Л Е С О Т Е Х Н И Ч Е С К И У Н И В Е Р С И Т Е Т
Ф а к у л т е т “ В е т е р и н а р н а м е д и ц и н а ”

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SYLLABUS

subject “EPIDEMIOLOGY AND PREVENTIVE VETERINARY MEDICINE”
for IV rd course students in specialty "Veterinary Medicine" - Faculty of Veterinary Medicine at UF
Educational degree: Master

PART I. VETERINARY EPIDEMIOLOGY (EPIZOOTOLOGY)

1. History and development of Veterinary Epidemiology. Evolution of the epidemiological approach for prevention, control and eradication of animal diseases through the centuries from the individual animal to the population as a whole. Modern epidemiology.
2. Objectives, tasks and scope of Veterinary Epidemiology. Methodology. Epidemiological sub-disciplines (Comparative Epidemiology, Geographical Epidemiology, Molecular Epidemiology, and Genetic Epidemiology). Role and importance of Veterinary Epidemiology and its relationship with other disciplines. Difference between epidemiology and clinical disciplines.
3. Descriptive, Analytical, Experimental and Theoretical Epidemiology. Types of epidemiological studies: descriptive, analytical (ecological/correlation, cross-sectional, case-control/retrospective, cohort), experimental (randomized), field studies.
4. Basic concepts and definitions in Epidemiology. Parasitism, infectious process and infectious disease, different types of infections based on their manner of occurrence, the clinical forms and stages in the course of an infectious disease.
5. Main types of epidemiological indicators used to measure the frequency of disease occurrence in the population and the indicators for characterization of the epizootic situation such as prevalence, incidence (new cases), mortality (incl. general, specific and proportional mortality), and lethality (fatal cases), as well as with some specific indices and ratios. Examples for the way of their calculation.
6. Definitions of the terms: sporadic, endemic, epidemic and pandemic disease manifestation. Modes of transmission of the infection: horizontal, vertical, trans-placental and trans-ovarian. Type of hosts and vectors. Factors associated with the spread and maintenance of infection in the population (Epidemiological triad). The epidemiological role of carrier state.
7. The causality concept in Epidemiology (necessary, sufficient, single and multiple causes). Postulates of Henle & Koch and Evans, Bradford Hill criteria. Epidemiological links (associations), possible biases and confounding factors that may influence the formation of the hypothesis of causality
8. Determinants (factors influencing the occurrence, distribution and maintenance of disease in populations):
- main factors (determinants), related to the causation of the disease such as: primary and secondary, internal and external, those associated with host, with the pathogen, or with the environment;
- predisposing factors (such as age, gender or previous illness, that can create a state of predisposition to disease agents);
- facilitating factors (such as malnutrition and living conditions, or technology of livestock breeding, improper treatment, and others.);
- accelerating factors (such as exposure to some specific disease-causing or harmful factors that can be associated with the onset of a disease or condition), and
- reinforcing factors (such as repeated exposure or excessive hard work, which can exacerbate a disease or condition).
9. Animal populations and their characteristics with epidemiological importance. Epidemiological structure of animal populations (such as a combination of their size, density concentration and the ratio between the generations). Population dynamic (horizontal and vertical changes). Definition of the terms population, subpopulations, meta-populations. Ethological factors (natural animal behavior), such as inter-

species and intra-species relationships (commensalism – the relationship between two organisms where one organism benefits without affecting the other; mutualism, in which both organisms benefit, and parasitism, where one benefits while the other is harmed; predation, etc.), having epidemiological importance for wildlife.

10. Animal population disease resistance and immunity and factors affecting them. Natural resistance and host's nonspecific defensive mechanisms to infectious diseases. Acquired specific resistance (immunity) and immune mechanisms (cellular and humoral immunity). Active and passive immunity. Individual, herd/flock and population immunity. Mathematic of sustainable population.
11. Epidemic process. Sources of infection. Mechanism of transmission. Susceptible animals. Pattern of epidemic process. Epidemic curve - seasonal and periodic fluctuations.
12. Dynamic of the epidemic process intensity (the speed of development and its measurable indicators morbidity and mortality) and extensiveness (territorial spread), and driving factors (determinants). Primary/secondary/tertiary outbreaks.
13. Epidemiological surveillance. Forms of surveillance (active and passive surveillance). Screening, Survey, Surveillance and Monitoring and their integration in the national health strategy. Identification of priority diseases and determination of the frequency (repeatability, intervals) of surveillance and the necessary time, human and financial resources for its implementation. Evaluation of the effectiveness.
14. Epidemiological investigations and possible errors. Methods for determining the number of samples, depending on the purpose of the study and interpretation of the results. The roles of laboratories, slaughterhouses, rendering plants, and hunting as sources of epidemic information for surveillance purposes. Case definition. Sampling frame and sampling units.
15. Types of diagnostic tests (screening and confirmatory). Evaluation and comparison of their diagnostic value. Possible errors and ways to validate diagnostic tests. Sensitivity, specificity, seroconversion, "threshold" levels "reference" value "gold" standard, repeatability, precision, accuracy of the methods. Quantify antibodies by using titers. Methods for determination of the 50% effect (on different biological test systems: ED50 - an effective dose of 50%; LD50 - lethal dose; CPE 50 - cytopathic dose; TCID50 - Tissue culture infective dose; PD50 - protective dose, etc.
16. Sources and methods for collection analysis and interpretation of epidemiological data. Questionnaires (content and structure), check lists and interviews, investigations and measurements of various indicators, statistical methods for data processing, data analysis and interpretation of the results.
17. Concept of risk and its main structural elements: hazard, vulnerability, consequences, sources of risk and risk factors. Identification of risk factors, by comparing the new cases of disease occurrence (incidence) and the number of affected animals or flocks (prevalence), between different groups: exposed or not exposed to certain risk factors. Possible mistakes and confounding factors. Relative risk (RR - risk ratio or IR-relative incidence ratio), attributable risk and attributable fraction.
18. Risk analysis. Steps in risk analysis: hazards identification, risk assessment (release assessment, exposure assessment and impact/consequent assessment), risk estimation. Risk management and risk communication. Acceptable risk and appropriate level of protection (similarity and difference between them).
19. Application of mathematical modeling in veterinary epidemiology. Basic type of models (deterministic and stochastic) SIR; SIS; SIRS; SEIR etc. Basic reproduction number (R0), Effective reproductive number (R) and Control reproductive number (RC). Mathematic of mass vaccination.
20. Economic aspects of prevention, control and eradication of infectious animal diseases. Economic losses, associated with the disease (direct and indirect). Evaluation of the effectiveness of the anti-epidemic measures. Cost-benefit analysis of disease prevention, control and eradication. Economic and social aspect of disease control strategy.
21. Conditions and schemes for compensation payment to the farmers for destroyed animals and equipment during control and eradication of epidemics. Subsidy payments to the farmers who invest in construction of farm biosecurity systems as a stimulus. Animal health insurance systems.
22. Planning and preparation of animal disease prophylactic and control programs and recovery plans. Evaluation of their effectiveness. National animal disease prophylactic and control program. Explain how it integrates animal health strategy, control and eradication programmes and plans, time schedule for their implementation, phases, role and duties of different stakeholders, how to control the quality and effectiveness, based on the economic indicators and criteria, when, how and who can make changes in the program or in the rehabilitation plan. Criteria for animal disease prioritization.
23. Zoonoses. New emerging diseases. Reasons for their occurrence and the role of the veterinary profession in preventing outbreaks of zoonotic diseases. Biological weapons, bioterrorism, agro-terrorism

biological war. Distinguishing between spontaneous and intentional disease outbreaks (epidemiological key). Biosafety and biosecurity measures related to different types of risk.

PART II. PREVENTIVE VETERINARY MEDICINE

24. General and specific anti-epidemic measures. Scope of the general prophylactic and hygiene measures, aimed at elimination of the infectious agent, the source of infection and the ways to block the transmission of the disease agent and prevent exposition of healthy animals at risk of infection. Specific measures: use of vaccines and diagnostic or therapeutic treatments (metaphylaxis - medication of a group of animals to eliminate or minimize an expected outbreak of disease). Explain the meaning of stamping out, isolation quarantine, responsibilities of farmers for introducing farm biosecurity in their farms, to reduce the level of risk of the emergence and spread of infectious diseases. Explain the differences between the measures applied in the infected and surveillance zones.
25. Methods for manure and carcasses disposal from infected farms and decontamination of stables, premises, transport vehicles and environment in case of an outbreak. Measures before restocking the farms (sentinel animals).
26. International cooperation in the prevention, control and eradication of infectious animal diseases. Border veterinary control and quarantine procedures. Conditions and procedure for issuing veterinary certificates for international trade. Veterinary information systems: System for identification and registration of animals (I&R), Animal Disease Information System – ADIS, World Animal Health Information System – WAHIS. European System for Tracking and Tracing the trade of animals and animal products – TRACES.
27. Specific anti-epidemic measures. Diagnostic tests (tuberculin test, serological tests for brucellosis, equine infectious anemia, etc..), isolation and observation of suspect animals for diagnostic purposes (e.g. rabies), using of metaphylactic and therapeutic products of special purpose (such as premixes and aerosols for prophylaxis of some alimentary and respiratory infections), immunization using various specific means including: vaccines, serums, immunoglobulin etc. Types of vaccines and vaccination schemes and their application in different epidemiological situations.
28. Strategies for infectious animal disease prevention, control and eradication. Explain the advantages and disadvantages of different strategies (with and without vaccination). Type of vaccines. Explain DIVA concept (differentiation of infected from vaccinated animals), and the need of “exit strategy” when using vaccination as well as the restrictions for international trade due to vaccination.
29. Regionalization, compartmentalization (similarities and differences, advantages and disadvantages). Principles and criteria for defining infected, surveillance and disease free zones and compartments. Role of depopulation (pre-emptive slaughter) and emergency vaccination in epidemic situation.
30. Measures for recognition and maintenance of disease free status of a country or part of it. Role of early detection, early reporting and early reaction in case of a notifiable disease (international reportable disease). Explain the immediate actions to be taken to contain the infection in the primary outbreak, the measures in the farms and territories at risk and post epidemic measures (after elimination of the outbreak).
31. Contingency plans (plans for action in emergency situations) for control and eradication of infectious animal disease. Explain how to assess the needs and calculate the necessary human and financial resources and time for implementation from the moment of disease reporting to its elimination and payment of compensations to the affected farmers and declaring the disease free status of the farm or country.
32. Role of sanitation, cleaning and disinfection in the complex of anti-epidemic measures. Explain the difference between routine preventive disinfection and emergency (intra-focal) disinfection. Describe different methods of disinfection (physical, chemical) and factors affecting them as well as the method for control of their effectiveness.
33. Disinfection and proceeding of livestock farms and additional areas (at the presence and absence of animals), of: accommodations for staff; stores and inventory; playgrounds; open areas and communications roads; ramps for loading and unloading of animals and fodders; canals for fresh water and wastewater. Final disinfection of the infected farm.
34. Disinfection in factories for yield, processing and storage of raw materials and products of animal origin, manufacturing departments for feed and feed components' production, in silos for their storage, at border checkpoints, in laboratories, etc.
35. Role of insect control (disinsection) in the complex of anti-epidemic measures. Bio-ecological characteristics of different arthropod vectors: blood sucking with wings (tabanidae, culicoides, culicidae/

mosquitoes, simuliidae, phlebotominae) and wingless (fleas, ticks, lice and mites), not blood sucking (housefly and cockroaches) and their epidemiological significance.

37. Insect control methods (mechanical, physical, biological, chemical – insecticides and larvicides and repellents). Most often used groups of chemical substances (advantages and disadvantages).

38. Role of rodent control (deratization) in the complex of anti-epidemic measures. Population structure and social organization and their importance for control. Bio-ecological characteristics of synanthropic rodents in particular the brown rat (Rattus norvegicus), the black rat (Rattus rattus), and the house mouse (Mus musculus) and their epidemiological significance.

39. Prophylactic and emergemcy rodent control. Methods for rodent control: mechanical (traps, crushers, glue grounds etc.); chemical (by using poison food, or aplications of poison powders in burrows and tracing roads, fumigation); biological; ultrasonic for frightening rodents etc. Most often used groups of rodenticides (advantages and disadvantages). Choice of rodenticide depending on the situation. Control of effectiveness of deratisation.

Prepared by,

Chief of discipline:…….

(Assoc. Prof. Chavdar Filipov, PhD)