


<p> ОҢТҮСТІК ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of «Topographic anatomy and histology»		52-11
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METHODOLOGICAL GUIDELINES FOR PRACTICAL CLASSES

Discipline: "The normal nervous system and sense organs and vision"

Discipline code: NNSSOV 2206


EP name and code: 6B10115 – “Medicine”

Amount of study hours/credits: 30/1

Course and semester of study: 2/3

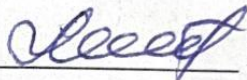
The scope of practical classes: 8 hours

Shymkent, 2024

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Methodological guidelines for practical training were developed in accordance with the working curriculum of the discipline (syllabus) "The nervous system and organs of senses and vision are normal" and discussed at a meeting of the department of «Topographic anatomy and histology»

Protocol No. 1 from "03" 09 2024

Head of the department, c.m.s., acting professor  Murzanova D.A.

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Lesson No.11.

The theme: Nerves. Nervenodes. The spinal cord.

2.Purpose: to know the general characteristics of the nervous system and the structural features of nervenodes, nervetrunks and spinal cord

3.Learning objectives: •Learn to identify the tissue components of sensitive nervenodes; Learn to identify the structural components of nervetrunks. •Learn to identify the structural elements of the spinal cord at the microscopic level • To understand the features of the structure of vegetative nodes

4. The main issues of the topic:

1. Make a table of morphological and functional types of neurocytes of spinal nodes.

Type of neurocytes		The place of neurocytes in the reflex arc
Morphological	functional	

2. Specify the morphological and functional types of neurocytes of intramural autonomic nerve ganglia. Make a table.

Type of neurocytes		The place of neurocytes in the reflex
Morphological	functional	

3. Indicate in the table with the signs "+" or "-" the main structures of the gray and white matter of the spinal cord.

Body substance	Nerve fibers			

Spinal cord gliocytes of neurocytes are myelin-free

4. Make a table of the "nuclei" of the spinal cord and specify the main ones.		
Topography	Morphological type	Functional significance

neurocytes

Handout

Microscopes

Micro-preparations for studying and sketching:


1. The spinal node (ganglion). Staining with hematoxylin-eosin.
2. A cross section of the spinal cord. Impregnation with silver nitrate

5. The main forms/ methods/ technologies of training to achieve the LO discipline: working in small groups, filling out a checklist of histological preparations and microphotographs.

6. Types of control to assess the level of achievement of the LO discipline: the checklist for evaluating the practical lesson.

7. Литература:

Main literature

<p style="text-align: center;"> ОҢТҮСТІК ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p style="text-align: center;">  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
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1. Inderbir Singh. Textbook of Human Histology. With Color Atlas and Practical Guide/8th Edition. Jaypee Brothers Medical Publishers .2016.-302 p. Перевод Гистология человека
2. Dudek Ronald W. Embryology / Ronald W. Dudek. - 5th ed. - [s. l.] : Wolters Kluwer, 2014. - 158 p. Перевод заглавия: Эмбриология
3. Gartner Leslie P. Cell Biology and Histology / Leslie P. Gartner. - 8th ed. - [s. l.] : Wolters Kluwer, 2019. - 436 p. - (BRS. Board Review Series) Перевод заглавия: Клеточная биология и гистология

Additional literature

Textbook of Human Histology. Inderbir Singh /Sixth Edition/ Inderbir Singh 2010.-386 p.
Перевод Учебник по гистологии человека

Electronic publications

1. ATLAS OF HISTOLOGY with Functional Correlations. Thirteenth Edition, Wolters Kluwer. 2017.- 1102 p.
2. Theory and practice of Histological techniques. Eighth edition. Elsevier Limited. 2019.-554 p.
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Cytology and histology : Educational-methodical complex. . - Kokshetau: KGU, 2017. - 101 p. <http://rmebrk.kz/>
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8. Control Questions

1. Morphofunctional characteristics of the nervous system
2. Classification, sources and course of development;
3. Structural features of sensitive nodes.
4. Vegetative ganglia.
5. Peripheral nerves.
6. Spinal cord, gray and white matter.
7. The concept of the reflex arc.

Tests

1. The outer shell in the peripheral nerve is:
Epineurium
Mesoneurium
Endoneurium

Perineurium

Axial cylinder 2. The spinal ganglia are located in the area of the posterior roots

lateral horns

of the anterior horns

dura

mater soft meninges

3. The white matter of the spinal cord consists of

Collagen fibers

Elastic fibers

Nerve fibers and neuroglia

Reticular fibers

Pre collagen fibers

4. In the gray matter of the spinal cord there are ... neurocytes

Multipolar

Bipolar

Pseudo-bipolar

Unipolar

Neuroblasts

5. Gray matter bundle cells are part of ...

The anterior roots of the spinal cord

The conductive pathways of the spinal cord

The posterior roots of the spinal cord

Preganglionic sympathetic fibers

Postganglionic nerve fibers

6. Microgliaocytes originate from ...

Monocytes

Fibroblasts

Astrocytes

Ependymocytes

Neurolemmocytes

7. In the white matter of the spinal cord, the most numerous are ...

Stellate cells

Fibrous astrocytes

Protoplasmic astrocytes

Oligodendrogliaocytes

Ependymoglyocytes

8. In the anterior horns of the spinal cord there are ... nuclei

Motor skills

Associative

Sensitive

Vegetative

Braking


9. In the posterior horns of the spinal cord there are ... nuclei

Motor skills

Associative

Sensitive

Vegetative

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Braking

10. The nuclei of the gray matter of the spinal cord are represented by ...

Fibroblasts of various degrees of differentiation

Nerve cells of similar size, structure, and function

Protoplasmic astrocytes

Fibrous astrocytes

Microglia

Situational tasks

1. Two microphotographs show intramural and extraorgan nerve ganglia with multipolar nerve cells. What are these ganglia in their meaning? What types of nerve cells are distinguished in them according to the functional classification?

2. The researcher is tasked with studying sensitive neurocytes in the peripheral nervous system. Which organs of the peripheral nervous system do they belong to? By what morphological features can they be distinguished from motor neurocytes?

3. When studying the microscopic structure of the posterior spine of the spinal cord, myelin nerve fibers are visible in it. Where do these fibers originate? Which processes of cells form their axial cylinders?

4. In the experiment, the posterior spine of the spinal cord was cut in the animal. What will happen to the myelin nerves in the segment of the root that has retained its connection with the spinal cord, and in the segment of the root associated with the spinal ganglion?

5. Microscopic examination of the spinal cord revealed degeneration (degeneration) of the nerve fibers of the dorsal cords. As a result of damage to which nerve cells is this possible? Which processes of these nerve cells form the axial cylinders of the nerve fibers of the dorsal cords?

Lesson No. 2

1. The Topic: The brain. The cerebellum.

2. Purpose: to know the structural features of the brain stem, cerebellar cortex and cerebral cortex

3. Learning objectives:

Learn to identify the tissue components of the brain stem;

To learn to identify at the microscopic level the white matter of the cerebellum, the cortex, its layers and their characteristic neurocytes.

Learn to identify the layers and neurocytes in the cerebral cortex.

To understand the structure and role of the blood-brain barrier

4. The main issues of the topic:

1. Make a table of cytoarchitectonics of the cerebellar cortex


2. Write down the afferent and efferent pathways of the cerebellum.

3. Fill in the layers of the cerebral cortex and their characteristic neurocytes in the table. Indicate with a "+" sign which of them form the efferent corticospinal pyramidal pathway.

Layers of the cerebral cortex Types of neurocytes Involved in the formation of the pyramidal pathway

4. Write down the main types of nerve fibers of the cerebral hemispheres and indicate their role, types of nerve fibers of the brain Functional significance

5. Sketch the structures involved in the construction of the blood-brain barrier.

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Handout

Microscopes

A micropreparation for studying and sketching:

1. The cerebellar cortex. Impregnation with silver nitrate.
2. The cortex of the cerebral hemispheres. Impregnation with silver nitrate.

5. The main forms/ methods/ technologies of training to achieve the LO discipline: working in small groups, filling out a checklist of histological preparations and microphotographs.

6. Types of control to assess the level of achievement of the LO discipline: the checklist for evaluating the practical lesson.

7. Literature:

Main literature

1. Inderbir Singh. Textbook of Human Histology. With Color Atlas and Practical Guide/8th Edition. Jaypee Brothers Medical Publishers .2016.-302 p. Перевод Гистология человека
2. Dudek Ronald W. Embryology / Ronald W. Dudek. - 5th ed. - [s. l.] : Wolters Kluwer, 2014. - 158 p. Перевод заглавия: Эмбриология
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Additional literature

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Cytology and histology : Educational-methodical complex. . - Kokshetau: KGU, 2017. - 101 p. <http://rmebrk.kz/>
6. Бородулина, О.В. Цитология и гистология – Cytology and histology : Практикум. / Костанайский гос. педагогический университет им. У. Султангазина. - Костанай: КГПУ им. У. Султангазина, 2020. - 100 с. - <http://rmebrk.kz/>

8. Control Questions

1. Features of the structure of the brain stem
2. Cerebellar cortex
3. Interneuronal connections in the cerebellar cortex
4. Cyto- and myeloarchitectonics of the cerebral cortex
5. Types of organization of the cerebral cortex
6. Neuroglia of the cerebellum and cerebral cortex
7. Blood-brain barrier

Tests

1. The large cells of the cerebellum are:

Stellate

Basket-shaped

Purkinje cells (pear-shaped)

Small grain cells

Golgi cells 2. The molecular layer of the cerebellum consists of:

Basket-shaped and star-shaped

Pear - shaped

Grain cells

Golgi Cells

Fusiform cells

3. The ganglion layer of the cerebellum contains:

Basket-shaped and star-shaped

Pear - shaped

Grain cells

Golgi Cells

Fusiform cells

The granular layer of the cerebellum contains

Basket-shaped and star-shaped

Pear - shaped

Grain cells, large stellate and spindle-shaped horizontal cells,

Small stellate cells

The outer granular layer of the cerebral cortex consists of

Pyramidal and stellate neurocytes

Betz Cells

Fusiform

Small stellate

6. Fibers extending to the molecular layer of the cerebellum:

Associative

Commission fees

Climbing

Mossy

Projection

7. In the cerebellum, the fibers go to the grain cells A) Associative

Commission fees

Climbing

Mossy

Projection

8. Climbing fibers connect the cerebellum with ...

The anterior horns of the spinal cord

The lateral horns of the spinal cord

The posterior horns of the spinal cord

A spongy substance

Reticular formation

9. Mossy fibers connect the cerebellum with ...

By the bridge

The spinal cord

Hypothalamus

The cerebral cortex

10. Cerebellar cells sensitive to alcohol:

Pear - shaped

Grain cells

Basket-shaped

Stellate

Horizontal 11. Which cerebellar cells carry inhibitory impulses to the pear-shaped cells?

Basket-shaped, star-shaped

Grain cells

Golgi Cells

Macroglial cells

Microglia cells

12. Which axons of the cerebral cortex neurons form a pyramidal pathway?

Fusiform

Betz Cells

Grainy

Stellate

Horizontal

13. The layer of the cerebral cortex has the largest size:

Molecular

Outer granular layer

Pyramid layer

The inner granular layer

Ganglion 14. Large cells of the cerebral cortex: A) Fusiform

Betz Cells

Grainy

Horizontal

Stellate

15. Nerve fibers forming the pathways of the brain A) Commission fees

Associative

Projection

Mossy

Climbing

16. Cells that perform the function of macrophages in the cerebral cortex


Microglia

Astrocytes

Oligodendroglia cells

Ependymocytes

17. Ependymocytes of the cerebral cortex are located in:

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white matter
 ventricles of the brain
 ganglion layer
 pyramid layer
 the molecular layer 18. Cerebrospinal fluid is secreted:
 Microglia
 Astrocytes
 Oligodendrogliaocytes
 Ependymocytes
 Neurolemmocytes 19. Have a connection with the motor nuclei of cranial nerves
 The molecular layer
 Outer granular layer
 Pyramid layer
 The inner granular layer
 Ganglionic
 20. During transplantation into the cerebral cortex, you can use
 Neuroblasts
 Neurocytes
 Macrogial cells
 Microglia cells
 Ependymocytes

Situational tasks

1. The preparation shows a section of the cerebral cortex in which the II and IV layers are well developed. What type of bark can this area be attributed to? What are the layers called?
2. The micrograph shows a pyramidal cell about 120 microns in size, from the base of which the neurite departs. Specify which area of the brain it belongs to, which pathways include its axon, where it may end in the spinal cord?
3. Three drawings depict neurocytes: the first one has a pyramidal shape, the second one is pear-shaped, and the third one has granules of secretions in the neuroplasm. Which parts of the central nervous system do these neurocytes belong to?
4. The scientific article deals with the department of the central nervous system, in which the mossy and climbing nerve fibers end. Which department of the Central nervous system is this? On which neurocytes do these fibers end in it?

Lesson No. 3

1. The theme: Organs of vision and the sense of smell.


2. Purpose: To know the microscopic and electron microscopic structure of the organs of vision and smell.

3. Learning objectives:

To form theoretical knowledge about the microscopic and ultramicroscopic structure and receptor cells of the organs of vision and smell; to form an idea of the histophysiology of photoreception and olfaction.

To develop practical skills in identifying the structural elements of the cornea, retina and olfactory region of the nasal mucosa under a microscope.

4. The main issues of the topic:

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- 1.Fill in the table on the functional value of the main membranes of the eye and their derivatives.
Functional devices of the eyeball
Dioptric (light refractive) accommodation receptor
- 2.Fill out the table by writing down the retinal neurocytes and specifying their topography.
Types of neurocytes Location in the retinal layer
- 3.Study the features of the structure and chemical composition of the neurosensory cells of the retina. Make a table.
Sensorineural Cells Receptor Protein Localization of structures in Change in light and dark

Handout Microscopes.

Micro-preparations for studying and sketching:

1. The cornea of the eye. Staining with hematoxylin-eosin.
2. The retina of the eye in the dark and in the light. Staining with hematoxylin-eosin.

5. The main forms/ methods/ technologies of training to achieve the LO discipline: working in small groups, filling out a checklist of histological preparations and microphotographs.

6. Types of control to assess the level of achievement of the LO discipline: the checklist for evaluating the practical lesson.

7.Literature:

Main literature


1. Inderbir Singh. Textbook of HumanHistology.With Color Atlas and Practical Guide/8 thEdition.Jaypee Brothers Medical Publishers .2016.-302 p.ПереводГистологиячеловека
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8. Control Questions

1. The structure of the membranes of the eyeball;
2. Features of the structure of the dioptric apparatus of the eye;
3. The cornea of the eye;
4. The retina of the eye;
5. Ultramicroscopic structure of receptor cells;
6. Retinal neuroglia;
7. Features of the structure of the olfactory organ;

Tests

1. The inner retinal layer of the retina contains:

photoreceptor cell bodies

peripheral processes of photoreceptor cells

bodies of bipolar cells

synaptic contacts of photoreceptor cells with dendrites

bipolar and outgrowths of horizontal cells

Bipolar retinal neurocytes:

they connect photoreceptor cells with horizontal

ones, their axons form a layer of nerve fibers

, connect photoreceptor cells with ganglion

cells, and sacrine cells with ganglion

cells transmit impulses from ganglion cells to photoreceptor cells

A retinal layer consisting of a single row of prismatic predominantly hexagonal cells containing melanosomes:

outer nuclear

outer reticular

pigment

inner nuclear

inner reticular

The retinal layer consisting of nucleated particles of photoreceptor cells:

rods and cones

outer nuclear

inner nuclear

ganglion


inner mesh

5. The layer of retinal nerve fibers is formed by:

dendrites of bipolar cells

, axons of horizontal cells

, axons of ganglion cells

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, dendrites of amacrine cells, processes of radial gliocytes

6. The sensory organ, whose sensory cells consist of a short dendrite and a long axon, the dendrites end in a thickening mace, and the axons combine to form 20-40 filamentous stems: hearing

, taste

, balance

, sense of smell

, vision

Situationaltasks

1. The patient sees well at close range and poorly at long range. What structures of the eyeball can be associated with such a condition?
2. The cortical part of the visual analyzer is damaged in the patient. Which function will be disrupted in this case?
3. When climbing to the top of a mountain, climbers often lose the ability to see due to the blinding effect of light. How can this condition be explained?
4. A person began to see poorly at dusk, and in the light his vision almost did not change. What structural and functional changes, and what retinal receptor elements can this be associated with?
5. Two histological preparations of the posterior wall of the animal eye are presented. In the first preparation, melanin granules are contained in the cytoplasm of the perinuclear zone of the cell of the pigment layer, in the second – in their processes. What lighting conditions were the animals in?
6. When olfactory epithelial receptor cells are overexcited by odorous substances, the function of the olfactory analyzer may temporarily be lost. In which part of this analyzer can we expect changes in structure and function in the first place?

Lesson No. 4

1. Topic: The organs of balance and gravity.

2. Purpose: To know the microscopic and ultramicroscopic structure of the organs of hearing, balance and taste.

3. Learning objectives:

To form theoretical knowledge about the microscopic and ultramicroscopic structure of receptor cells of the organs of hearing, balance and taste; to form an idea of the histophysiology of the organs of hearing, balance and taste.

To form practical skills in identifying the structural elements of the organs of hearing, balance and taste under a microscope.


4. The main issues of the topic:

Fill out the table by examining the structure of the organ of hearing and balance.

The senses	Localization of receptor cells	function

Write down the channels of the snail and the tissues lining them, indicate how the lumen of their channels is filled.

Snail Channels	Fabrics lining the walls of the channels	What is the gap filled with

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Write down the cell varieties of the spiral (Cortical) organ and specify their function.
Types of cells of the spiral organ Function

Write down the types of receptor cells of the balance organ, the special structures involved in reception.

The organ of balance	Types of receptor cells	Receptor structures
Ampullary Scallop		
The receptor spot		

Write down the cells in the composition of the taste bulb, specify their function and origin.

Types of cells of the organ of taste	function	origin

Handout material.

1. Microscopes
2. Micro-preparations for studying and sketching

5. The main forms/ methods/ technologies of training to achieve the LO discipline: working in small groups, filling out a checklist of histological preparations and microphotographs.

6. Types of control to assess the level of achievement of the LO discipline: the checklist for evaluating the practical lesson.

7. Literature.

Main literature


1. Inderbir Singh. Textbook of Human Histology. With Color Atlas and Practical Guide/8th Edition. Jaypee Brothers Medical Publishers .2016.-302 p. Перевод Гистология человека
2. Dudek Ronald W. Embryology / Ronald W. Dudek. - 5th ed. - [s. l.] : Wolters Kluwer, 2014. - 158 p. Перевод заглавия: Эмбриология
3. Gartner Leslie P. Cell Biology and Histology / Leslie P. Gartner. - 8th ed. - [s. l.] : Wolters Kluwer, 2019. - 436 p. - (BRS. Board Review Series) Перевод заглавия: Клеточная биология и гистология

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<p style="text-align: center;">Department of «Topographic anatomy and histology»</p>		52-11
<p style="text-align: center;">Methodological guidelines for practical classes "The normal nervous system and sense organs and vision"</p>		.15 page out of 16

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8. Control

Questions

1. The structure of the membranous labyrinth of the snail;
2. Features of the structure of the spiral organ;
3. Auditory analyzer;
4. The structure of receptor spots;
5. The structure of the ampullary scallop;
6. Statokinetic analyzer;
7. Features of the structure of the organ of taste

Tests

1. Angular accelerations are perceived by sensory cells:
the auditory spot of the spherical sac
, the auditory spot of the elliptical sac
, the auditory scallops
of the spiral organ
of the retina
2. The spots of the sacs are characterized by the fact that their
hair cells do not contain stereocilia
hair cells secrete mucus
supporting cells secrete hormones
supporting cells secrete enzymes
supporting and hair cells are covered with gelatinous
otolith membrane
3. The vascular strip of the cochlear canal of the membranous labyrinth is an epithelium:
multi-row, between the cells of which capillaries pass
single-layer flat
single-layer prismatic
multilayer flat non-horny multilayer flat keratinizing
4. The outer hair cells of the spiral organ lie on the cells:
the outer phalangeal
outer cells-pillars
external boundary Gensen
external supporting Claudius
Bettjera

<p> ОҢТҮСТІК ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of «Topographic anatomy and histology»		52-11
Methodological guidelines for practical classes "The normal nervous system and sense organs and vision"		.16 page out of 16

Epithelial cells of the spiral organ, having a pitcher-shaped shape, on the apical pole of which there are 30-60 stereocilia, arranged in 3-4 rows:

internal phalanx

external phalanx

internal sensory hairs

external sensory hairs

external columnar

The cells that make up the taste buds:

goblet-shaped and endocrine

ciliated

nerve

receptor, supporting and basal

columnar and non-ciliated

Situational tasks

1. The principle of operation of the hearing aid is based on amplification of vibrations of the endolymph of the membranous labyrinth. In which cases the use of a hearing aid is effective:

a) in case of damage to the auditory nerve, b) in case of damage to the auditory ossicle system, c) in case of injury to the eardrum.

2. Is a person able to navigate in space in a state of weightlessness? If so, with the help of which senses?

3. The patient has impaired perception of irritations associated with the position of the body in relation to the gravitational field. Which receptor cells have lost their function?

4. In the student's essay it is written that the sensorepithelial cells of the hearing organ are primarily sensitive, because they develop from the "auditory vesicle". Think about whether this statement is correct?

5. The electronogram shows a cell with thin hairs (microvilli) and one cilium with a typically microtubular structure located at the apical pole. The student believes that this is a receptor cell of the hearing organ. Is he right?

6. One of the symptoms of a malfunction of the gastrointestinal tract is a "coated tongue". How can I explain that this disrupts the perception of taste?