

VETERINARY PARASITOLOGY

Course Structure – at a Glance

CODE	COURSE TITLE	CREDITS
VPA 601	VETERINARY HELMINTHOLOGY-I	2+1
VPA 602	VETERINARY HELMINTHOLOGY-II	2+1
VPA 603	VETERINARY ENTOMOLOGY AND ACAROLGY	2+1
VPA 604	VETERINARY PROTOZOOLOGY	2+1
VPA 605	PARASITOLOGICAL TECHNIQUES	0+2
VPA 606	CLINICAL PARASITOLOGY	1+1
VPA 607	TRENDS IN CONTROL OF LIVESTOCK AND POULTRY PARASITES	1+1
VPA 608	IMMUNOPARASITOLOGY	2+1
VPA 609	PARASITIC ZONOSSES	2+0
VPA 610	PARASITES OF ZOO AND WILD ANIMALS	2+1
VPA 611	MALACOLOGY	1+1
VPA 691	MASTER'S SEMINAR	1+0
VPA 699	MASTER'S RESEARCH	20
VPA 701	APPLICATIONS OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM IN PARASITOLOGY	1+2
VPA 702	MOLECULAR DIAGNOSTICS AND VACCINE DEVELOPMENT IN PARASITOLOGY	2+1
VPA 703	HOST PARASITE INTERACTIONS	2+0
VPA 704	ADVANCES IN PROTOZOOLOGY	2+1
VPA 705	ADVANCES IN HELMINTHOLOGY-I	2+1
VPA 706	ADVANCES IN HELMINTHOLOGY-II	2+1
VPA 707	ADVANCES IN ENTOMOLOGY AND ACAROLGY	2+1
VPA 708	<i>IN VITRO</i> CULTIVATION OF PARASITES	1+2
VPA 709	EMERGING AND RE-EMERGING PARASITIC DISEASES	2+0
VPA 710	BIONOMICS OF PARASITES	3+0
VPA 711	ENVIRONMENTAL PARASITOLOGY	1+1
VPA 790	SPECIAL PROBLEM	0+2
VPA 791	DOCTORAL SEMINAR I	1+0
VPA 792	DOCTORAL SEMINAR II	1+0
VPA 799	DOCTORAL RESEARCH	45

VETERINARY PARASITOLOGY

Course Contents

VPA 601 VETERINARY HELMINTHOLOGY - I 2+1

Objective

To learn about various aspects of trematode and cestode parasites of veterinary importance.

Theory

UNIT I

Introduction, history, classification, general account and economic importance of platyhelminths.

UNIT II

Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of trematodes belonging to families: Dicrocoeliidae, Opisthorchiidae, Strigeidae and Fasciolidae.

UNIT III

Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of trematodes belonging to families: Echinostomatidae, Heterophyidae, Plagiorchiidae, Troglotrematidae, Prosthogonimidae, Nanophyetidae and Paragonimidae.

UNIT IV

Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of trematodes belonging to families: Notocotylidae, Brachylemidae, Cyclocoelidae, Paramphistomatidae and Schistosomatidae.

UNIT V

Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of cestodes belonging to families: Mesocestoididae, Anoplocephalidae, Thysanosomidae, Dipylidiidae and Dilepididae.

UNIT VI

Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of cestodes belonging to families: Davaineidae, Hymenolepididae, Taeniidae and Diphyllbothriidae.

Practical

Identification of trematode and cestode parasites; their eggs and intermediate hosts. Observation on parasitic stages in host tissues and associated pathological lesions.

Suggested Readings

- Chowdhury N. and Toda I. 1994. *Helminthology*. Springer Verlag, Narosa Publishing House.
- Dalton JP. 1999. *Fasciolosis*. CABI.
- Gibson DI. 2002. *Keys to the Trematoda*, Vol.1. CABI.
- Khalil LF, Jones A & Bray RA. 1994. *Keys to the Cestode Parasites of Vertebrates*. CABI.
- Kumar V. 1998. *Trematode Infections and Diseases of Man and Animals*. Kluwer Academic Publishers.
- Lapage G. 2000. *Monning's Veterinary Helminthology and Entomology*. Greenworld Publ.

Suggested Readings

- Andersen RC. 2000. *Nematode Parasites of Vertebrates, their Development and Transmission*. CABI.
- Kennedy MW & Harnett W. 2001. *Parasitic Nematodes: Molecular Biology, Biochemistry and Immunology*. CABI.
- Lapage G. 2000. *Monning's Veterinary Helminthology and Entomology*. Greenworld Publ.
- Lee DL. 2002. *The Biology of Nematodes*. Taylor and Francis.
- Soulsby E.J.L. 1982. *Helminths, Arthropods and Protozoa of Domesticated Animals*. Bailliere Tindal.

VPA 603 VETERINARY ENTOMOLOGY AND ACAROLOGY 2+1

Objective

To learn various aspects of arthropods of veterinary importance.

Theory

UNIT I

Introduction, history, classification and economic importance.

UNIT II

Distribution, life cycle, seasonal pattern, pathogenesis, economic significance and control of arthropods belonging to the families: Culicidae, Ceratopogonidae, Simuliidae and Psychodidae.

UNIT III

Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Tabanidae, Gasterophilidae, Muscidae, and Glossinidae.

UNIT IV

Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Oestridae, Sarcophagidae, Calliphoridae and Hippoboscidae.

UNIT V

Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Pediculidae, Haematopinidae, Linognathidae, Menoponidae, Philopteridae and Trichodectidae

UNIT VI

Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Siphonapteridae, Cimicidae and Reduviidae,

UNIT VII

Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Dermanyssidae, Argasidae and Ixodidae

UNIT VIII

Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Sarcoptidae, Psoroptidae, Demodicidae, Trombiculidae, Cytoditidae and Linguatulidae.

UNIT IX

Strategic control measures of arthropods with special emphasis on improved versions of chemical, biological and immunological control and integrated pest management.

Practical

Collection, preservation, identification and differentiation of various arthropods and their developmental stages; associated pathological changes and lesions; skin scraping examination.

Suggested Readings

- Gupta SK & Kumar R. 2003. *Manual of Veterinary Entomology and Acarology*. International Book Distr. Co.
- Harwood RF & James MT. 1979. *Entomology in Human and Animal Health*. MacMillan.
- Kettle DS. 1995. *Medical and Veterinary Entomology*. CABI.
- Lehane M. 2005. *The Biology of Blood Sucking Insects*. 2nd Ed. Cambridge University Press.
- Marquardt WC. 2000. *Parasitology and Vector Biology*. Academic Press
- Mullen G & Durben L. 2002 *Medical and Veterinary Entomology*. Academic Press
- Wall R & Shearer D. 1997. *Veterinary Entomology*. Chapman & Hall.

VPA 604

VETERINARY PROTOZOOLOGY

2+1

Objective

To project the importance and to impart detailed knowledge on various aspects of protozoan parasites.

Theory

UNIT I

Introduction, history, classification, general account, economic importance of protozoan parasites.

UNIT II

Morphology, epidemiology, pathogenesis, clinical signs, diagnosis and control measures of protozoan parasites belonging to the families: Trypanosomatidae, Monocercomonadidae, Trichomonadidae, Hexamitidae and Endamoebidae.

UNIT III

Morphology, epidemiology, pathogenesis, clinical signs, diagnosis and control measures of protozoan parasites belonging to the families: Eimeriidae, Cryptosporidiidae and Sarcocystidae.

UNIT IV

Morphology, epidemiology, pathogenesis, clinical signs, diagnosis and control measures of protozoan parasites belonging to the families: Plasmodiidae, Babesiidae, Theileriidae, Haemogregarinidae and Balantidiidae.

UNIT V

Morphology, epidemiology, pathogenesis, clinical signs, diagnosis and control measures of Rickettsiales like *Anaplasma*, *Ehrlichia* and *Haemobartonella*.

Practical

Identification of protozoan parasites and observation on parasite stages in host tissues and the attendant pathological lesions. Diagnosis of protozoan parasites of veterinary importance.

Suggested Readings

- Bhatia BB & Shah HL. 2000. *Protozoa and Protozoan Diseases of Domestic Livestock*. ICAR.
- Bhatia BB. 2000. *Textbook of Veterinary Protozoology*. ICAR.
- Dobbelaere DAE & McKeever D. 2002. *Theileria*. Springer Verlag.
- Dubey JP & Beattie CP. 1988. *Toxoplasmosis of Animals and Man*. CRC Press.
- Dubey JP, Speer CA & Fayer R. 1989. *Sarcocystosis of Animals and Man*. CRC Press.
- Dubey JP, Speer CA & Fayer R. 1990. *Cryptosporidiosis in Man and Animals*. CRC Press.
- Kreier JP. 1991-95. *Parasitic Protozoa*. Ed. JR Baker. Academic Press.
- Levine ND. 1985. *Veterinary Protozoology*. Iowa State Univ. Press.
- Lindsay DS & Weiss LM. 2004. *Opportunistic Infections :Toxoplasma Sarcocystis and Microsporidia*. Kluwer Academic Press.
- Maudlin I. 2004. *The Trypanosomiasis*. Oxford Univ. Press.
- Sterling CR. and Adam RD. 2004. *The Pathogenic Enteric Protozoa*. Kluwer Academic Press.
- Thompson A. 2003. *Cryptosporidium*. Elsevier

VPA 605

PARASITOLOGICAL TECHNIQUES

0+2

Objective

To impart practical knowledge on various techniques used in veterinary parasitology.

Practical

Microscopy, micrometry, camera lucida drawings, micro- and digital photography.

Collection, processing and examination of faecal and blood samples; lymph node biopsies, skin scrapings and nasal washings from animals for parasitological findings. Quantitative faecal examination.

Evaluation of the efficacy and resistance of drugs against parasites.

Maintenance of tick and fly colonies in laboratory for experimental purposes and testing of drugs; tick dissection for vector potential.

Collection of aquatic snails from field and their examination for the presence of different parasitic stages.

Collection, fixation, staining, whole mounts and identification of parasites.

Cryopreservation of parasites, culturing techniques for important parasites and pasture larval count, worm count and assessment of worm burden.

Remote sensing (RS) and geographic information system (GIS) as tools for mapping parasitic diseases.

Suggested Readings

- Chaudhri SS & Gupta SK. 2003. *Manual of General Veterinary Parasitology*. International Book Distr. Co.
- Durr P & Gatrell A. 2004. *GIS and Spatial Analysis in Veterinary Science*. CABI.
- Ministry of Agriculture, Fisheries and Food (MAFF). 1986. *Manual of Veterinary Parasitological Laboratory Techniques*. 3rd Ed. Tech. Bull. 18, HMSO.
- Rathore VS & Sengar YS. 2005. *Diagnostic Parasitology*. Pointer Publ.

VPA 606

CLINICAL PARASITOLOGY

1+1

Objective

Collection and examination of clinical material for parasitological investigations and study of clinical cases.

Theory

UNIT I

History, clinical signs, gross and microscopic examination of secretions and excretions of clinical cases.

UNIT II

Collection and dispatch of material to laboratory for diagnosis.

UNIT III

Animal sub-inoculation tests; blood and biopsy smear examination; histopathology of affected organs.

Practical

Identification, observation of parasitic stages in host tissues, excretions, secretions and associated pathological lesions.

Suggested Readings

- Faust EC, Russell PF & Jung RC. 1971. *Craig and Faust's Clinical Parasitology*. Lea & Febiger.
- Sloss MW, Kemp RL & Zajac AM. 1994. *Veterinary Clinical Parasitology*. Indian Ed. International Book Distr. Co.
- Soulsby E.J.L. 1965. *Textbook of Veterinary Clinical Parasitology*. Blackwell.

VPA 607

**TRENDS IN CONTROL OF LIVESTOCK AND
POULTRY PARASITES**

1+1

Objective

To learn about integrated approach for the control of helminths, arthropods and protozoan parasites of veterinary importance.

Theory

UNIT I

Conventional and novel methods of control of helminth – anthelmintics, their mode of action, characteristic of an ideal anthelmintic, anthelmintic resistance, spectrum of activity, delivery devices, integrated control method and immunological control Formulation of deworming schedule. Snail and other intermediate host control.

UNIT II

Conventional and novel methods of control of protozoan parasites – antiprotozoan drugs, their mode of action, integrated control method and immunological control.

UNIT III

Conventional and novel methods of control of insects – Insecticides / acaricides - methods of application, their mode of action, insecticide resistance , integrated control method and immunological control.

Practical

In vivo and *in vitro* detection of efficacy of and resistance to parasitocidal agents.

Suggested Readings

- Kaufmann J. 1996. *Parasitic Infections of Domestic Animals*. Birkhauser Verlag.

Mehlhorn H (Ed). 2001. *Encyclopedic Reference of Parasitology: Diseases, Treatment, Therapy*. Springer Verlag.

VPA 608 **IMMUNOPARASITOLOGY** **2+1**

Objective

To impart knowledge about the immunology, immunodiagnosis and immunoprophylaxis of ecto- and endoparasites of veterinary importance.

Theory

UNIT I

Introduction, types of parasitic antigens and their characterization.

UNIT II

Types of immunity in parasitic infections. Cellular and humoral immunity to parasites, hypersensitivity, regulation of the immune response.

UNIT III

Evasion of immunity, immunomodulations and their uses.

UNIT IV

Immune responses in helminths, arthropods and protozoa of veterinary importance.

UNIT V

Immunodiagnostic tests and their techniques; application of biotechnological tools in the diagnosis and control of parasitic diseases.

UNIT VI

Vaccines and vaccination against parasitic infections.

UNIT VII

Genetic control of parasites.

Practical

Preparation of various antigens (somatic, secretory and excretory) and their fractionation and characterization; raising of antisera and demonstration of various immunodiagnostic methods for the diagnosis of parasitic infections.

Suggested Readings

- Behnkey JM. 1990. *Parasites, Immunity and Pathology*. Taylor & Francis.
Boothroyd JC & Komuniecki R. 1995. *Molecular Approaches to*
Cohen S & Sadun EH. 1976. *Immunology of Parasitic Infections*.
Blackwell.
Cox FEG. 1993. *Modern Parasitology*. Blackwell.
Marr JJ, Nilsen TW & Komuniecki RW. 2003. *Molecular Medical*
Parasitology. Elsevier.
Parasitology. Wileyliss Publication, New York.
Waklin D. 1996. *Immunity to Parasites*. Cambridge University Press.

VPA 609 **PARASITIC ZOOSES** **2+0**

Objective

To provide the students with an in-depth knowledge of occurrence and importance of parasitic zoonoses and how these parasites are diagnosed and controlled.

Theory

UNIT I

Introduction to the concept of zoonotic infections, definitions, various classifications of zoonoses, host-parasite relationships, modes of infections, factors influencing prevalence of zoonoses.

UNIT II

A detailed study of transmission, epidemiology, diagnosis and control of major protozoa of zoonotic importance.

UNIT III

A detailed study of transmission, epidemiology, diagnosis and control of major helminths of zoonotic importance.

UNIT IV

A detailed study of transmission, epidemiology, diagnosis and control of major arthropods of zoonotic importance.

Suggested Readings

Miyazaki 1991. *Helminthic Zoonoses*. International Medical Foundation of Japan.

Palmer SR, Soulsby E.J.L. & Simpson D.H. 1998. *Zoonoses*. Oxford

Parija S.C. 1990. *Review of Parasitic Zoonoses*. AITBS Publ.

Rathore V.S. 2005. *Parasitic Zoonoses*. Pointer Publishers.

Shakespeare M. 2002. *Zoonoses*. Pharmaceutical Press.
University Press.

VPA 610

PARASITES OF ZOO AND WILD ANIMALS

2+1

Objective

To learn about biological and control aspects of parasitic diseases of zoo and wild animals.

Theory

UNIT I

A detailed study of major protozoa of zoo and wild animals with particular emphasis on morphological features, geographical distribution, epidemiology, diagnosis and management.

UNIT II

A detailed study of major arthropod parasites of zoo and wild animals with particular emphasis on morphological features, geographical distribution, epidemiology, diagnosis and management.

UNIT III

A detailed study of major helminth parasites of zoo and wild animals with particular emphasis on morphological features, geographical distribution, epidemiology, diagnosis and management.

Practical

Methods for investigating parasitic diseases in wild animals. Collection of parasites at post-mortem. Identification and quantification of parasites. Visit to Zoo and Wild Life Parks/ Sanctuaries.

Suggested Readings

Chowdhury N & Alonso Aquirre A. 2001. *Helminths of Wild Life*.

Friend M & Franson J.C. 1999. *Field Manual of Wildlife Diseases: General Field Procedures and Diseases of Birds*. Free of charge at: www.nwhc.usgs.gov/publications/field_manual/field_manual_of_wildlife_diseases.pdf

NBII Wildlife Diseases Information Node can be reached at: <http://wildlifediseases.nbii.gov>

Oxford & IBH Publishing Co. Pvt. Ltd.

Samual W, Pybus M & Kocan A. (Eds). 2001. *Parasitic Diseases of Wild Mammals*. Iowa State Univ. Press.

VPA 611 MALACOLOGY 1+1

Objective

To learn about the details of various snails involved in diseases transmission.

Theory

UNIT I

Characters and classification of Mollusca.

UNIT II

Occurrence, distribution, ecology, life history, morphology and control of vector snails belonging to families, Planorbidae, Lymnaeiidae, Thiridae, Amnicolidae, Helicidae, Succineidae and Zonitidae.

Unit III

Examination of vector molluscs for parasitic infections.

Unit IV

Haematology, internal defense mechanisms, parasite-induced pathology and molluscan tissue culture.

Practical

Collection and identification of vector molluscs, study of their shells and internal organs. Breeding, rearing and maintenance of vector molluscs in the laboratory. Examination of molluscs for various developmental stages of parasites.

Suggested Readings

Malek EA & Cheng TC. 1974. *Medical and Economic Malacology*. Academic Press.

Sturm CF, Pearce TA & Valdés A. 2006. *The Mollusks: A Guide to Their Study, Collection and Preservation*. American Malacological Society, Pittsburgh and Universal Publishers, Boca Raton.

VPA 701 APPLICATIONS OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM IN PARASITOLOGY 1+2

Objective

To study the emerging applications of Remote Sensing and Geographic Information System in parasitology.

Theory

UNIT I

Basic principles of Remote Sensing, satellite and imagery sensor systems, spectral signatures, interpretation of satellite imagery, digital image processing.

UNIT II

Fundamentals of GIS, raster data representation, vector data representation, GIS data management, data input, editing, analysis and modeling. GIS output as maps.

UNIT III

Integration of RS and GIS. Applications of RS and GIS in parasitology, case studies related to vector and vector-borne parasitic diseases, soil transmitted helminths.

Practical

Understanding maps and map projections, maps as models. IRS data products, visual interpretation of image, Digital image processing, contrast

- VPA 708** **IN VITRO CULTIVATION OF PARASITES** **1+2**
- Objective**
Development of skills for cultivation of various parasites in the laboratory for research and practical control.
- Theory**
UNIT I
Introduction, problems and goals.
UNIT II
In vitro cultivation of genital flagellates, intestinal flagellates and intestinal ciliates.
UNIT III
In vitro cultivation of intestinal and tissue protozoa.
UNIT IV
In vitro cultivation of haemoprotozoans.
UNIT V
In vitro techniques, media and tissue culture for cultivation of helminths and their larval stages.
UNIT VI
In vitro mass rearing and colonization of ticks, flies and other insects.
- Practical**
Preparation of media and cultivation of important parasites, raising and maintenance of cell-lines of important parasites.
- Suggested Readings**
Selected articles from journals.
- VPA 709** **EMERGING AND RE-EMERGING PARASITIC DISEASES** **2+0**
- Objective**
To study the emerging and re-emerging parasitic diseases.
- Theory**
UNIT I
Emerging and re-emerging helminthic diseases.
UNIT II
Emerging and re-emerging protozoan diseases.
UNIT III
Emerging and re-emerging vector-borne diseases.
- Suggested Readings**
Selected articles from journals.
- VPA 710** **BIONOMICS OF PARASITES** **3+0**
- Objective**
To study ultrastructure, physiology, biochemistry and bionomics of important parasites.
- Theory**
UNIT I
Ultrastructure, physiology, biochemistry and bionomics of trematodes and cestodes of veterinary importance.
UNIT II
Ultrastructure, physiology, biochemistry and bionomics of nematodes of veterinary importance.

UNIT III

Ultrastructure, physiology, biochemistry and bionomics of important arthropod parasites.

UNIT IV

Ultrastructure, physiology, biochemistry and bionomics of important protozoan parasites.

Suggested Readings

Selected articles from journals.

VPA 711 ENVIRONMENTAL PARASITOLOGY 1+1

Objective

To study the effect of environmental changes and ecological disturbances on the emergence, proliferation and transmission of parasitic diseases.

Theory

UNIT I

Environmental changes and ecological disturbances due to natural phenomenon and human interventions (demographic, societal and agricultural changes, global warming, floods, hurricanes and pollution etc.).

UNIT II

Effect of environmental changes and ecological disturbances on the proliferation and transmission of helminthic diseases

UNIT III

Effect of environmental changes and ecological disturbances on the proliferation and transmission of protozoan diseases.

UNIT IV

Effect of environmental changes and ecological disturbances on the proliferation of intermediate hosts and vectors and their role in transmission of diseases.

Practical

Examination of water, soil, meat and vegetables etc. to record the contamination with parasites due to environmental changes. Assessment of effect of temperature and humidity on the development of parasites. Use of Process-based (mathematical) models to express the scientifically documented relationship between climatic variables and biological parameters e.g., vector breeding, survival and biting rates; parasite incubation rates.

Suggested Readings

Selected articles from journals.

VPA 790 SPECIAL PROBLEM 0+2

Objective

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

Practical

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