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ФИО: Ястребов Олег Александрович
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**Federal State Autonomous Educational Institution for Higher Education PEOPLES'
FRIENDSHIP UNIVERSITY OF RUSSIA
Agrarian and Technological Institute**

WORKING COURSE SYLLABUS

Cytology, histology and embryology

Recommended by the Methodological Council for the Education Field:

36.05.01 Veterinary medicine

1. GOALS AND OBJECTIVES OF THE DISCIPLINE

The aim of mastering the discipline "**Cytology, histology and embryology**" is to study the structure of living matter normally at different levels of its organization: molecular, subcellular, cellular, tissue, systemic, organismal, as well as to study the patterns of development of tissues, organs and the body as a whole.

2. REQUIREMENTS FOR THE RESULTS OF MASTERING THE DISCIPLINE

The development of the discipline "**Cytology, histology and embryology**" is aimed at creating the following competencies (parts of competencies) for students:

Table 2.1. List of competencies formed by students during the development of the discipline (results of the development of the discipline)

Шифр	Компетенция	Индикаторы достижения компетенции (в рамках данной дисциплины)
GPC -1	The ability to determine the biological status and normative clinical indicators of organs and systems of the animal body.	GPC-1.1 Knows the structure and functions of the main systems of the animal body, taking into account the specific features
		GPC-1.2 He s able to predict the expected violations of the biological status in case of suspected development of diseases
		GPC-1.3 He is able to determine the main indicators of the activity of individual body systems and draw conclusions about the presence of deviations from the standard values
		GPC-1.4 Has the skills of sampling biological fluids and tissues for research, performing laboratory tests, interpreting research results.
GPC-4	The ability to use methods of solving problems using modern equipment in the development of new technologies in professional activity and to use modern professional methodology for conducting experimental research and interpreting their results.	GPC-4.1 Possesses the conceptual and methodological apparatus of basic natural sciences at a level sufficient for full-fledged professional activity at the modern level.
		GPC-4.2 Owns methods of solving problems using modern equipment.
		GPC-4.3 He is ready to use modern methodology in the development and conduct of experimental research.

		GPC-4.4 Uses modern professional methodology in interpreting research results.
PC -4	The ability to conduct clinical studies of animals using special (instrumental) and laboratory methods to clarify the diagnosis.	PC-4.1 Able to conduct additional animal studies using laboratory methods to clarify the diagnosis.
		PC-4.2 Able to conduct additional animal studies using special (instrumental) methods to clarify the diagnosis.
PC -5	The ability to make a diagnosis based on the analysis of anamnesis data, general, special (instrumental) and laboratory research methods.	PC-5.1 He is able to diagnose patients of different types based on the analysis of anamnesis data, general, special (instrumental) and laboratory research methods.
		PC-5.2 He is able to predict the risks of diseases based on anamnestic data, the results of general, special (instrumental) and laboratory. studies.
PC -10	The ability to determine the need for the use of surgical methods in the treatment of animals.	PC-10.1 Able to determine the need for the use of surgical methods in the treatment of animals;
		PC-10.2 Able to choose the optimal surgical method for the patient, taking into account the external conditions and the status of the patient's body, and if necessary, several manipulations - their order and time distribution;
		PC-10.3 He is able to take into account the risks and possible complications accompanying surgical interventions and take measures to prevent them.
PC -14	The ability to conduct repeated examinations and studies of animals to assess the effectiveness and safety of the prescribed treatment and adjust the treatment plan of animals (if necessary) based on the results of the evaluation of the effectiveness of treatment	PC-14.1 He is able to develop a plan of repeated studies necessary and sufficient to assess the predicted changes in the patient's health
		PC-14.2 He is able to conduct a repeated clinical examination, taking into account the specifics of diseases previously diagnosed in the patient
		PC-14.3 He is able to carry out the necessary repeated instrumental and laboratory tests
		PC-14.4 He is able to analyze the identified changes, evaluate the effectiveness of the treatment and, if

		necessary, correct the prescribed course of treatment.
PC -19	He is able, based on the results of medical examination, to give recommendations on the implementation of therapeutic and preventive and curative measures aimed at improving the health of a group of animals	PC-19.1 He is able to conduct a general examination of animal corpses before autopsy
		PC-19.2 He is able to perform autopsy of animal corpses using special tools and compliance with safety requirements
		PC-19.3 He is able to establish the cause of death and pathoanatomic diagnosis in accordance with generally accepted criteria and classifications, lists of animal diseases
		PC-19.4 He is able to formalize the results of a postmortem diagnostic examination of an animal in the autopsy protocol

3. COURSE IN HIGHER EDUCATION

The discipline "**Cytology, histology and embryology**" refers to the mandatory part of block B1 of the Educational Program of Higher Education.

As part of the Educational Program of Higher Education, students also master other disciplines and /or practices that contribute to achieving the planned results of mastering the discipline "**Cytology, histology and embryology**".

Table 3.1. List of Higher Education Program components disciplines that contribute to expected learning outcomes

Competence code	Competence	Previous Disciplines (Modules)	Subsequent Disciplines (Modules)
GPC -1	The ability to determine the biological status and normative clinical indicators of organs and systems of the animal body.	Animal anatomy	Physiology and ethology of animals Pathological physiology Clinical diagnosis Pathological anatomy Instrumental diagnostic methods Obstetrics, gynecology and andrology Immunology Clinical laboratory diagnostics

			<p>Laboratory diagnostics of infectious and invasive diseases Veterinary and industrial laboratories with the basics of design Bee diseases and entomophages Fish pathology and aquaculture Anesthesiology, intensive care and intensive care</p>
GPC -4	<p>The ability to use methods of solving problems using modern equipment in the development of new technologies in professional activity and to use modern professional methodology for conducting experimental research and interpreting their results.</p>	<p>Inorganic and analytical chemistry Organic Chemistry Biological physics Computer science Physical and colloidal chemistry</p>	<p>Biological chemistry Veterinary microbiology and mycology Virology and biotechnology Physiology and ethology of animals Breeding with the basics of private animal husbandry Pathological physiology Veterinary Radiobiology Clinical diagnosis Pathological anatomy Operative surgery with topographic anatomy Instrumental diagnostic methods Toxicology Obstetrics, gynecology and andrology Internal non-infectious diseases General surgery Private Veterinary surgery Parasitology and</p>

		invasive diseases Epizootology and infectious diseases Mathematics Immunology Veterinary sanitation Technology of processing livestock products Medicinal and poisonous plants Forage plants Fundamentals of intellectual work Personality psychology and professional self- determination Clinical laboratory diagnostics Laboratory diagnostics of infectious and invasive diseases Diseases of horses Diseases of productive animals Diseases of small pets Diseases of small pets Bee diseases and entomophages Fish pathology and aquaculture Diseases of exotic animals Anesthesiology, intensive care and intensive care Dermatology Cardiology Endocrinology Nephrology Reconstructive and reconstructive surgery Veterinary
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			Ophthalmology Animal Dentistry
PC -4	The ability to conduct clinical studies of animals using special (instrumental) and laboratory methods to clarify the diagnosis	Animal anatomy Biological physics	Biological chemistry Veterinary microbiology and mycology Virology and biotechnology Physiology and ethology of animals Pathological physiology Clinical diagnosis Pathological anatomy Instrumental diagnostic methods Obstetrics, gynecology and andrology Internal non-infectious diseases General surgery Private Veterinary surgery Parasitology and invasive diseases Epizootology and infectious diseases Clinical laboratory diagnostics Laboratory diagnostics of infectious and invasive diseases Diseases of horses Diseases of productive animals Diseases of small pets Diseases of small pets Diseases of exotic animals Anesthesiology, intensive care and intensive care Dermatology

			Cardiology Endocrinology Nephrology Veterinary Ophthalmology Animal Dentistry
PC -5	The ability to make a diagnosis based on the analysis of anamnesis data, general, special (instrumental) and laboratory research methods	Veterinary genetics	Physiology and ethology of animals Breeding with the basics of private animal husbandry Feeding animals with the basics of feed production Pathological physiology Clinical diagnosis Pathological anatomy Toxicology Obstetrics, gynecology and andrology Internal non-infectious diseases General surgery Private Veterinary surgery Parasitology and invasive diseases Epizootology and infectious diseases Forensic veterinary examination and autopsy of animals Zoopsychology Diseases of horses Diseases of productive animals Diseases of small pets Diseases of small pets Bee diseases and entomophages Fish pathology and aquaculture Diseases of exotic

			<p>animals Anesthesiology, intensive care and intensive care Dermatology Cardiology Endocrinology Nephrology Reconstructive and reconstructive surgery Veterinary Ophthalmology Animal Dentistry</p>
PC -10	The ability to determine the need for the use of surgical methods in the treatment of animals	Veterinary genetics	<p>Veterinary microbiology and mycology Physiology and ethology of animals Pathological physiology Clinical diagnosis Pathological anatomy Obstetrics, gynecology and andrology General surgery Private Veterinary surgery Diseases of horses Diseases of productive animals Diseases of small pets Diseases of small pets Diseases of exotic animals Dermatology Cardiology Endocrinology Nephrology Reconstructive and reconstructive surgery Veterinary Ophthalmology</p>

			Animal Dentistry
PC -14	The ability to conduct repeated examinations and studies of animals to assess the effectiveness and safety of the prescribed treatment and adjust the treatment plan of animals (if necessary) based on the results of the evaluation of the effectiveness of treatment	-	Physiology and ethology of animals Pathological physiology Veterinary Pharmacology Clinical diagnosis Pathological anatomy Instrumental diagnostic methods Toxicology Obstetrics, gynecology and andrology Internal non-infectious diseases General surgery Private Veterinary surgery Parasitology and invasive diseases Epizootology and infectious diseases Clinical laboratory diagnostics Diseases of horses Diseases of productive animals Diseases of small pets Diseases of small pets Diseases of exotic animals Anesthesiology, intensive care and intensive care Dermatology Cardiology Endocrinology Nephrology Reconstructive and reconstructive surgery Veterinary Ophthalmology

			Animal Dentistry
PC -19	Ability to perform post-mortem diagnostic examination of animals in order to establish pathological processes, diseases, causes of death	Animal anatomy	Life safety Pathological anatomy Toxicology Obstetrics, gynecology and andrology Internal non-infectious diseases General surgery Private Veterinary surgery Parasitology and invasive diseases Epizootology and infectious diseases Veterinary and sanitary examination Forensic veterinary examination and autopsy of animals Clinical laboratory diagnostics Laboratory diagnostics of infectious and invasive diseases Diseases of horses Diseases of productive animals Diseases of small pets Bee diseases and entomophages Fish pathology and aquaculture Diseases of exotic animals Dermatology Cardiology Endocrinology Nephrology Veterinary Ophthalmology Animal Dentistry

4. COURSE WORKLOAD AND TRAINING ACTIVITIES

Course workload of the discipline "Cytology, histology and embryology" is 8 credits.

Table 4.1. Types of academic activities during the period of the HE program mastering for *full-time* study

Types of academic activities		HOURS	Semesters				
			2	3	-	-	
Contact academic hours		144	72	72	-	-	
including							
Lectures		36	18	18	-	-	
Lab work		108	54	54	-	-	
Seminars (workshops/tutorials)		-	-	-	-	-	
Self-study		118	26	92	-	-	
Evaluation and assessment (exam/pass/fail grading)		26	10	16	-	-	
Course workload		Academic hour	288	108	180	-	-
		Credit unit	8	3	5	-	-

Table 4.2. Types of academic activities during the period of the HE program mastering for *part-time* study

Types of academic activities		HOURS	Semesters				
			2	3	-	-	
Contact academic hours		72	36	36	-	-	
including							
Lectures		36	18	18	-	-	
Lab work		36	18	18	-	-	
Seminars (workshops/tutorials)		-	-	-	-	-	
Self-study		196	26	170	-	-	
Evaluation and assessment (exam/pass/fail grading)		20	10	10	-	-	
Course workload		Academic hour	288	72	216	-	-
		Credit unit	8	2	6	-	-

5. CONTENT OF THE DISCIPLINE

Table 5.1 Content of the discipline (module) by type of academic work

Name of the discipline section	Content of the section (topics)	Types of academic activities
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Section 1. Cytology, embryology and general histology	Topic 1.1. Cytology	Lectures, Lab work.
	Topic 1.2. Embryology	Lectures, Lab work.
	Topic 1.3. Epithelial tissues	Lectures, Lab work.
	Topic 1.4. Connective tissues	Lectures, Lab work.
	Topic 1.5. Muscle tissue	Lectures, Lab work.
	Topic 1.6. Nervous tissue	Lectures, Lab work.
Section 2. Private histology	Topic 2.1. Nervous system and sensory organs	Lectures, Lab work.
	Topic 2.2. Endocrine system	Lectures, Lab work.
	Topic 2.3. Circulatory system and organs of hematopoiesis	Lectures, Lab work.
	Topic 2.4. Digestive system	Lectures, Lab work.
	Topic 2.5. Respiratory organs	Lectures, Lab work.
	Topic 2.6. Skin and its derivatives	Lectures, Lab work.
	Topic 2.7. The genitourinary system	Lectures, Lab work.

6. CLASSROOM INFRASTRUCTURE AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Material and technical support of the discipline

<i>Classroom for Academic Activity Type</i>	<i>Equipping the classroom</i>	Specialized educational/laboratory equipment, software and materials for the development of the discipline (if necessary)
Lecture	An auditorium for conducting lecture-type classes, equipped with a set of specialized furniture; a board (screen) and technical means of multimedia presentations.	<ul style="list-style-type: none"> - Personal computer. - Multimedia equipment. - Information stands. - Biological microscopes. - Histological preparations
Laboratory	An auditorium for laboratory work, individual consultations, routine monitoring and interim certification,	<ul style="list-style-type: none"> - Personal computer. - Multimedia equipment. - Information stands. - Biological microscopes.

	equipped with a set of specialized furniture and equipment.	- <i>Histological preparations</i>
Self-studies	An auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to an electronic information and educational environment.	-

7. RECOMMENDED SOURCES FOR COURSE STUDIES

Main reading:

1. Vasiliev Yu. G., Troshin E. I., Berestov D. S., Krasnoperov D. I. Cytology, histology, embryology: textbook 2020.-648 p.
2. Sokolov V. I. Cytology, histology and embryology / Sokolov V. I., Chumasov E. I., Ivanov V. S. – St. Petersburg: Quadro, 2020. – 384 p.
3. Botchey V.M. Fundamentals of cytology : textbook / Botchey V. M., Savrova O. B., Eremina I. Z., Fatkhudinov T. H. – M. : RUDN, 2020. – 76 p.

Additional Reading:

1. Kuznetsov, C. L. Gistologiya, citologiya i embriologiya : textbook / s. L. Kuznetsov, N. N. Mushkambarov. - 2nd ed. ISP. and touch. - M. : Mia, 2012. - 640 s.
2. Histology. Embryology. Cytology [Text] : Textbook / N.V. Boychuk [et al.]; Edited by E.G. Ulumbekov, Yu.A. Chelyshev. - 4th ed., reprint. and additional - M. : GEOTAR-Media, 2016. - 928 p. : ill. - ISBN 978-5-9704-3782-7 : 0.00.
3. Bykov V.L. Histology, cytology and embryology. Atlas [Electronic resource] : Textbook / V.L. Bykov, S.I. Yushkantseva. - M. : GEOTAR-Media, 2015. - 296 p. - ISBN 978-5-9704-3201-3 <https://lib.rudn.ru/MegaPro/Web/SearchResult/ToPage/1>
4. Savrova O.B. Private histology [Electronic resource] : Lecture notes / O.B. Savrova, I.Z. Eremina. - Electronic text data. - Moscow : RUDN Publishing House, 2016. - 122 p. : ill. - ISBN 978-5-209-07294-2. <https://lib.rudn.ru/MegaPro/Web/SearchResult/ToPage/1>

Resources of the Internet information and telecommunication network:

1. Electronic library system of RUDN and third-party Electronic library systems to which university students have access on the basis of concluded contracts:
 - Electronic library system of RUDN - ELS RUDN <http://lib.rudn.ru/MegaPro/Web>
 - ELS "University Library online" <http://www.biblioclub.ru>
 - ELS Yurayt <http://www.biblio-online.ru>
 - ELS "Student Consultant" www.studentlibrary.ru
 - ELS "Lan" <http://eZlanbook.com/>

- ELS "Trinity Bridge" <http://www.trmost.com/>
- 2. Databases and search engines:
 - electronic fund of legal and regulatory and technical documentation <http://docs.cntd.ru/>
 - search engine Yandex <https://www.yandex.ru/>
 - search engine Google <https://www.google.ru/>
 - abstract database SCOPUS <http://www.elsevierscience.ru/products/scopus/>

Educational and methodological materials for independent work of students during the development of the discipline/ module*:

1. A course of lectures on the discipline "**Cytology, histology and embryology**".
2. Laboratory workshop on the discipline "**Cytology, histology and embryology**".

* - All educational and methodological materials for independent work of students are placed in accordance with the current procedure on the discipline page in the **Telecommunication educational and Information System!**

8. MID-TERM ASSESSMENT

Evaluation materials and a point-rating system* for assessing the level of competence formation (part of competencies) based on the results of mastering the discipline "**Cytology, histology and embryology**" are presented in the Appendix to this Work Program of the discipline.

* - Assessment Materials and a Point Rating System are formed based on the requirements of the relevant local regulatory act of the RUDN.

DEVELOPER:

Associate Professor of the Department of Veterinary
Medicine

Position, Basic curriculum

Signature

Rystsova E.O.

Full name.

HEAD OF THE DEPARTMENT:

Department of Veterinary Medicine

Name Basic Curriculum

Signature

Vatnikov Yu.A.

Full name.

HEAD OF THE HIGHER EDUCATION PROGRAM:

Director of the Department of Veterinary Medicine

Position, Basic curriculum

Signature

Vatnikov Yu.A.

Full name