13. Chromatin: heterochromatin, euchromatin. Sex chromatin, features of its formation and importance in medicine. The structure of the metaphase chromosome.

14. Cell cycle. Periods of interphase and their regulation. DNA replication. Types of cell division. Mitosis.

15. Differentiation and aging of cells. Cell death: necrosis and apoptosis. Ploidy, the mechanism of formation. Chromosomal abnormalities.

16. Progenesis, gametogenesis. Meiosis. Features of the structure of germ cells.

17. Fertilization. Cleavage of the zygote, morula, blastula. Implantation. Human gastrulation: formation of embryonic layers.

18. Differentiation of embryonic layers - ectoderm, mesoderm and human endoderm.

19. Extra-embryonic organs and fetal membranes.

20. Covering epithelium: types of simple and stratified epithelium. Their histogenesis, classification, localization, morphofunctional characteristics and regeneration. Intercellular junctions, their types, structure and functions. Basement membrane: structure and function.

21. Secretory epithelium: general characteristics. Types of secretion. Exocrine glands: sources of development and classification. Intercellular junctions, their types, structure and functions. Basement membrane: structure and function.

22. Blood: general characteristics, functions, its components.

23. Loose connective tissue, its localization and functions. Cells (structural features and functions) and extracellular matrix (fibers, their molecular structure, formation and functions).

24. Dense fibrous connective tissues and connective tissues with special properties: their development, classification, localization and morphofunctional features.

25. Cartilage: morphofunctional features, classification, regeneration and age-related changes.

26. Bone tissues: morphofunctional features and classification. Regeneration and age-related changes. Osteohistogenesis. Hormonal regulation of bone tissue. Bone as organ, structure.

27. Skeletal muscle tissue: development, structural and functional characteristics, growth and regeneration, peculiarities of innervation and vascularization. Myofibrils: the structure of contractile filaments. The mechanism of muscle contraction.

28. Smooth muscle tissue: histogenesis, structure, functions, mechanism of contraction, regeneration, peculiarities of innervation and vascularization. Cardiac muscle tissue: development, structural features and regeneration.

29. Nervous tissue: histogenesis, general morphofunctional characteristics. Neuron: microscopic and submicroscopic structure, morphofunctional characteristics. Neurosecretory cells. Neuroglia: sources of development, classification, morphofunctional characteristics.

30. Nerve fibers: classification, structures and functional characteristics. The mechanism of conduction of a nerve impulse. Formation of the myelin sheath. Sensitive and motor nerve endings: classification, structure, functional features. Synapses: classification, submicroscopic structure.

**SILLABUS - WORKING EDUCATIONAL PROGRAM**

The content of the bachelor's degree covers the planning of the educational process, the forms and methods of its implementation, the volume of the study load, the duration of educational stages (semesters), types of training (lectures, classes, laboratories, etc.), requirements for educational programs.

The planning and organization of the educational process (exemplary workers and individual) are implemented on the basis of work programs in the subjects. The form and structure of these documents are determined by the university.

Subject programs are developed by higher educational institutions in accordance with the requirements of higher education programs in specialties and are approved by the Ministry of Education of the Republic of Azerbaijan. Work programs (syllables) are developed on the basis of subject programs and are approved by higher educational institutions.

Working plan (syllabus) - a description of the subject, its purpose and objectives, a summary, duration and types of lessons, assignments for the student's independent work, their duration, consultation hours, information about the teacher, prepared on the basis of the corresponding curriculum of the subject; this is a document containing the teacher's requirements, assessment criteria, an intermediate grading schedule, a list of references.

**LITERATURE AND MATERIALS:**

<http://www.amu.edu.az/az/cafedra/1119/3208> General histology - the text of the lecture. Compiled by: Gasimov EK and Sultanova T.A.

Abdullayev M.S., Abiyev H.S. Histoloji nomenklatura: Ali məktəblər üçün dərs vəsaiti. Bakı: Az. Döv. Tibb İnst., 1972, 181 s.

1. Abdullayev M.S., Abiyev H.S. Ümumi histologiya : Ali məktəblər üçün dərslik. Bakı: Maarif, 1975, 323 s.
2. Qasımov E.K. Sitologiya: Ali məktəblər üçün dərslik. Bakı: “Time Print”, 2013, 272 s.
3. E.K.Qasımov. Histologiya atlası. Bakı: Oskar, 2010, 510s.
4. Xüsusi histologiya. E.K. Qasımovun redaktəsi ilə. Bakı, 2015, 310s.
5. Алмазов И.В., Сутулов Л.С. Атлас по гистологии и эмбриологии. М.: Медицина, 1978, 543 с.
6. Гистология: (введение в патологию). Учебник для студентов / Под ред. Э.Г.Улумбекова, Ю.А.Челышева. М.: ГЭОТАР-МЕД, 1998, 960 с.
7. Гистология: (введение в патологию). Учебник для студентов / Под ред. Э.Г.Улумбекова, Ю.А.Челышева. М.: ГЭОТАР-МЕД, 2005, 672c.
8. Кузнецов С.Л., Мушкамбаров Н.Н. Гистология, цитология и эмбриология. Учебник для студентов медицинских вузов. М.: ООО "Медицинское информационное агенство", 2012, 600 с.
9. Хэм А., Кормак Д. Гистология (в пяти томах). Перевод с английского / Под ред. Ю.И.Афанасьева, Ю.С.Ченцова. М.: Мир, 1983, 1362 с.
10. Ю.И.Афанасьев, Н.А.Юрина. Гистология. М., 2006, 766 с.
11. Alberts B, Johnson A, Lewis J, Raff M, Roberts K, Walter P. Molecular Biology of the Cell. 5th ed. New York: Garland Publishing; 2008, 1601 p.
12. Gartner LP, Hiatt JL. Color textbook of histology. 4th international ed. Philadelphia: PA:, Elsevier, 2017, 657 p.
13. Gray`s anatomy. 38th ed. / Chairman of the editorial board Peter L. Williams. New York:Churchill Livingstone Inc., 1995, 2092 p.
14. Junqueira LC, Carneiro J. Basic histology. New York: McGraw Hill Companies, 2013, 515 p.
15. Kerr JB. Atlas of functional histology. London: Mosby, 1999, 402 p.
16. Ross MH, Pawlina W. Histology. A text and atlas with correlated cell and molecular biology. 7th ed. Baltimore: Lippincott Williams & Wilkins, 2016, 984 p.
17. Sadler TW. Langman's Medical Embryology. 13th edition. Philadelphia: Lippincott Williams &Wilkins, 2015, 407 p.
18. Terminologia Histologica. International terms for human Cytology and Histology. Philadelphia: Lippincott Williams & Wilkins, 2008, 207 p.
19. Wheater`s functional histology. 4th ed. / Edit. Young B and Heath JW. Edinburgh: Churchill Livingstone, 2000, 413 p.

**CUORSEWORK**

Coursework on this subject is not provided.

**PRACTICE**

Industrial practice on this subject is not provided.

**PREPARED**  Sultanova Tamilla

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