



SYLLABUS OF AN ACADEMIC DISCIPLINE «Veterinary radiobiology»

Academic degree - Bachelor
Specialty - 211 Veterinary medicine

Academic programme «Veterinary medicine»
Year of study – 4, semester - 7-th
Form of study full-time
Number of ECTS credits – 5
Language(s) of instruction - English

Lecturer of the discipline
Lecturer's contact information (e-mail)
URL of the e-learning course on the NULES e-learning portal

Ph.D., senior lecturer Volodymyr Illienko

illienkovv@gmail.com

<https://elearn.nubip.edu.ua/course/view.php?id=667>

ACADEMIC DISCIPLINE DESCRIPTION

Radiobiology - the science of the effects of all types of ionizing radiation on living organisms, their totality and the biosphere as a whole in order to control the body's responses to the action of ionizing radiation. Veterinary radiobiology is a part of general radiobiology, its branch. Based on the data of nuclear physics on the nature, properties, sources of ionizing radiation and methods of their measurement, it studies the features of the biological action of ionizing radiation on farm animals, studies the behavior of radionuclides in productive animals and their transition to livestock products. radiation examination of objects of veterinary control, studies the possibilities of practical application of ionizing radiation in veterinary medicine and agriculture. Veterinary radiobiology has become a mandatory component of educational programs in agricultural universities after the Chernobyl radiation accident in 1986, when 12 regions (47 districts) of Ukraine were contaminated, more than 300 thousand hectares of agricultural production stopped, more than 100 thousand cattle were sent for forced slaughter and about 10 thousand tons of raw meat are buried as radioactive waste. Veterinary radiobiology provides basic concepts on the effects of ionizing radiation on various species of farm animals, classification of radiobiological effects, protection of animals from IP, obtaining good quality livestock products in radionuclide-contaminated areas, and studies the patterns of behavior of radionuclides in farm animals. The study of the discipline "Veterinary Radiobiology" provides the acquisition of such general competencies as the ability to use modern knowledge about the patterns of ionizing radiation on the body of farm animals to effectively manage livestock production processes in contaminated areas.

Acquisition of competences:

Integral competence (IC): ability to solve complex tasks and problems in the field of veterinary medicine, which involves research and/or innovation and is characterised by uncertainty of conditions and requirements.

General competencies (GC):

GC03. Knowledge and understanding of the subject area and profession.

GC09. Ability to make informed decisions.

Special (professional) competences (SC):

SC16. Ability to protect the environment from contamination by livestock waste, as well as materials and veterinary products.

SC21. Ability to develop and implement measures to manage and prevent radiation damage and contamination of domestic animals and cenosis in general with radionuclides.

Expected Learning Outcomes (ELO):

ELO10. Propose and use appropriate innovative methods and approaches to solving problem situations of professional origin.

ELO21. Develop measures to prevent radiation damage and contamination of livestock and census with radionuclides.

ACADEMIC DISCIPLINE STRUCTURE

Topic	Hours (lectures/ practical works)	Results of study	Task	Evaluation
Module 1. Introduction. Physical foundations of radiobiology				
Topic 1. Introduction Radiobiology and radioecology as a complete science	2/2	Know the basic concepts of the nature of ionizing radiation, the structure of the atom and its basic physical characteristics.	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn).	Execution and delivery of laboratory works - credited. Module: descriptive part 100; test part 30 * 0.1; Independent work - according to the evaluation journal in eLearn.
Topic 2. Radioactivity, types of ionising radiation and their dosimetry	3/4	The structure of electronic shells and the nucleus of the atom. Nuclear forces, mass defect. The phenomenon of radioactivity, sources of ionizing radiation of natural and artificial origin. Types of ionizing radiation - electromagnetic and corpuscular, their physical characteristics. Types of nuclear transformations and the law of radioactive decay.	Execution and delivery of laboratory work (in methodical recommendations - in continuation of laboratory employment, and independently - in eLearn). Doing independent work (tasks in eLearn).	
Topic 3. Sources of ionising radiation on the Earth	-/2		Preparation and writing of a modular test (descriptive part - in the classroom, test - in eLearn)	
Topic 4. Physical basis of interaction ionising radiation with substances of cells of living organisms				
	-/2	Be able to characterize the phenomena of radioactivity, use units of measurement of radioactivity, determine the specific activity.		
Possibility to receive additional points:	Additional points can be obtained for preparing a report and participating in a student conference up to 10 points			
Module 2. Effects of ionising radiation on living organisms				
Topic 1. Biological effects of ionising radiation in plants and animals	2/2	Know the patterns of biological action of ionizing radiation on biological structures and the body as a whole, classification of radiobiological effects and their dependence on the dose of ionizing radiation, modern ideas about the causes of different radiosensitivity of organisms, theoretical foundations of radiation sickness in farm animals and methods of farming.	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn).	Execution and delivery of laboratory works - credited. Module: descriptive part 100; test part 30 * 0.1; Independent work - according to the evaluation journal in eLearn.
Topic 2. Radiosensitivity of plants, animals and other organisms	2/2	Understand the patterns of formation of absorbed doses of ionizing radiation in the body of animals and individual organs. Be able to calculate radiation doses and predict the severity of radiation damage to animals. Use laboratory equipment to determine dose criteria.	Execution and delivery of laboratory work (in methodical recommendations - in continuation of laboratory employment, and independently - in eLearn). Doing independent work (tasks in eLearn).	
Topic 3. Anti-radiation biological protection and radiosensitisation	2/2		Preparation and writing of a modular test (descriptive part - in the classroom, test - in eLearn)	
Topic 4. Methods of protecting agricultural animals from the effects of ionising radiations	0/4			

Possibility to receive additional points:	Additional points can be obtained for preparing a report and participating in a student conference	up to 10 points
Module 3. Migration of radionuclides in the environment in the environment. Conducting livestock farming in areas contaminated with radionuclides territories		
Topic 1. Atmosphere and soil as initial links in the migration of radionuclides in the natural environment	2/0	<p>To know the patterns of behavior of the main dose-forming radionuclides in agricultural ecosystems and ways of their entry into the body of farm animals, the danger of incorporated radionuclides. Understand the hazard criteria for incorporated radionuclides and the principles of standardization of levels of radioactive contamination of livestock products.</p> <p>Be able to determine the presence of radioactive contamination of farm animals and livestock products. Use laboratory equipment, modern laboratory devices to study the content of radionuclides in animals and products of animal origin.</p>
Topic 2. Uptake of radionuclides from soil into plants and animals, biological effect of incorporated radionuclides	2/4	
Topic 3. Measures to reduction of intake of radionuclides in products livestock	0/2	
Topic 4. Cleaning of products livestock products from radionuclides by means of primary technological processing	0/2	
Topic 5. The use of ionising radiation in the biological and natural sciences human activity and method of isotopic indicators in biology and ecology.	0/2	
Possibility to receive additional points:	Additional points can be obtained for preparing a report and participating in a student conference	up to 10 points
Total for the semester Exam Total for the course		100*0,7 (max 70 points) 30 points 100 points

ASSESSMENT POLICY

<i>Deadline and recompilation policy:</i>	Works that are submitted in violation of the deadlines for more than a week without good reason are evaluated at a lower score (maximum - 20% of the maximum). Rearrangement of modules takes place with the permission of the lecturer if there are good reasons (for example, hospital or family problems).
<i>Academic Integrity Policy:</i>	Writing while writing modular test papers and the final exam is prohibited. The use of mobile devices during these periods is also prohibited.
<i>Visiting policy:</i>	Attendance is mandatory. For objective reasons (for example, illness, international internship) training can take place individually (in online form in consultation with the dean of the faculty). In case of violations and abuses (non-attendance more than 50% of the time - non-admission to the exam)

SCALE FOR ASSESSING STUDENTS 'KNOWLEDGE AND SKILLS

Student's rating, points	National grading of exams and credits	
	exams	credits
90-100	excellent	pass
74-89	good	
60-73	satisfactorily	
0-59	unsatisfactorily	fail

RECOMMENDED SOURCES OF INFORMATION

1. <https://elearn.nubip.edu.ua/course/view.php?id=667> Veterinary Radiobiology
2. Gudkov I. M. Radiobiology and Radioecology (in English): Textbook for students of higher educational institutions. Вид. 2-е, переробл. та допов. К.: НУБіП України, Житомирська політехніка, 2019. 384 с.
3. Gudkov I. M. Radiobiology and Radioecology / I. M. Gudkov, M. M. Vinichuk. – К. : NAUU, 2006. – 295 p.
4. Choppin G. R., Liljenzin J.-O., Rydberg J. Radiochemistry and nuclear chemistry. 4th ed., Academic Press, 2013, 858 p.

Recommended sources of information

1. Chernobyl: 30 Years of Radioactive Contamination Legacy. Report. Lead writer and coordination of report: Prof. Valerii Kashparov, Kyiv, 2016, 59 p.
2. Climate change and nuclear power. International Atomic Energy Agency, VIENNA, 2005, 112 p.
3. Natural and induced radioactivity in food. International Atomic Energy Agency, VIENNA, 2002, 136 p.
4. Gleyzes, C., Tellier, S. & Astruc, M. Fractionation studies of trace elements in contaminated soils and sediments: a review of sequential extraction procedures. Trac-Trends in Analytical Chemistry, 21 (6-7), 2002, p. 451-467.
5. International Atomic Energy Agency Safety Standards Series No. RS-G-1.8, Environmental and Source Monitoring for Purposes of Radiation Protection for protecting people and the environment, Safety Guide, IAEA, VIENNA, 2005, p.119.
6. Radiation biology: a handbook for teachers and students. International Atomic Energy Agency, VIENNA, 2010, 150 p.
7. Гродзинський Д.М. Радіобіологія. – К.: Либідь, 2000. – 448 с.
8. Гудков І.М. Радіобіологія: підручник. – Херсон : Олді-Плюс, 2016. – 504 с.
9. Гудков І.М., Гайченко В.А., Кашпаров В.О. Сільськогосподарська радіоекологія: підручник. – К.: Ліра-К, 2017. – 268 с.
10. Кічно В.О., Поліщук С.В., Гудков І.М. Основи радіобіології та радіоекології. – К.: Хай-Тек Прес, 2008 (2009). – 316 с.
11. НРБУ-97/2000.

12. Хомутінін Ю.В., Кашпаров В.О., Жебровська К.І. Оптимізація відбору і вимірювань проб при радіоекологічному моніторингу, Монографія. – К.: Український науково–дослідний інститут сільськогосподарської радіології, 2002, 160 с.
13. Паренюк О.Ю., Ілленко В.В., Гудков І.М. Мікрофлора забруднених радіонуклідами ґрунтів. – К.: Вид-во НУБіП України, 2018. – 198 с.
14. Бондар О.І., Фещенко В.П., Гудков І.М., Гуреля В.В. Радіоекологічний термінологічний словник (україно-англійсько-російський). – Житомир: ПП Експертний центр Укреколбіокон, 2018. – 254 с.
15. Якість ґрунту. Методи відбору проб ґрунту для радіаційного контролю, СОУ 74.14-37-425:2006.
16. Якість ґрунту. Визначення щільності забруднення території сільськогосподарських угідь радіонуклідами техногенного походження, СОУ 74.14-37-424:2006
17. Якість продукції рослинництва. Методи відбору проб для радіаційного контролю, СОУ 01.1-37-426:2006.
18. Якість продукції тваринництва. методи відбору проб для радіаційного контролю, СОУ 01.2-37-427:2006.
19. Якість продукції тваринництва. Проведення прижиттєвого контролю тварин на територіях, забруднених радіонуклідами, СОУ 01.2-37-428:2006.