

Liverpool John Moores University

Title: Microbiology and Immunology
Status: Definitive
Code: **4501YAUZOO** (127901)
Version Start Date: 01-08-2021

Owning School/Faculty: Biological and Environmental Sciences
Teaching School/Faculty: Yunnan Agricultural University

Team	Leader
Rachael Symonds	Y

Academic Level: FHEQ4
Credit Value: 20
Total Delivered Hours: 108
Total Learning Hours: 200
Private Study: 92

Delivery Options

Course typically offered: Semester 1

Component	Contact Hours
Lecture	88
Practical	16

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam	Written exam covering lecture material for microbiology	30	2
Exam	Exam	Written exam covering lecture material for immunology	30	2
Test	Test	In class test in microbiology	14	
Report	Report	Practical report covering experiments in immunology	12	
Test	Test	In class test in immunology	14	

Aims

This course focuses on the immune response process of higher vertebrates, covering from the basic concepts of antigens and antibodies to systematical

introduction of the structure and physiological functions of the immune system, with an emphasis on the cellular and molecular mechanisms of the acquired immune response. The application of immunological (serology) techniques in the diagnosis and prevention of animal diseases and biomedical research are also depicted. This course also focuses on animal pathogenic microorganisms, emphasizing on the basic knowledge of microbiology introduction, general theory of bacteria and general theory of viruses, covering the classification, morphology, culture characteristics, pathogenicity and disease caused by pathogenic microorganism as well as the corresponding diagnostic methods and prevention measures, aiming to make students grasp the basic concepts and to train their analysis and application capabilities. The content of eukaryotic microbes, microbial genetics and molecular biology, monographs for animal pathogens, food and feed microbes and other chapters are arranged for students to study on their own referring to textbooks. This course lays the cornerstone for preventive animal medicine.

Learning Outcomes

After completing the module the student should be able to:

- 1 Understand the history of microbiology and immunology, master the concept of hierarchical division, characteristics, types, artificial control methods and ecological significance of microorganisms and basic functions and characteristics of immunity.
- 2 Correctly describe the morphological structure, physiological characteristics, classification methods, pathogenic mechanisms and drug susceptibility of prokaryotes such as bacteria, and master the microbiological diagnosis methods of infectious diseases, understand the biological characteristics and control principles of important pathogenic bacteria, and acquaint the characteristics, hazards and control methods of eukaryotic microorganisms such as fungi and protozoa, and the types of commonly used fermenting microorganisms and poisoning (infectious) microorganisms in food and feed.
- 3 According to the morphological structure, classification status and proliferation process of animal virus, understand the characteristics and significance of the viruses, master the pathogenesis, mutation and culture detection methods of the viruses, understand the types and mechanisms of antiviral drugs, and understand the characteristics and hazards of important animal viruses and prions
- 4 Correctly describe the tissue structure, physiological and pathological functions and internal association of the immune system in higher vertebrate such as livestock, poultry and other species
- 5 Grasp the immunogenetic features and the developmental process of lymphocytes, and understand the genetic patterns and immunomodulatory roles of MHC
- 6 Master the concept, nature, types and mutual relationship of antigens and antibodies, and employ serological detection techniques to diagnose diseases
- 7 Understand the laws of animal immune response and explain the relationship between immune response and the occurrence, development and prevention of animal diseases.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Written exam	1	2	3	7	
Written exam	1	4	6	5	7
Microbiology performance test	1	2	3	7	
Laboratory experimental report	4	6	5	7	
Immunology performance test	1	4	6	5	7

Outline Syllabus

Taxonomic status of microorganisms; characteristics of prokaryotes; horizontal transmission of bacterial genes and its significance; endosymbiosis theory; achievements of representative microbiologists; pathogenic significance and control measures of aquatic microbes; concepts and specific methods for disinfection and sterilization; concept and application of SPF animals; common chemotherapeutic agents and bacteriostatic mechanism; principle and application of Ames test; composition and function of normal flora or rumen microorganisms; probiotics applications in disease prevention, food and feed processing and animal production; types of phage and significance of lysogenic conversion. Structure, composition and functions of bacterial cell wall; properties and application of plasmid; examination methods of special structures of bacteria; principle of Gram staining and acid-fast staining; microbial control measures in food and feed; types and preparation requirements of bacterial medium; synthesis of nucleic acids, proteins and peptidoglycans; morphological and biochemical methods for bacterial identification; Escherichia coli lactose operon; bacterial population growth curve and its significance; classification, antibacterial mechanisms and quantitative methods of antibiotics; mechanism and control strategy of bacterial drug resistance; pathogenic mechanisms and virulence factors of bacteria; factors, influencing factors, diagnostic strategies and prevention and control principles of infectious diseases; anti-infective immunity; concept of bacterial species, serotypes and strain; criteria for 16S rRNA-based bacterial classification; genera and species of Gram-positive and Gram-negative bacteria; principle and results of counting bacteria by plating method and fermentation tube method; representative pathogenic species in other prokaryotic microorganisms and related diseases; culture characteristics and application of yeast; pathogenicity, disease diagnosis and control of Candida albicans, Aspergillus fumigatus and aflatoxin; diagnosis, prevention or control of aquatic animal mycosis; principles of prevention and treatment of protozoal bees and silkworm. Basic characteristics and significance of viruses; types and function of viral proteins; significance of viral nucleic acid; classification of vertebrate viruses (order, family, representative genera, representative species and their pathogenicity); viral proliferation; pathogenicity of provirus; structural composition and immunogenicity of virus-like particles; viral pathogenic mechanisms; characteristics and significance of virus-induced apoptosis; mechanisms and application of inter-viral interference; typing, biological characteristics and function characteristics of interferons; broad-spectrum antiviral drugs; types and application prospects of anti-viral RNAs; uses of animal and chicken embryo inoculation; control methods for cell culture contamination; microscopy and detection of virus culture; determination of viral titer

(PFU, LD50 or TCID50) and PD50 of serum antibody; HA test and HI test; characteristics, pathogenic mechanism and detection methods of prion; public health significance and control measures of mad cow disease. The history and important achievements of immunology; the concept, function and features of immunity; the types and functions of immune organs, immune cells and immune molecules; evolutionary development of immune systems and difference among species; the immune system in aquatic species; the concept, composition and significance of innate immunity; natural physical barriers; composition, activation and function of the complement system; inflammatory response. The concept, classification (types), nature, structure and function of antigens and antibodies; factors affecting antigenicity and immune response; concept and types of epitope; mechanism and significance of haptent-carrier effect; theories of antibody production and their significance; the properties, preparation principles and applications of monoclonal antibodies; the types of adjuvants and their mechanisms of action. Characteristics and processes of acquired immunity; developmental processes and activation and regulation mechanisms of T cells and B cells; composition and functions of cellular immunity; laws and applications of humoral immune responses; types and mechanisms of anti-infective immunity. Immunogenetics of BCR (Immunoglobulin), TCR and MHC molecules; four levels of immunomodulation and their significance; four types, pathogenesis and disease significance or application of hypersensitivity reactions; pathogenesis of autoimmune diseases, oncological diseases and immunodeficiency diseases; animal model of autoimmune diseases. Types and target molecules of immunological tests; features and influencing factors of serological reactions; types, principles and applications of agglutination test, precipitation test, complement fixation test and labeled antibody or antigen techniques; Conventional techniques for detection of cell-mediated immunity; preparation of antibodies; separation of leukocytes; types of acquired immunity; concept of biological products; types of conventional vaccines and novel vaccines; application of vaccines and immunization program; application of immunology in animal production.

Learning Activities

The module content will be delivered through lectures and several stages of practical activities involving experimental class and team work and a final exam, to promote the achievement of learning goals.

Notes

This module aims to make individuals master the theoretical knowledge and technique principle of animal immunology and microbiology. Individuals will also develop basic skills in interpreting changes in immune index under the morbid state and to prevent, diagnose and treat animal diseases and even zoonoses. The study of veterinary microbiological theory and techniques to diagnose, prevent and treat infectious diseases or microbial toxicosis in animals will also be covered.