Title of subject: Molecular diagnostics for veterinary medicine

Teacher or teachers: Assoc. Prof. Dr. Jevrosima Stevanović, Prof. Dr. Zoran Stanimirović

Associates: Assist. Uroš Glavinić, DVM

Subject status: Optional subject in the field of dissertation

ESPB points: 10

Requirement: Enrolled semester in which the subject is attending

The aim of the subject: The subject aims to provide students theoretical and practical knowledge about the application of the molecular methods and procedures in the diagnosis of animal disorders of various etiologies.

Outcome of the subject: Student should know potentials of the application of molecular techniques in veterinary medicine and be able to select the appropriate molecular technique in diagnosis of certain disorders in animals. Student should be able to independently perform the complete procedures used in molecular diagnostics. Student should understand the principles of applied molecular techniques, result's significance and correct interpretation.

Subject content: Theoretical instructions: Features of pro- and eukaryotes genome. The genetic basis of animal disorders. Application possibilities of molecular methods and techniques for diagnostic purposes. Advantages and disadvantages of molecular techniques in the diagnosis of certain disorders in veterinary medicine. Recombinant DNA technology. The basic principles of extraction and amplification of nucleic acids (Polymerase Chain Reaction-PCR). Reverse Transcription Polymerase Chain Reaction (RT-PCR) and its application in detecting causative agents of viral diseases and in gene expression. Real-time PCR - principle and application in the diagnosis of animal diseases of different etiology; introduction to the software used in processing obtained results; quantification of obtained products; examination of the expression of certain genes - application in immunology, pharmacology and genotoxicology. Sequencing - principle and application in the diagnosis of hereditary diseases in animals, the identification and determination of cause of animal diseases of different etiology. HRM (High resolution Melting) technology - the principle and application in the detection of mutations and early detection of neoplastic lesions.

Independent research activities: Rules of behaviour and safety measures in the laboratory. Type of sample and selection of molecular technique. Storing samples - various security measures. Sample preparation and nucleic acid extraction. Preparation of the PCR mixture, nucleic acid amplification (PCR), and optimization of the PCR protocol. PCR diagnosis of inherited disorders through detection of the alteration in the corresponding genes; and some bacterial and parasitic diseases in animals through detection of the pathogen DNA. RT-PCR diagnostics of viral diseases in animals by detecting pathogen RNA. Electrophoresis and analysis of results. Real-time PCR and optimizing computer - marking samples and control of reactions. Processing Real-time PCR results - determination of reaction efficacy, threshold and the amount of the obtained product. Absolute and relative quantification. Preparation for sequencing, performing the sequencing technique and analysis of obtained results. Application of HRM analysis. Contamination - the consequences, prevention and solving.

Recommended literature:

Number of active teaching Lectures: 60

Methods of teaching performance: Block lectures with student's individual work with mentors. Active and specific work on issues related to the student's doctoral thesis, including preparation of seminary elaborate. Independent research activities: performing experiment, analysis and discussion of the results. Practical work
will be performed on the existing equipment in the Laboratory for animal genetics at the Department of Biology, which fully supports the intended curriculum. A rotation system of PhD students: every other week a new tutor for a new diagnostic technique will be available. In this way, each candidate after completing the course is trained to independently perform every learned technique.

**Final marks (a total number of points in 100):** Activities during lectures: 10 points, Seminar 20 points, Test 70 points (minimum of 36); Points and marks: 51-60 (6), 61-70 (7), 71-80 (8), 81 - 90 (9), 91 - 100 (10).

Method of testing knowledge can be different (written exams, oral exam, project presentations, seminars, etc......)