

# VETERINARY PATHOLOGY

## Course Structure

COURSE NO.	COURSE TITLE	CREDITS	SEM
VPP 601	GENERAL PATHOLOGY	2+1	I
VPP 602	TECHNIQUES IN PATHOLOGY	1+1	I
VPP 603	ANIMAL ONCOLOGY	1+1	I
VPP 604	CLINICAL PATHOLOGY	1+2	I
VPP 605	NECROPSY PROCEDURES AND INTERPRETATIONS - I	0+1	I
VPP 606	NECROPSY PROCEDURES AND INTERPRETATIONS - II	0+1	II
VPP 607	SYSTEMIC PATHOLOGY	2+1	II
VPP 608	PATHOLOGY OF INFECTIOUS DISEASES OF DOMESTIC ANIMALS	2+1	II
VPP 609	TOXICOPATHOLOGY	2+1	II
VPP 610	AVIAN PATHOLOGY	2+1	I
VPP 611	PATHOLOGY OF LABORATORY ANIMALS, FISH AND WILD ANIMALS	2+1	II
VPP 612	VETEROLEGAL PATHOLOGY	1+0	II
VPP 691	MASTER'S SEMINAR	1	I, II
VPP 699	MASTER'S RESEARCH	20	I, II
VPP 701	PATHOLOGY OF NUTRITIONAL AND METABOLIC DISTURBANCES	2+1	I
VPP 702	ADVANCES IN TOXICOPATHOLOGY	2+1	I
VPP 703	ADVANCES IN DIAGNOSTIC PATHOLOGY	1+2	I
VPP 704	ULTRASTRUCTURAL PATHOLOGY	1+1	II
VPP 705	IMMUNOPATHOLOGY	2+1	II
VPP 706	PATHOLOGY OF IMPORTANT AND EMERGING DISEASES OF PETS AND LIVESTOCK	1+1	II
VPP 707	ADVANCES IN AVIAN PATHOLOGY	2+1	I
VPP 708	PATHOLOGY OF FUNGAL DISEASES	2+1	II
VPP 709	MOLECULAR PATHOLOGY OF CELL INJURY	2+1	II
VPP 710	EXPERIMENTAL PATHOLOGY	1+1	I
VPP 790	SPECIAL PROBLEM	0+2	I, II
VPP 791	DOCTORAL SEMINAR I	1	I, II
VPP 792	DOCTORAL SEMINAR II	1	I, II
VPP 799	DOCTORAL RESEARCH	45	I, II

# VETERINARY PATHOLOGY

## Course Contents

<b>VPP 601</b>	<b>GENERAL PATHOLOGY</b>	<b>2+1</b>	<b>SEM - I</b>
<b>Objective</b>			
To acquaint students with different types of degenerations, cell injuries caused by different types of irritants and inflammation.			
<b>Theory</b>			
<u>UNIT-I</u> : Introduction and history of pathology, principles of pathology including etiology, course and termination of disease.			
<u>UNIT-II</u> : Advanced study of various degenerations, infiltrations, necrosis, endogenous and exogenous pigmentations.			
<u>UNIT-III</u> : Circulatory and growth disturbances. Reversible and irreversible cell injury.			
<u>UNIT-IV</u> : Inflammation including vascular and cellular alterations with emphasis on chemical mediators. Hypersensitivity and immune mediated mechanisms, Mechanism of healing and fever.			
<b>Practical</b>			
To study the gross and microscopic changes in degenerations, infiltrations, pigmentations, circulatory and growth disturbances and different types of necrosis in different tissues of domestic animals. Study of gross and histopathological features of different types of inflammation.			
<b>Suggested Readings</b>			
McGavin MD & Zachary JF. 2006. <i>Pathologic Basis of Veterinary Diseases</i> . 4 <sup>th</sup> Ed. Elsevier.			
Vegad JL. 2007. <i>Text Book of Veterinary General Pathology</i> . 2 <sup>nd</sup> Ed. International Book Distr.			
<b>VPP 602</b>	<b>TECHNIQUES IN PATHOLOGY</b>	<b>1+1</b>	<b>SEM - I</b>
<b>Objective</b>			
To acquaint students with different techniques used frequently in Veterinary Pathology.			
<b>Theory</b>			
<u>UNIT-I</u> : Basic histopathological techniques, collection of tissues, fixation, processing and section cutting, staining by routine and special methods.			
<u>UNIT-II</u> : Principles of dark ground, phase contrast and fluorescent microscopy and micrometry.			
<u>UNIT-III</u> : Histochemical techniques for demonstration of fat, glycogen and fibrous connective tissue, mucopolysaccharides and common enzymes.			
<b>Practical</b>			
Collection of tissues for histopathological, histochemical, toxic, bacterial and viral examination. Use of different fixatives for preservation of museum specimens. Application of different techniques- histopathological, cryosectioning, micrometry, routine and special staining. Demonstration of different inclusions, bacteria and fungi in tissues. Histochemical techniques to demonstrate different tissue constituents.			
<b>Suggested Readings</b>			
Culling CFA. 1969. <i>Handbook of Histological Techniques</i> . Butterworths.			
Lillie RD. 1965. <i>Histopathologic Techniques and Practical Histo-chemistry</i> . 3 <sup>rd</sup> Ed. McGraw-Hill.			
<b>VPP 603</b>	<b>ANIMAL ONCOLOGY</b>	<b>1+1</b>	<b>SEM - I</b>
<b>Objective</b>			
To acquaint students with different types of neoplasms of domestic animals, their nature, cause, pathology and diagnosis.			
<b>Theory</b>			
<u>UNIT-I</u> : Study of different neoplasms of animals including their identification, and epidemiology.			
<u>UNIT-II</u> : Etiology, histogenesis and experimental production.			
<u>UNIT-III</u> : Tumour immunology, cell cultures, transplantation and biological behaviour.			

**Practical**

To study the gross and microscopic changes in different types of neoplasms.

**Suggested Readings**

Meuten DJ. 2002. *Tumors in Domestic Animals*. 4<sup>th</sup> Ed. Blackwell.

<b>VPP 604</b>	<b>CLINICAL PATHOLOGY</b>	<b>1+2</b>	<b>SEM - I</b>
<b>Objective</b>			
To acquaint students with clinical alterations in blood, urine, CSF and other body fluids due to different diseases.			
<b>Theory</b>			
<u>UNIT-I</u> : Study of changes in blood, urine, faeces, cerebrospinal fluid and biopsy specimens and their interpretation.			
<u>UNIT-II</u> : Exfoliative cytology, organ function tests and their interpretation.			
<u>UNIT-III</u> : Biochemical profile of blood/plasma/serum and its correlation with disease conditions in domestic animals.			
<b>Practical</b>			
Evaluation of laboratory investigations on blood, urine, faeces and biopsy specimens from natural and experimentally produced disease conditions.			
<b>Suggested Readings</b>			
Benzamin MM. 1978. <i>Outline of Veterinary Clinical Pathology</i> . 3 <sup>rd</sup> Ed. Iowa State Univ. Press.			
Coles EH. 1967. <i>Veterinary Clinical Pathology</i> . WB Saunders.			
<b>VPP 605</b>	<b>NECROPSY PROCEDURES AND INTERPRETATIONS - I</b>	<b>0+1</b>	<b>SEM - I</b>
<b>Objective</b>			
To acquaint students with different Post-mortem procedures in large animals and study of PM lesions in different diseases.			
<b>Practical</b>			
Detailed necropsy examination of various species of farm animals, laboratory animals and wildlife. Necropsy case presentation and report writing/protocol preparation. Collection of specimens for diagnosis of viral, bacterial, protozoan, parasitic diseases, toxic/ poisoning and for histochemistry/histopathology. Systemic examination of brain, lungs, heart, endocrine glands, lymph nodes, liver, Gastro Intestinal tract, urinary and genital systems for gross pathological and histopathological studies and correlation of the observations to diagnose the disease conditions.			
<b>Suggested Readings</b>			
Jones TC & Gleiser CA. 1954. <i>Veterinary Necropsy Procedures</i> . JB Lippincott.			
<b>VPP 606</b>	<b>NECROPSY PROCEDURES AND INTERPRETATIONS - II</b>	<b>0+1</b>	<b>SEM - II</b>
<b>Objective</b>			
To acquaint students with different Post-mortem procedures in small animals and poultry and study of PM lesions in different diseases.			
<b>Practical</b>			
Detailed necropsy examination of various species of small animals, poultry, laboratory animals and wildlife. Necropsy case presentation and report writing/protocol preparation. Collection of specimens for diagnosis of viral, bacterial, protozoan, parasitic diseases, toxic/poisoning and for histochemistry/histopathology. Systemic examination of brain, lungs, heart, endocrine glands, lymph nodes, liver, Gastro Intestinal tract, urinary and genital systems for gross pathological and histopathological studies and correlation of the observations to diagnose the disease conditions.			
<b>Suggested Readings</b>			
Jones TC & Gleiser CA. 1954. <i>Veterinary Necropsy Procedures</i> . JB Lippincott.			
<b>VPP 607</b>	<b>SYSTEMIC PATHOLOGY</b>	<b>2+1</b>	<b>SEM - II</b>
<b>Objective</b>			
To teach the students about the different disease conditions of haemopoietic, circulatory, respiratory, digestive, urinary and genital systems, nervous, musculoskeletal, endocrine, glands and special senses.			

## **Theory**

UNIT-I: Advanced study of pathological conditions affecting different organs of haemopoietic (bone marrow, blood, spleen, lymph node), circulatory (heart, blood vessels and lymph vessels). Respiratory (nasal cavity, larynx, trachea, bronchi, lung and pleura) systems. Study of etiology, pathology and pathogenesis of specific infectious and non-infectious diseases of domestic animals related to the above mentioned systems.

UNIT-II: Advanced study of pathological conditions affecting different organs of digestive (buccal cavity, pharynx, oesophagus, stomach and intestines) urinary (kidneys, ureter, urinary bladder and urethra) and genital (male and female organs including mammary gland) systems. Study of etiology, pathology and pathogenesis of specific infectious and non-infectious diseases of domestic animals related to the above mentioned systems.

UNIT-III: Advanced study of pathological conditions affecting different organs of nervous (brain and spinal cord), endocrine (pituitary, thyroid, parathyroid, pancreas), musculo-skeletal systems (muscles and bones), and organs of special senses (eye, ear), skin and its appendages (hoof, tail). Study of etiology, pathology and pathogenesis of specific infectious and non-infectious diseases of domestic animals related to the above mentioned systems/organs.

## **Practical**

To study the gross and histopathological changes in important conditions affecting various systems. Study of gross and microscopic lesions in specific diseases pertaining to above said systems.

## **Suggested Readings**

Jubb KVF & Kennedy PC. 2005. *Pathology of Domestic Animals*. Academic Press.

# **VPP 608                      PATHOLOGY OF INFECTIOUS DISEASES                      2+1                      SEM - II OF DOMESTIC ANIMALS**

## **Objective**

To teach the students about the important infectious disease conditions of domestic animals.

## **Theory**

UNIT-I: Pathology of various viral diseases of domestic animals.

UNIT-II: Pathology of various bacterial and fungal diseases of domestic animals.

UNIT-III: Pathology of various rickettsial and parasitic diseases of domestic animals.

## **Practical**

To study the slides, museum specimens including autopsy specimens concerned with specific diseases.

## **Suggested Readings**

Jones TC, Hunt RD & King NW 1997. *Veterinary Pathology*. Blackwell Publishing.

Jubb KVF & Kennedy PC 2005. *Pathology of Domestic Animals*. Academic Press.

# **VPP 609                      TOXICOPATHOLOGY                      2+1                      SEM - II**

## **Objective**

To teach students about toxicity in livestock due to plants and extraneous poisons.

## **Theory**

UNIT-I: Introduction, mode of action, diagnosis and treatment of different poisons and their classification.

UNIT-II: Pathogenesis, gross and microscopic pathology of diseases caused by toxic plants, organic and inorganic poisons commonly taken or administered maliciously to different species of domestic animals.

## **Practical**

To study gross and histopathological alterations as a result of ingestion of toxic plants and extraneous poisons in domestic animals.

## **Suggested Readings**

Jones TC, Hunt RD & King NW 1997. *Veterinary Pathology*. Blackwell Publishing.

# **VPP 610                      AVIAN PATHOLOGY                      2+1                      SEM - I**

## **Objective**

To teach the students about the different disease conditions of poultry including pathology and diagnosis.

### Theory

UNIT-I: Pathology of infectious diseases of chickens, turkeys, ducks and other birds.

UNIT-II: Pathology of non-infectious diseases of chickens, turkeys, ducks and other birds.

### Practical

Necropsy examination of the different species of poultry; study of gross and histopathological lesions in naturally occurring and artificially produced diseases of birds.

### Suggested Readings

Calnek BW. 1991. *Diseases of Poultry*. 9<sup>th</sup> Ed. Iowa State Univ. Press.

Saif YM, Barnes FJ, Glisson JR, Fadly AM, Mc Dougald LR & Swayne D. 2008. *Diseases of Poultry*. 11<sup>th</sup> Ed. Blackwell Publishing.

<b>VPP 611</b>	<b>PATHOLOGY OF LABORATORY ANIMALS, FISH AND WILD ANIMALS</b>	<b>2+1</b>	<b>SEM - II</b>
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### Objective

To teach the pathology and diagnosis of different disease conditions of laboratory animals, fish and wild animals.

### Theory

UNIT-I: Introduction, disease transmission and inter-phase.

UNIT-II: Pathology of important infectious diseases (viz. bacterial, viral, fungal and parasitic) of fish, laboratory and wild/zoo animals.

UNIT-III: Pathology of non-infectious diseases of fish, lab/ wild/zoo animals.

### Practical

Post-mortem examination of wild animals including wild birds. Study of gross and microscopic lesions of important infectious and non - infectious diseases of fish and laboratory animals.

### Suggested Readings

Arora BM. 1984. *Wildlife Diseases in India*. Periodical Expert Book Agency.

Beninchka K, Garner FM & Jones TC. 1978. *Pathology of Laboratory Animals*. Vols. I, II. Springer Verlag.

Fowler ME. 1978. *Zoo and Wild Animal Medicine*. WB Saunders.

Roberts RJ. 1979. *Fish Pathology*. Bailliere Tindall, London.

<b>VPP 612</b>	<b>VETEROLEGAL PATHOLOGY</b>	<b>1+0</b>	<b>SEM - II</b>
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### Objective

To educate the students about common veterolegal problems and legal writing of PM report.

### Theory

UNIT-I: General knowledge about the laws relating to veterinary practice, professional discipline and professional etiquettes.

UNIT-II: Regulations dealing with diseases of animals in India regarding epidemiology, quarantine certificate, issue of soundness certificate etc.

UNIT-III: Common causes of violent death, criminal assault, cruelty to animals, malicious poisoning, snake bite, electrocution, gun shot wounds, automobile accidents, doping etc.

### Suggested Readings

Gahlot AK, Sharma SN & Tanwar RA. 2003. *Veterinary Jurisprudence*. 5<sup>th</sup> Ed. NBS Publishers, Bikaner.

Jones TC & Gleiser CA. 1954. *Veterinary Necropsy Procedures*. JB Lippincott.

Lincoln PJ & Thomson J. 1998. *Forensic DNA Profiling Protocols*. Humana Press.

Rudin N & Inman K. 2002. *An Introduction to Forensic DNA Analysis*. CRC Press.

<b>VPP 701</b>	<b>PATHOLOGY OF NUTRITIONAL AND METABOLIC DISTURBANCES</b>	<b>2+1</b>	<b>SEM - I</b>
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### Objective

To teach students about nutritional and metabolic disorders of livestock.

### Theory

UNIT-I: Pathogenesis, gross and microscopic pathology of nutritional deficiencies viz. carbohydrate, protein, fats, vitamins and macro and microelements and their imbalances.

UNIT-II: Different metabolic diseases namely milk fever, ketosis, tetany, azoturia. Downer's cow syndrome and post parturient hemoglobinuria in domestic animals.

**Practical**

Estimation of certain minerals in sera of natural and experimentally induced deficiencies in domestic animals. To study the haematological, gross and microscopic pathological alterations caused by nutritional and metabolic disorders.

**Suggested Readings**

Selected articles from journals.

**VPP 702                      ADVANCES IN TOXICOPATHOLOGY                      2+1                      SEM - I****Objective**

To teach students about toxicity in livestock due to plants and extraneous poisons.

**Theory**

UNIT-I: Introduction, mode of action, diagnosis and treatment of different poisons and their classification. Experimental animal models for toxicity studies and evaluation of parameters.

UNIT-II: Pathogenesis, gross and microscopic pathology of diseases caused by toxic plants, organic and inorganic poisons commonly taken or administered maliciously to different species of domestic animals.

**Practical**

Clinico-pathological studies on natural or experimentally induced toxicity /poisoning in domestic animals. To study gross and histopathological alterations as a result of ingestion of toxic plants and extraneous poisons in domestic animals.

**Suggested Readings**

Selected articles from journals.

**VPP 703                      ADVANCES IN DIAGNOSTIC PATHOLOGY                      1+2                      SEM - I****Objective**

To teach current diagnostic techniques for diagnosis of different diseases.

**Theory**

UNIT-I: Study of the principles of biopsy techniques and electron microscopy.

UNIT-II: Current techniques for diagnosis of diseases.

**Practical**

Principles and practice of fluorescent and phase contrast microscopy, chromatography, spectrophotometry and immunodiffusion technique, use of laboratory animals, chick embryos etc. for the diagnosis of animal diseases.

**Suggested Readings**

Selected articles from journals.

**VPP 704                      ULTRASTRUCTURAL PATHOLOGY                      1+1                      SEM - II****Objective**

To study the significance of ultra-structural changes in organelles.

**Theory**

UNIT-I: Study of cells- cell morphology, interpretation of normal and abnormal cells.

UNIT-II: Study of cell organelles, degenerations, infiltrations, viral inclusions.

**Practical**

Study of EM photographs, collection and preparation of specimens for EM studies.

**Suggested Readings**

Selected articles from journals.

**VPP 705                      IMMUNOPATHOLOGY                      2+1                      SEM - II****Objective**

To teach students immunologically mediated and autoimmune diseases of livestock.

**Theory**

UNIT-I: Principles of immunopathology, hypersensitivity status, pathology of immune complex diseases.

UNIT-II: Immunoproliferative disorders, autoimmune diseases and immune deficiencies in man and domestic animals.

**Practical**

Immune complexes, quantification 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 Readings**

Selected articles from journals.

<b>VPP 706</b>	<b>PATHOLOGY OF IMPORTANT AND EMERGING DISEASES OF PETS AND LIVESTOCK</b>	<b>1+1</b>	<b>SEM - II</b>
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**Objective**

To teach students important and emerging diseases of pets and livestock.

**Theory**

UNIT-I: Introduction to emerging diseases, foot and mouth disease, vesicular stomatitis, vesicular exanthema, rinderpest/Peste des petits ruminants, para influenza -3, infectious bovine rhinotracheitis/infectious pustular vulvovaginitis, bovine spongiform encephalopathy, scrapie, blue tongue, malignant catarrhal fever, mucosal disease/bovine viral diarrhoea, bovine leucosis.

UNIT-II: Tuberculosis/Johne's disease, brucellosis, listeriosis, caprine arthritis, campylobacteriosis, encephalitis, parvovirus infection, emerging diseases of pets.

**Practical**

Study of clinical and gross alterations and histopathology of some important emerging and enzootic diseases.

**Suggested Readings**

Selected articles from journals.

<b>VPP 707</b>	<b>ADVANCES IN AVIAN PATHOLOGY</b>	<b>2+1</b>	<b>SEM - I</b>
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**Objective**

To teach different diagnostic techniques for diagnosis of different avian diseases.

**Theory**

UNIT-I: Advances in pathogenesis and pathology including molecular basis of important infections (bacterial, viral, fungal and parasitic).

UNIT-II: Non-infectious diseases with particular emphasis on emerging diseases of chickens, turkeys, ducks and other birds.

**Practical**

Necropsy examination of different species of poultry. Study of gross and microscopic lesions in natural and experimentally produced diseases in different species of birds. Diagnosis of different diseases of poultry.

**Suggested Readings**

Selected articles from journals.

<b>VPP 708</b>	<b>PATHOLOGY OF FUNGAL DISEASES</b>	<b>2+1</b>	<b>SEM - II</b>
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**Objective**

To teach the diseases caused by different fungi and mycotoxins in animals.

**Theory**

UNIT-I: Pathology of diseases associated with pathogenic fungi like aspergillosis, candidiasis, epizootic lymphangitis, histoplasmosis, coccidioidomycosis, cryptococcosis, bovine abortions, dermatophytomycosis etc.

UNIT-II: Diseases associated with mycotoxins like aflatoxins, rubratoxin, T2 toxin, ochratoxin etc. Metabolism of toxins and their effect in man, domestic and laboratory animals, poultry and aquatic species.

**Practical**

Demonstration of pathogenic mycotoxic fungi, chemistry of toxic compounds, physical and chemical properties, methods of extraction, isolation and identification of mycotoxins.

**Suggested Readings**

Selected articles from journals.

<b>VPP 709</b>	<b>MOLECULAR PATHOLOGY OF CELL INJURY</b>	<b>2+1</b>	<b>SEM - II</b>
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**Objective**

To acquaint the students about the molecular basis of cell injury and inflammation.

**Theory**

UNIT-I: Causes of cell injury - Ischemic, Hypoxic, Free radicals, virus and chemical cell injury - Chemical Mediators - Cytoskeletal and biochemical changes in cell injury.

UNIT-II: Ultrastructural changes and biochemical mechanisms of reversible injury, necrosis, apoptosis. Molecular basis of disease. Cellular adaptation- hyperplasia, hypertrophy, atrophy, metaplasia and dysplasia. Intracellular accumulations.

UNIT-III: Inflammation- mechanism and types. Tissue repair and healing.

**Practical**

Gross and histopathological studies pertaining to above conditions.

**Suggested Readings**

Selected articles from journals.

<b>VPP 710</b>	<b>EXPERIMENTAL PATHOLOGY</b>	<b>1+1</b>	<b>SEM - I</b>
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**Objective**

To provide expertise in designing the experiments and handling of animals.

**Theory**

UNIT-I: Need for experimentation in research, animal experimentation techniques, preparation of experimental protocols, biochemical studies, pathological examination of clinical samples.

UNIT-II: Transplantation techniques, immune regulation, tissue culture, blood cell separation protocols, electrophoresis and chromatography, study of animal model and designing of experiment.

**Practical**

Short research problems involving contemporary issues and research techniques.

**Suggested Readings**

Selected articles from journals.

<b>VPP 790</b>	<b>SPECIAL PROBLEM</b>	<b>0+2</b>	<b>SEM - I, II</b>
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**Objective**

To provide expertise in handling practical research problem(s).

**Practical**

Short research problem(s) involving contemporary issues and research techniques.



# **VETERINARY PATHOLOGY**

## **List of Journals**

- Advances in Veterinary Sciences
- American Journal of Veterinary Medical Association
- Avian Diseases
- Current Contents
- Indian Journal of Animal Sciences
- Indian Journal of Poultry Science
- Indian Journal of Veterinary Pathology
- Journal of Immunology and Immunopathology
- Veterinary Bulletin
- Veterinary Pathology

## **e-Resources**

- [www.iavp.org](http://www.iavp.org) (Indian Journal of Veterinary Pathology)
- [www.vetpathology.org](http://www.vetpathology.org) (Veterinary Pathology)
- [www.tandf.co.uk](http://www.tandf.co.uk) (Avian Pathology)
- [www.avdi.allenpress.com](http://www.avdi.allenpress.com) (Avian Diseases)
- [www.elsevier.com/locate/vetimm](http://www.elsevier.com/locate/vetimm) (Veterinary Immunology and Immuno- pathology)

## **Suggested Broad Topics for Master's and Doctoral Research**

- Effect of probiotics on pathogenesis and pathology of bacterial diseases
- Effect of antioxidants on pathogenesis and pathology of bacterial diseases
- Pathology of mixed infections in domestic animals
- Role of stress in pathogenesis and pathology of animal diseases