

Faculty of Preventive Medicine

General histology

Syllabus

Autumn semester

EDUCATIONAL PROGRAM
(SILLABUS) of Azerbaijan Medical
University
GENERAL HISTOLOGY

**"CONFIRM" Head of the
Department of Histology,
Cytology and Embryology
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Signature _____
16.09.2019

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
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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 LECTURES

№	<i>Topics</i>	hours
1	Cytology as biological and medical science. The cell theory: basic stages of formation, the modern formulation, importance for biology and medicine. Plasma membrane: structure, functions. Cortical cytoplasm and cytoskeleton elements. Mechanisms of cellular movement. Sentrosome. Mitochondrion.	2
2	Endoplasmic reticulum. Golgi complex. Endosomes. Lysosomes and lysosomal storage diseases. Nucleus. Structure of the chromatin. General information about the nuclear and mitochondrial genome and gene expression. Cell cycle and type of cell division. Cell aging and death. Bases of cell pathology.	2
3	Embryology as part of biological development. Progenesis, human sexual cells. Comparative analysis of spermatogenesis and oogenesis. Human gametes. Fertilization. Zygote. Morulation. Blastocyst formation in human. Implantation. Gastrulation. Axial organs of embryo. The differentiation of germ layers and axial organs of embryo. Human embryo in 2 -8 weeks. Conception about the critical periods and teratogenic factors.	2
4	Histology as biological and medical science. Tissues – definition, classification. Epithelial tissues: histogenesis, classification, morpho-functional features. Covering epithelium. Glandular epithelium. The mechanism and periods of secretion. The mechanism of production of saliva.	2
5	Mesenchyme, its differentiation. Structural characteristics of cellular and non-cellular elements of connective tissue. Classification and histogenesis of connective tissue. Connective tissue proper. Specialized connective tissues. Blood. Embryonic and postembryonic hemopoiesis. Bone as an organ. Types and main stages of osteohistogenesis.	2
6	Contractile cells and tissues: classification. Neuro-muscular tissue. Smooth muscle tissue: histogenesis, innervation, vascularization. Striated muscle tissue: genesis, morpho-functional features, innervation and vascularization. Cardiac muscle tissue. Growth and regeneration of muscle tissues.	2
7	Nervous tissue: histogenesis, morpho-functional features. Neurons. Glial cells. Nerve fibers. Peculiarities of formation and conduction of nerve impulses. Modern views on nervous tissue. Nervous system: development, general morpho-functional features. Spinal cord. Brain stem. Cerebellum. Cerebral hemispheres. Module organization of cerebral cortex. Autonomic nervous system. The blood-brain barrier.	2

Totally: 14 hours

PRACTICAL LESSONS FOR GENERAL HISTOLOGY

№	Topics	Hours
1.	Histologic techniques. Methods of investigation.	2
2.	The general morphology of eukaryotic cells. The chemical content and ultrastructure of the plasma membrane.	2
3.	Selective permeability of the plasma membrane.	2
4.	Endocytosis. Exocytosis.	2
5.	Receptor function of the plasma membrane. Second messengers.	2
6.	Cytoskeleton.	2
7.	The general characteristics of cellular organelles. Centrosome. Mitochondria.	2
8.	Ribosome. Endoplasmic reticulum.	2
9.	Golgi complex. Endosomes.	2
10.	Lysosomes. Proteasomes. Peroxisomes. Cytoplasmic inclusions.	2
11.	The general structure of the nucleus. Nuclear envelope.	2
12.	Nucleoplasm. Chromatin. Nucleolus.	2
13.	Cell cycle. Mitosis.	2
14.	I Quiz	2
15.	The main periods of prenatal ontogenesis. Meiosis. The structure of sexual cells.	2
16.	Fertilization. Cleavage. The human morula.	2
17.	Blastocyst. Implantation. 2 nd week of prenatal development.	2
18.	Gastrulation. Differentiation of germ layers.	2
19.	Formation of axial elements of the embryo. The differentiation of ectoderm.	2
20.	The differentiation of mesoderm and endoderm.	2
21.	Development of embryo in 4-8 th week	2
22.	Extraembryonic organs. General characteristics of the fetal period.	2
23.	II Quiz .	2
24.	Epithelial tissues. Simple epithelium. Intercellular junctions.	2
25.	Stratified epithelium.	2
26.	Glandular epithelium. Exocrine glands.	2
27.	Mesenchyme. Derivatives of the mesenchyme. Blood. Lymph.	2
28.	Loose (areolar) connective tissue.	2
29.	Dense connective tissue. Connective tissue with specific properties.	2
30.	Cartilage tissue. Chondrogenesis.	2
31.	Bone tissue.	2
32.	Osteohistogenesis.	2
33.	Striated skeletal muscle tissue.	2
34.	Cardiac and smooth muscle tissues.	2
35.	Nervous tissue. Neurons.	2
36.	Synapses. Glial cells.	2
37.	Nerve fibers. Nerve endings.	2

Totally: 76 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.

Quizzes 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 references 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 DNA.
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.Qasimov. Histologiya atlası. Bakı: Oskar, 2010, 510s.
4. Xüsusi histologiya. E.K. Qasimovun 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, 672с.
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

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