Veterinary Immunology (MVSc Programme)

Course contents

VIM601/VMC606  Principles of Immunology  2+1  Sem. I

Objective
To impart knowledge about fundamental principles of immunology and its applications in various fields.

Theory
UNIT-I: History of immunology, immunity types, cardinal features, phylogeny. Vertebrate immune system: lymphoid organs and tissues; development of B and T lymphocyte repertoires and other leukocytes, differentiation markers and other distinguishing characters of leukocytes; lymphoid cells trafficking.


UNIT-IV: Immunity against veterinary infectious agents, immunological surveillance and cancer immunity, immunological tolerance, its breakdown and autoimmunity, immuno-deficiencies: types and examples, hypersensitivity: classification, mechanisms of induction and examples.

Practical
Preparation of antigens for laboratory animals immunization, production, collection and preservation of antisera; quantitation of immunoglobulins and antisera by zinc sulphate turbidity and single radial immunodiffusion: examination of lymphoid organs of animals: tests for in vivo and in vitro phagocytosis; separation and counting of peripheral blood lymphocytes; separation and concentration of immunoglobulin by ammonium sulphate precipitation and dialysis; demonstration of antigen- antibody interactions and serological tests such as agar gel precipitation, immunoelectrophoresis, bacterial agglutination, direct and passive hemagglutination, latex agglutination, complement fixation, enzyme-linked immunosorbent assay, immunoblotting.

Suggested Readings

VIM-602   ` Immunochemistry  2+1  Sem. I

Objective: To impart knowledge about structure and functions of molecules of the immune system
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Theory
UNIT-I: Introduction to molecules of the immune system; innate immune system molecules: toll-like receptors, complement and others; adaptive immunity molecules: Immunoglobulins and T cell receptors.

UNIT-II: Immunoglobulins: relationship between structure and function, phylogeny, normal profiles in neonates and adult animals; allotypes of rabbit, chicken, bovine and other species; idiotypes: role in immunoregulation and use as vaccines; immunoglobulins of domestic animals; monoclonal antibodies and their uses; recombinant antibodies.


Practical

Suggested reading

VIM-603 Immunobiology 2+1 Sem. I
Objective: To impart knowledge about immune system cells and their interactions for immune responses and immunoregulation

Theory
UNIT-I: Lymphoid organs of domestic animals, development of immune cells and apoptosis. Lymphocyte traffic in mice, sheep, pig and cattle. Innate immune system & its link to adaptive immune system
UNIT-II: Subsets of lymphocytes and leukocyte differentiation antigens of man and animals. T-cell antigen receptors. Phagocytes and antigen presenting cells.
UNIT-III: Lymphocyte activation, Antigen presentation, immunoregulation. Cellular interactions in the immune response, cytokines, MHC restriction, NK cells, Tregs and Immunological tolerance.
UNIT-IV: Immunology of reproduction, transplantation immunology, mucosal immunity and immunity of bovine mammary glands.

Practical
Lymphoid organs of calf; thymectomy, bursectomy, skin grafting and rejection, graft versus host reactions. Tests for cell mediated immune response: macrophage and leukocyte migration inhibition assays, cytotoxicity assay, lymphocyte transformation, contact sensitivity test, in vitro phagocytosis, ELISPOT assay for cell enumeration.

Suggested Reading
Elgert, KD. 2009. Immunology. 2nd Ed. Wiley-Blackwell Publishers

VIM-604  Immunogenetics  2+0  Sem. I

Objective: To impart knowledge about genetic principles of immunological traits

Theory
UNIT-I: Fundamental principles of immunogenetics; genomic organization of immunoglobulins genes and origin of antibody diversity, T cell receptor genes and T cell repertoire.
UNIT-II: Genetics of complement and complement deficiencies. Major histocompatibility complex of domestic animals, histocompatibility antigens, MHC and its association with disease and resistance.
UNIT-IV: Blood groups of domestic animals. Transgenic animals and cellular chimeras. Genetic control of cytokines production.

Suggested Reading

VIM-605  Immunopathology  2+1  Sem. II

Objective: To impart knowledge about pathogenesis and pathology of immunological disorders and immune-mediated diseases

Theory
UNIT-I: Principles of immunopathology, hypersensitivity reactions, pathology of immune complex diseases.
UNIT-II: Immunoproliferative disorders, autoimmune diseases and immune deficiencies in domestic animals.

Practical
Immune complexes quantitation and determination by various techniques, enumeration of various populations of lymphocytes by different techniques; determination of C3 levels, autoimmune reaction by demonstrating autoantibodies, hypersensitivity reactions (class IV and others)

Suggested Reading

VIM-606  Infection and Immunity  2+1  Sem. I

Objective: To impart knowledge about host immune mechanisms against infectious diseases of domestic animals

Theory

UNIT-II: Immunobiology of major viral, bacterial and fungal diseases of animals. Types of vaccines in infectious diseases and current trends in vaccine development.

Practical

Antibody levels in infected and vaccinated animals, lymphocyte proliferation assay, ELISPOT assay for cell enumeration, primary and secondary immune response curves, pathogen challenge of vaccinated animals.

Suggested Reading


VIM-607 Vaccinology 2+0 Sem. II

Objective: To understand science and practice of vaccines for prevention of infectious and non-infectious diseases.

Theory:


UNIT-II: Traditional vaccines: inactivated, attenuated and toxoid vaccines. Methods of construction of traditional vaccines: microbial cultures, embryonated eggs, cell culture; Seed-lots of vaccine organisms. Methods of inactivation and attenuation of pathogens.


Suggested Reading:


VIM- 608 Techniques in Immunology 0+3 Sem. II

Objective: To impart technical skills for handling immune system cells and molecules, and their applications in diverse fields

Theory
UNIT-I: Purification and isolation of immunoglobulins and their sub-units: salt fractionation, dialysis, quantitation, gel filtration, concentration of elutes, ion-exchange chromatography, proteolytic cleavage of IgG molecules by enzymes.

UNIT-II: Raising of anti-IgM and preparing of immuno-adsorbent. Quantitation of immunoglobulins.


**Suggested Reading**


**VIM609 Immunotechnology & Immunodiagnostics 1+2 Sem. II**

**Objective:** To impart technical and technological skills for production of immunological reagents and their applications in diagnostic tests

**Theory**

UNIT- I: Traditional and modern methods of production of antibodies: animal immunization, hybridoma and rDNA technologies, including antibody display technologies; purification & characterization of reagent antibodies; production and characterization of various types of antigens.

UNIT-II: Immunodiagnostic tests: various serological tests such as agar gel precipitation, agglutination reaction-based tests, immunoassays (ELISA, Fluoroimmunoassay, Radioimmunoassay), immunofiltration tests, ‘penside or point-of-care’ immunodiagnostic tests, flow cytometry in disease diagnosis.

**Practical**

Production of reagent antibodies by animal immunization; hybridoma technique for monoclonal antibody production; phage display technique for production of antibody fragments; purification of reagent antibodies and Ab fragments; isolation & characterization of antigens from viruses, bacteria, fungi, protozoa, helminths and other sources; agar gel immunodiffusion test; hemagglutination, latex agglutination, immunofiltration, indirect & sandwich ELISA, FAT, RIA, flow cytometry.

**Suggested Reading**


**VIM 610 Clinical Immunology 2+1 Sem. II**
Objective: To impart knowledge about clinical conditions involving immune responses and immune system

Theory

UNIT-I: Hypersensitivity reactions in domestic animals: types, induction, diagnosis, prevention and treatment. Transplantation immunology: graft rejection, graft versus host and host versus graft reactions

UNIT-II: Autoimmune diseases: mechanisms of induction of autoimmune responses, classification, diagnosis, prevention and management and treatment of autoimmune diseases of domestic animals.

UNIT-III: Immunodeficiency diseases: types, clinical signs & symptoms, diagnosis and management of immunodeficiency disorders in domestic animals.

UNIT-IV: Immune system cancers, immunotherapy of cancers, congenital defects in immune system.

Practical

Detection of IgE and immune complexes in sera samples, delayed type hypersensitivity in laboratory animals, contact hypersensitivity, examination of clinical cases.

Suggested Reading


List of Journals: as included under Veterinary Microbiology

E-Resources: as included under Veterinary Microbiology

Suggested broad topics for Master’s and PhD research:

• Understanding basic immune mechanisms of domestic animals
• Identification and characterization of antigens of infectious agents, including parasites of domestic animals
• Roles of cytokines and chemokines in domestic animals
• Hybridoma & phage display technologies for monoclonal and recombinant antibody production
• Development of modern immunodiagnostic tests for infectious and non-infectious diseases
• Development of modern vaccines, delivery systems and adjuvants
• Immunological interventions in management of allergies, cancers, autoimmune and immunodeficiency diseases in domestic animals