

M. Sc., Public Health Entomology

**2 Year Course
(Semester Pattern)**

Course Contents

2011 - 2012 Onwards

Rules, Regulations & Syllabus



Vector Control Research Centre

(Indian Council of Medical Research)

Puducherry 605 006

M.Sc., Public Health Entomology

(TWO YEAR-FULL TIME SEMESTER PROGRAMME)

There is a growing need for entomologists in the field of Public Health in view of emerging and re-emerging vector-borne diseases in India. The National Rural Health Mission (NRHM) is planning to tackle this situation with the assistance of entomologists at the district level across the country. At present, there is no one university in India offering a course catering to meet this national need. Therefore, Vector Control Research Centre, Puducherry aims to provide an opportunity for students to undertake a two year programme (semester pattern) on Public Health Entomology to obtain knowledge and expertise on the modern approaches for epidemiology and control of vectors and vector-borne diseases.

Course Description

Arthropods affect the health and well-being of human being in a wide variety of ways, by transmitting several of the most devastating infectious diseases. This course provides an overview of the ways in which arthropods impact public health, laying greater emphasis on insect vectors and vector-borne diseases control. The course will focus on vectors of local as well as global importance. An epidemiological perspective will be integrated throughout the course. Biology, ecology and application of modern tools in the management of vectors and vector-borne diseases will be discussed in detail. Finally, attention will be given to the students on the development of practical skills in the implementation of operational programmes.

Learning Objectives

By the end of this course, students will be able to:

- i) Describe the basics of arthropods of public health importance
- ii) Identify vector - host - pathogen relationships in arthropod-borne diseases
- iii) Conduct studies on the epidemiology of vector-borne diseases
- iv) Apply modern tools for surveillance and diagnosis of vector-borne diseases
- v) Able to design appropriate control measures including the rationalization of the use of pesticides in Public health programmes
- vi) Promote Integrated Vector Management strategy

AFFILIATION

The Vector Control Research Centre (VCRC) is affiliated to the Pondicherry University, Puducherry. The proposed programme shall be governed by the rules and regulations of the Pondicherry University, Puducherry.

DURATION OF THE COURSE

The duration of the course is TWO academic years (Semester pattern).

MEDIUM OF INSTRUCTION

English shall be the medium of instruction for all subjects of study and examinations of the Course.

ADMISSION PROCEDURE

The admission to the above course shall be made by following the admission related procedures as prescribed by the Pondicherry University from time to time.

The deadline prescribed for admission to this course will be notified in April of every calendar year.

ELIGIBILITY FOR ADMISSION

Candidates who have obtained a degree in Science of any University, accepted as equivalent by the academic council of the Pondicherry University, Puducherry with any of the specified groups of options viz., B.Sc., Zoology, Botany, Life Sciences, Medical Laboratory Technology, Microbiology, Biochemistry, B.V.Sc., M.B.B.S., B.E., and B.Tech., degree with biotechnology as one of the subjects shall be permitted to appear and qualify for the M.Sc. Public Health Entomology degree examination in non-clinical subjects under the School of Medical Sciences after a course of study of two academic years.

ELIGIBILITY CRITERION

As per National Council for Teachers Education (NCTE) a minimum of 50% mark is essential for General/Unreserved/OBC and 40% for SC/ST candidates in their Under Graduate Degree examination, the qualifying examination for admission to the course. The requirement for differently-abled candidates will depend on the category they belong to. Wherever sufficient numbers of candidates are not available in a particular category interchanging will be done.

Sixty Percentage of admission is through competitive examination and remaining each twenty percentage is for candidates from India (in-service) and abroad respectively. Wherever sufficient numbers of candidates are not available in a particular category interchanging will be done.

RESERVATION

The rule of reservation set in force by the Government of India and Pondicherry University, Puducherry shall be followed while allocation of seats during admission.

REGISTRATION

A candidate admitted into the M.Sc. Public Health Entomology Course shall submit the prescribed application form for registration duly filled in along with prescribed fee and declaration in the format, to the Academic Officer of this University through the affiliated institution within 60 days from the cut-off date prescribed for admission.

ATTENDANCE REQUIRED FOR APPEARING FOR EXAMINATION

A candidate shall be permitted to appear for the terminal examination in any particular subject only if the candidate secures not less than 80% of the attendance (reckoned in terms of the total number of contact hours for the subject) during the year.

CONDONATION FOR LACK OF ATTENDANCE

Condonation of shortage of attendance in aggregate up to 10% (between 70% and 80%) during the academic year may be granted by the College Academic Committee and as per the regulations of University.

PROGRAMME STRUCTURE

The M.Sc. Programme is divided into two Parts. Each part consists of two Semesters as given below.

		Semester-Odd	Semester-Even
Part I	First Year	Semester - 1	Semester - 2
Part II	Second Year	Semester - 3	Semester - 4

Semesters 1-3 (two odd semesters and one even semester) consist of four papers each. Semester 4 comprises of Dissertation. It is mandatory for each student to complete a Project/Dissertation at the end of 4th Semester.

The schedule of papers prescribed for various semesters shall be as follows:

PART I: Semester – 1

- 1 MPHE 101 Arthropods of Public Health importance
- 2 MPHE 102 Morphology, Taxonomy and Bio-diversity of Vectors
- 3 MPHE 103 Biology and Ecology of Vectors of Public Health Importance
- 4 MPHE 104 Physiology and Bio-chemistry of Vectors of Public Health Importance

PART I: Semester - 2

- 5 MPHE 201 Vector-Borne Parasites and Pathogens of Public Health Importance
- 6 MPHE 202 Application of Molecular Biology, Immunology and Bioinformatics
- 7 MPHE 203 Pesticides used in Public Health
- 8 MPHE 204 Control of Vectors of Public Health Importance

Educational Tour

PART II: Semester – 3

- 9 MPHE 301 Epidemiology and Biostatistics
- 10 MPHE 302 Environment and Public Health
- 11 MPHE 303 Integrated Vector Management
- 12 MPHE 304 Management of Vector-Borne Diseases

PART II: Semester – 4

- 13 MPHE 401 Project/Dissertation

SCHEME OF EXAMINATIONS

1. Examinations shall be conducted at the end of each semester as per the Academic Calendar notified by the Pondicherry University

2. The system of evaluation shall be as follows:

Each paper carries 150 marks and will have two components:	Marks
(i) Internal Assessment	30
(a) Attendance	05
(b) Theory	25
(ii) End-Semester Examination	120
(a) Theory	80
(b) Practical	40
Total marks for 12 papers (theory & practical) 150 x12	1800
Tour Report	50
Project work (Dissertation & viva)	150
Grand total (entire course)	2000

2.1 Internal assessment will be broadly based on attendance in Theory and Practical (5 marks), assignments, seminars and tests in the theory component (25 marks). These criteria are tentative and could be modified based on guidelines approved by the Pondicherry University, Puducherry.

2.2 The presentation of the educational tour report will be evaluated for 50 marks.

2.3 As regards Project/Dissertation, the scheme of evaluation shall be as follows:

2.3.1 Project work would be assigned at the end of Semester III to enable students to initiate work on the same.

2.3.2 It would formally begin from Semester IV. This component would be evaluated for 100 marks.

2.3.3 There shall be a viva-voce examination (conducted by a board of faculty members) at the end of Semester IV on the Dissertation that shall be evaluated for 50 marks.

3. Examinations for courses shall be conducted only in the respective odd and even Semesters as per the Scheme of Examinations. Regular as well as Ex-students shall be permitted to appear/reappear in courses of Odd Semesters only at the end of Odd Semesters and courses of Even Semesters only at the end of Even Semesters.

PASS PERCENTAGE

Minimum marks for pass in the examination in each semester shall be 45% in each paper and 50% in aggregate of a semester.

However, a candidate who has secured the minimum marks to pass in each paper but has not secured the minimum marks to pass in aggregate may reappear in any of the paper/s of his/her choice in the concerned semester in order to secure the minimum marks prescribed to pass the semester examination in aggregate.

No student shall be allowed to avail of more than two chances to pass a paper inclusive of the first attempt.

SPAN PERIOD

No student shall be permitted as a candidate for the examination for any of the Parts/Semesters after the lapse of three years from the date of admission to the Part-I/Semester-I of the M.Sc. Public Health Entomology Programme.

ATTENDANCE REQUIREMENT

No student shall be considered to have pursued a regular course of study unless he/she is certified by the Human Resource Development Division (HRD), VCRC, Puducherry, to have attended 80% of the total number of lectures and seminars conducted in each semester, during his/her course of study. Provided that he/she fulfills other conditions, the HRD, VCRC may permit a student to the next Semester who falls short of the required percentage of attendance by not more than 10% of the lectures and seminars conducted during the Semester.

PROJECT - SEMESTER IV

The course is designed to result in the satisfactory completion and defense of dissertation.

This process includes:

- (a) the conceptualization of the independent research that will comprise the dissertation,
- (b) the preparation of and satisfactory defense of the dissertation proposal,
- (c) the collection, analysis and interpretation of data,
- (d) presentation of findings in the dissertation format and oral defense of the dissertation.

Dissertation activity must be completed within prescribed time frame for the semester.

INTERNSHIP

After the completion of two year M. Sc., course, one year paid internship programme will be available for meritorious candidates, as optional.

Outline of Course contents

Note: All Course Codes are to be preceded with MPHE

Paper Code	Name of the Subject/Paper	Semester
MPHE 101	Arthropods of Public Health importance	I
MPHE 102	Morphology, Taxonomy and Bio-diversity of Vectors	
MPHE 103	Biology and Ecology of Vectors of Public Health Importance	
MPHE 104	Physiology and Bio-chemistry of Vectors of Public Health Importance	
MPHE 201	Vector-Borne Parasites and Pathogens of Public Health Importance	II
MPHE 202	Application of Molecular Biology, Immunology and Bioinformatics in Vector-borne diseases	
MPHE 203	Pesticides used in Public Health	
MPHE 204	Control of Vectors of Public Health Importance	
Educational Tour		
MPHE 301	Epidemiology and Biostatistics	III
MPHE 302	Environment and Public Health	
MPHE 303	Integrated Vector Management	
MPHE 304	Management of Vector-borne Diseases	
MPHE 401	Project/Dissertation	IV

COURSE STRUCTURE

(i) Course Study

Sl.No.	Subject	Hours		
		Theory	Practical	Credit Hours *
1	Arthropods of Public Health importance	65	20	4 + 2
2	Morphology, Taxonomy and Bio-diversity of Vectors	65	30	3 + 2
3	Biology and Ecology of Vectors of Public Health Importance	70	30	4 + 2
4	Physiology and Biochemistry of Vectors of Public Health Importance	70	48	3 + 2
5	Vector-Borne Parasites and Pathogens of Public Health Importance	65	30	4 + 2
6	Application of Molecular Biology, Immunology and Bioinformatics in Vector-Borne Diseases	65	30	4 + 2
7	Pesticides used in Public Health	70	40	3 + 2
8	Control of Vectors of Public Health Importance	70	35	4 + 2
9	Epidemiology and Biostatistics	70	30	4 + 2
10	Environment and Public Health	65	25	3 + 2
11	Integrated Vector Management	70	25	4 + 2
12	Management of Vector-borne Diseases	60	30	3 + 2
13	Project/Dissertation		400	
14	Library		36	3
Total		805	409	70

* (Theory + Practical)

MPHE101: Arthropods of Public Health Importance

THEORY

65 Hrs

Unit I Introduction to arthropods of public health importance

Arthropods, diseases and epidemiological triad - vectors - pests - transmission - cyclic and secular trend of diseases.

Unit II Arthropods as vectors of human diseases

Modes of disease transmission: vertical and horizontal transmission - biological, mechanical and contact - transmission cycle - interseasonal maintenance.

Unit III Anthroponotic diseases

Malaria, filariasis, visceral leishmaniasis, onchocerciasis, trypanosomiasis, Chagas disease, scrub typhus, tick typhus - Disease vectors - distribution and transmission - socio-economic impact on human population.

Unit IV Zoonotic diseases

Cutaneous leishmaniasis, schistosomiasis, plague, Kyasanur Forest Disease (KFD), leptospirosis, dracunculiasis - Disease vectors - distribution and transmission - socio-economic impact on human population.

Unit V Arthropods of Public health nuisance

Houseflies, cockroaches, lice, bugs, scorpions, centipede, millipede, wasps, bees, beetles, spiders, ants - distribution and impact on human health - toxins, venoms - allergy, asthma.

Unit VI Natural enemies of arthropods

Competitors - pathogens - parasites - parasitoids - predators - distribution and their role

PRACTICALS

20 Hrs

Collection / Identification of the following specimens:

1. Wasps, bees, beetles, spiders, scorpions, centipede, millipede
2. Ticks and mites
3. Bed bugs, Triatomine bugs
4. Fleas, head louse, body louse
5. Cockroaches, houseflies, Sandflies, black flies
6. Cyclops
7. Rodents
8. Predators, Parasites, Parasitoids, Pathogen

Suggested Readings:

1. Roy D.N. and Brown A.W.A. 1970. Entomology (Medical and Veterinary) including insecticides & insects & Rat control; The Bangalore Printing & Publishing Co. Ltd., Bangalore
2. Harwood R.F. and James M.T. 1979. Entomology in Human and animal health. Macmillan Publishing Co., Inc, London; 7 Ed pp 548
3. Service M.W. 2000. Medical Entomology for students, Cambridge Univ. Press, UK.
4. Rozendaal, J.A. 1997. Vector Control - Methods for Use by Individuals and Communities, World Health Organization, Geneva.
5. Nicholas R. H. Burgess. 1981. Arthropods of Medical importance, Published by Noble Books Ltd. Hampshire
6. World Health Organization. 2008. Public Health significance of urban pests (WHO - Europe 2008). ISBN 978 -92-890-7188-8
7. Richard P. Meyer, and Minoo B. Madon. 2002. Arthropods of public health significance in California, Training Manual. Mosquito and vector control association of California, 660 J Street, Suite 480, Sacramento, CA 95814
8. World Health Organization. 1991. Insect and rodent control through environmental management: A community action programme. WHO (1991) ISBN 92 4 154411, 2
9. World Health Organization (2006) Vector-Borne diseases in India. Report of a Brainstorming session. 9 Nov. 2006. WHO/SEARO & Govt. of India pp1 -7
10. Mullen, G. and Durden L. 2009. Medical and veterinary entomology, Academic press, London ISBN 0 12 510451 0
11. World Health Organization. 1989. Geographical distribution of arthropod-borne disease and their principal vectors, WHO/VBC/89.967, Geneva.

MPHE102: Morphology, Taxonomy and Bio-diversity of Vectors

THEORY

65 Hrs

Unit I Morphology of medically important insects and other arthropods

Head: antenna - mouth parts, Thorax: wings - wing venation - legs - general structure, Abdomen: Appendages - cerci - external genitalia.

Unit II Taxonomic concepts and Classification of Arthropoda

Type concept - Population concept - Levels of Taxonomy: alpha - beta - gamma taxonomy. Taxonomic hierarchy: Species - Genus - Family - Order - Class - Phylum. Species concept: species - infraspecific categories - Sibling species - subspecies - variants within populations. Characteristics of different Classes of Arthropoda. Classification of Insecta. Characteristics of Orders: Diptera - Siphonaptera - Anoplura - Hemiptera - Dictyoptera.

Unit III Classification of Diptera

Characteristics of Families Culicidae - Phlebotomidae - Muscidae - Tabanidae - Calliphoridae. Characteristics of mosquitoes - *Anopheles* - *Culex* - *Aedes* - *Mansonia*. Characteristics of sand flies: *Phlebotomus* - *Sergentomyia*. Characteristics of flies: *Musca* - *Calliphora*.

Unit IV Classification of Siphonaptera and Anoplura

Characteristics of Family Pulicidae. Characteristics of fleas: *Xenopsylla* - *Pulex* - *Ctenocephalides*. Characteristics of *Pediculus* - *Pthirus*.

Unit V Classification of Acarina

Characteristics of families Ixodidae - Argasidae - Trombiculidae - Sarcoptidae, Characteristics of Ticks: *Boophilus* - *Rhipicephalus* - *Haemaphysalis* - *Ornithodoros*, Characteristics of mites: *Leptotrombidium* - *Sarcoptes*.

Unit VI Collection and preservation techniques

Mosquitoes - sandflies - fleas - lice - ticks - flies.

Unit VII Biodiversity

Concepts and characteristics of biodiversity - Biodiversity hotspots - Biosphere - Species documentation - Diversity indices - Invasive species. Relationship between anthropogenic stressors - vector biodiversity.

Unit VIII Molecular taxonomy

Theory and practice of molecular taxonomy- Molecular techniques in mosquito taxonomy: RFLP - RAPD - Microsatellites - SNPs - Microarrays - DNA bar coding.

PRACTICALS

30 Hrs

1. Demonstration of mouth parts and wings of medically important insects.
2. Identification of *Culex quinquefasciatus*, *Cx. tritaeniorhynchus*, *Anopheles stephensi*, *Aedes aegypti*, *Ae. albopictus*, *Mansonia annulifera*, *Ma. uniformis*.
3. Identification of *Phlebotomus papatasi*, *Ph. argentipes*, *Chrysomya bezziana*.
4. Identification of *Xenopsylla astia*, *Xe. brasiliensis*, *Xe. cheopis*, *Pthirus pubis*, *Pediculus capitis*.
5. Identification of *Boophilus*, *Rhipicephalus*, *Haemaphysalis*, *Ornithodoros*.
6. Demonstration of RFLP, RAPD and SNPs for mosquito identification.
7. Demonstration of DNA bar coding.
8. Design of DNA probes for mosquito vector identification.

Suggested Readings:

1. Roy, D.N. and Brown, A.W.A. 1970. Entomology (Medical and Veterinary) including insecticides & insects & Rat control; The Bangalore Printing & Publishing Co. Ltd., Bangalore
2. Ernst Mayr, E. G. Linsley and R. L. Usinger. 1953. Methods and Principles of Systematic Zoology.
3. Gullan, P.J. and Cranston, P.S. 1994. The Insects - An Outline of Entomology.
4. William S. Romoser. 1973. The Science of Entomology.
5. Robert G. Foottit and Peter H. Adler. 2009. Insect Biodiversity - Science and Society. Ed.. Wiley-Blackwell.
6. Service, M.W. 1980. A Guide to Medical Entomology.
7. Kenneth G. V. Smith. 1973. Insects and other Arthropods of Medical Importance.
8. Harold Oldroyd. 1973. Collecting, preserving and studying insects.
9. Burgess, N.R.H and Cowan, G.O. 1993. A colour atlas of medical entomology.
10. Black IV, W.C. and Mustermann, L.E. 1996. Molecular taxonomy and systematics of arthropod vectors. In: *The Biology of Disease Vectors* (eds. B.J. Beaty and W.C. Marquardt). Pp.438-70. University Press of Colorado.
11. Hill, S.M. and Crampton, J.M. 1994. DNA-based methods for the identification of insect vectors. *Ann. Trop. Med. Parasitol.* 88 : 227-50.

12. Barraud P.J. 1934. The fauna of British India, including Ceylon and Burma. Diptera, Family Culicidae, Tribes Megarhini and Culicine. Today & Tomorrow's Printers & Publishers. Published under the authority of the Secretary of State for India in Council. Pp371.
13. Christophers S.R. 1933. The fauna of British India, including Ceylon and Burma. Diptera, Family Culicidae, Tribe Anophelini. Today & Tomorrow's Printers & Publishers. Published under the authority of the Secretary of State for India in Council. Pp314.

MPHE103: Biology and Ecology of Vectors of Public Health Importance

THEORY

70 hrs.

Unit I Mosquitoes

Biology: life cycle - mating, host seeking, feeding, resting, oviposition behavior - longevity, gonotrophic cycle, fecundity, survival. Salient features and distribution of important vector species of Anopheles (*An. stephensi*, *An. culicifacies*, *An. fluviatilis*), Aedes (*Ae. aegypti*, *Ae. albopictus*), Culex (*Cx. quinquefasciatus*, *Cx. tritaeniorhynchus*), Mansonia (*Ma. annulifera*, *Ma. uniformis*).

Unit II Sand flies

Biology: life cycle - mating, host seeking, feeding, resting, oviposition behavior- longevity, gonotrophic cycle, fecundity, survival. Salient features and distribution of important vector species of Phlebotomus, Sergentomyia.

Unit III Other dipterans of public health importance

Biology: life cycle and distribution of Black flies, Horse flies, Tsetse flies, House flies, Myiasis causing flies, Biting midges.

Unit IV Fleas

Biology: life cycle and distribution of Fleas - Salient features of important species of Xenopsylla, Ctenocephalides, Pulex, Tunga.

Unit V Bugs and Lice

Biology: life cycle and distribution of Bed bugs, Triatomine bugs, Head louse, Body louse.

Unit VI Ticks and Mites

Biology of Ixodid and Argasid ticks - Salient features of important species of Haemaphysalis, Ixodes, Dermacentor, Rhipicephalus, Amblyomma.

Biology of mites - Salient features of important species of Sarcoptes, Leptotrombidium, Dermatophagoides.

Unit VII Vector Ecology

Introduction to ecology and ecosystem - Habits and habitats - Species diversity - Food chain, food web, ecological niche, prey predator relationships - Interaction with biotic and abiotic factors - Dispersal and migration.

Unit VIII Population Ecology

Population structure and methods of sampling - Estimation of relative and absolute density.
Population dynamics - Natality, mortality, survivorship, age distribution - Life table studies.

PRACTICALS

30 Hrs

1. Rearing of *Culex quinquefasciatus* from egg to adult, and computation of immature duration and survival.
2. Demonstration of life cycle stages of sand fly, house fly, black fly, tsetse fly, fleas, lice, bugs, ticks, mites.
3. Demonstration of different collection methods and devices of vectors.
4. Assessment of immature density of *Culex quinquefasciatus* in breeding habitats.
5. Assessment of indoor and outdoor resting densities of mosquitoes.
6. Analysis of field water for important physical and chemical parameters.
7. Analysis of abiotic factors affecting adult survival.
8. Rice field ecosystem - biotic components - construction of food chain and food webs and energy flow.
9. Comparison of predatory potential of different larvivorous fishes and insects.

Suggested Readings:

1. Roy D. N. and Brown A.W.A. 1970. Entomology (Medical and Veterinary) including insecticides & insects & Rat control; The Bangalore Printing & Publishing Co. Ltd., Bangalore
2. Rao, T. R. 1984. The Anophelines of India. Malaria Research Centre, ICMR, New Delhi.
3. Marquardt, W.C. 2005. Biology of disease vectors (2nd Edition). Doody Enterprises, Inc. USA.
4. Service M. W. 1996. Medical Entomology for students. Chapman & Hall, London
5. Imms, A. D. 1977. A general text book of Entomology. ELBS, London.
6. Service, M. W. 1984. Mosquito Ecology- Field sampling methods. Applied Science Publishing Ltd., London.
7. Service, M.W. 1993. Mosquito Ecology- Field sampling methods. Chapman & Hall, New York.
8. Laird, M. 1988. The natural history of larval mosquito habitats. Academic Press Ltd., New York.
9. Ward, J.V. 1992. Aquatic Insect Ecology. John Wiley & Sons, Inc., USA.
10. Williams, D.D. & Feltmate, B.W. 1992. Aquatic Insects. C.A.B. International, UK.
11. Speight, M.R., Hunter, M.D. & Watt, A.D. 1999. Ecology of Insects- Concepts and Applications. Blackwell Science Ltd., London.

12. South wood, T.R.E. 1987. Ecological methods with particular reference to the study of insect populations. Chapman & Hall, New York.
13. Odom, E.P. 1971. Fundamentals of Ecology. Saunders College Publishing, Philadelphia.
14. Odom, E.P. (1983). Basic Ecology. Saunders College Publishing, Philadelphia.
15. Krebs, C.J. 1972. Ecology: The experimental analysis of distribution and abundance. Harper and Row Publishers, New York.
16. Price, P.W. 1971. Insect Ecology. John Wiley & Sons, New York.
17. Ananthakrishnan, T.N. 1982. Bioresources Ecology. Oxford & IBH Publishing Co., New Delhi.
18. Theroux, F.R., Eldridge, E.F. and Mallmann, W.L. 1943. Laboratory manual for chemical and bacterial analysis of water and sewage. McGraw Hill Book Co., New York.
19. Kalra, N. L. and Bang, Y. H. 1988. Manual on entomology in visceral leishmaniasis. World Health Organization, Regional Office for South East Asia, New Delhi, 88.

MPHE104: Physiology and Biochemistry of Vectors of Public Health Importance

THEORY

70 Hrs

Unit I Integumentary system

Formation of insect cuticle - Biochemical composition of various layers - Physiology of moulting - Secretion and composition of moulting fluid - Moulting associated enzymes and hormones.

Unit II Digestion and nutrition

Structural regions of the gut with reference to gut barriers in vectors - Digestive enzymes - Peritrophic membrane formation and function in haematophagous insects - Biting periodicity, blood digestion and abdominal conditions in haematophagous insects - Nutritional requirements and metabolic pathways in haematophagous insects.

Unit III Respiratory system

Structural regions, adaptations, and functional properties with special reference to aquatic forms of mosquitoes - Cyclic or discontinuous respiration - Respiratory metabolism and cytochrome oxidase system.

Unit IV Circulatory system and haemolymph

Circulatory system structure - Mechanism and neuronal/hormonal control of circulation - Haemolymph constituents and functions - Haemocytes, haemopoietic organelles and immune molecules - Phenoloxidase system, melanization and encapsulation.

Unit V Excretion and osmoregulation

Structural design of organs of excretion with special reference to aquatic stages of mosquitoes - Excretion in haematophagous insects - Osmoregulation in terrestrial and aquatic insects - Physiology of osmoregulation in aquatic stages of mosquitoes.

Unit VI Nervous system and sense organs

Regions of nervous system - Physiology and co-ordination of nervous system components, sense organs - Circadian rhythm in haematophagous insects - Sensory physiology of host-seeking behaviour in mosquitoes- Pheromones and control of insect behaviour.

Unit VIII Reproduction and development

Vitellogenesis and spermatogenesis - Fertilization, zygote formation and embryogenesis - Metamorphosis - Endocrine control of development and maturation - Autogeny, gonotrophic cycle and physiological age determination in mosquitoes.

PRACTICALS

48 Hrs

1. Qualitative analysis of protein, lipid and chitin in insect integument.
2. Qualitative analysis of digestive enzymes in the gut of mosquitoes.
3. Total protein estimation in the ovary of mosquitoes.
4. Haemolymph collection, staining and identification of haemocytes of mosquitoes.
5. Protein profiling of mosquito haemolymph through SDS-PAGE and HPLC.
6. Gel elution of protein through Electro elution method.
7. Membrane feeding of mosquitoes and determination of Sella's abdominal conditions.
8. Physiological age determination of mosquitoes by examination of the ovarian features.
9. Demonstration of ametabolous, hemimetabolous, and holometabolous conditions.
10. Demonstration of oviposition attractancy in mosquitoes by exposing gravid females to oviposition attractants.
11. Demonstration of juvenile hormone activity on mosquito immatures by exposing to JH analogues.

Suggested Readings:

1. Mani, M.S. 1973. General Entomology Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
2. Nation, J.L. 2002. Insect Physiology and Biochemistry. CRC Press, Florida.
3. Clements, A.N. 1992. The biology of mosquitoes, Volume I: Development, nutrition and reproduction. Chapman & Hall, UK.
4. Clements, A.N. 1999. The biology of mosquitoes, Volume II: Sensory reception and behaviour. Oxon, UK.
5. Clements, A.N. 1974. Physiology of Mosquitoes. Macmillan Co., New York
6. Chapman, R.F. 1998. The Insects: Structure and function. Cambridge University Press, UK.
7. Wigglesworth, V.B. 1977. The Principles of Insect Physiology. ELBS, London.
8. Wigglesworth, V.B. 1984. Insect Physiology. Chapman & Hall, New York
9. Advances in Insect Physiology (All Volumes since 1964). Academic Press, New York.

MPHE201: Vector-Borne Parasites and Pathogens of Public Health Importance

THEORY

65 Hrs

Unit I Malarial Parasites

History and geographic distribution of human malaria - Taxonomic position of different species - Distinguishing characters of different species of human malarial parasites - Life cycle and host-parasite interactions - Brief description of zoonotic malarial parasites.

Unit II Lymphatic Filarial Parasites

History and geographic distribution of lymphatic filariasis - Taxonomic position of different species - Distinguishing characters of different species/strains - Life cycle and host-parasite interactions - Endosymbionts and their significance - Brief description of zoonotic parasites and animal models.

Unit III Onchocercal, Schistosomal and Dracunculid Parasites

Geographic distribution - Taxonomic position of different human parasite species - Vectors of different species - Life cycle and transmission - Intermediate hosts.

Unit IV Arboviral pathogens

Classification of Arboviruses - Dengue, Chikungunya, Japanese encephalitis, Kyasanur Forest Disease (KFD), West Nile, and Yellow fever viruses - Geographic distribution - Viral structure and replication - Transmission and maintenance cycle.

Unit V Bacterial and rickettsial pathogens

Plague and rickettsial pathogens - morphology & identification - transmission of tick, mite and louse borne rickettsiae of public health importance.

Unit VI Leishmaniasis, Trypanosomiasis and Babesiosis

Geographical distribution - Different species and differentiating features - life cycle and transmission.

PRACTICALS

30 Hrs

1. Preparation of stains- JSB I and II, Leishman and Giemsa.
2. Preparation of blood smears (thick and thin) and staining with JSB. Leishman and Giemsa.
3. Dissection and examination of mosquitoes for malaria parasite infection.
4. Identification of various stages of malaria parasites:
(I) *Plasmodium vivax* (II) *P. falciparum* (III) *P. malariae* (IV) *P. ovale*
5. Dissection and examination of mosquitoes for filarial parasite (*Wuchereria bancrofti* and *Brugia malayi*) infection.
6. Staining and examination of blood smears for detection of microfilariae.
7. Membrane filtration technique for detection of microfilariae.
8. Demonstration of various stages of filarial parasites and differentiation of species.
9. Demonstration of Dracunculid worm - Leptospira bacterium - Leishmania parasite - Trypanosome parasites - Babesiosis parasites.
10. Demonstration of arbo-viral particles.

Suggested Readings:

1. Manabu Sasa, 1976. Human filariasis- A global survey of epidemiology and control. University of Tokyo press.
2. Manson- Bahr, R. E.C. and Bell, D.R. 1987 .Manson's Tropical Disease. ELBS.T. B. Nutman. 2002. Lymphatic filariasis.
3. Bruce-Chwatt, L.J.1985. Essential Malariology, The Alden Press, Oxford.1985.
4. Warnsdorfer W.H. and Sri. Mc Gregor, I. 1998. Malaria: Principles and Practice of Malariology. Vol. I and II, Churchill Livingstone, New York.
5. WHO, 1985. Bench Aids for the diagnosis of malaria..
6. Davis A. Warrell and Herbert M. Gilles. 2002. Essential Malariology, Fourth Edition. Arnold pub.
7. Burton J. Bogistch, Clint E. Carter, Thomas N. Oeltmann. 2005. Human Parasitology. Third Edition, Elsevier Academic press.
8. Kalra, N. L. and Bang Y. H. 1988. Manual on Entomology in Visceral Leishmaniasis, SEA/VBC/35.
9. Peters N. and Killick-Kendrick. 1987. Leishmaniasis in Biology and medicine. Vol. Academic Press.
10. Mulligan H.W. 1970. The African Trypanosomiasis edited by Ministry of overseas Development, Boston.
11. Brenner, R.R. and Shoka, A.M. 1987. Chagas' disease vectors. Volume I and II by CRC press, Florida.
12. Douglas D. Richman, Richard J. Whitley. 2002. Clinical Virology - 2nd Edition.

MPHE 202: Application of Molecular biology, Immunology and Bioinformatics in Vector-Borne Diseases

THEORY

65 Hrs

Unit I Basics of Nucleic acid structure & Function

Structure of DNA & RNA - DNA replication - Transcription - Translation - Gene expression and regulation.

Unit II Genome organization

Organisation of eukaryotic genome - components of eukaryotic chromatin and chromosome - structure - genome organization of mosquito vector and human vector borne parasites; Genome of plasmid and mitochondria; Gene transfer in microorganisms - conjugation - transformation - transduction.

Unit III Gene cloning, Characterization and its application

Amplification of DNA by PCR - restriction endonucleases - ligation - transformation - restriction mapping of DNA fragments - construction of genomic and cDNA libraries and screening for genes of interest - site directed mutagenesis - preparation of radio labeled DNA and RNA probes for molecular diagnosis of parasites and vectors by Southern and Northern hybridization, DNA sequencing. Transgenic mosquitoes.

Unit IV Gene polymorphism and Molecular markers for diagnosis

Genetic polymorphism of vector and parasites - strain identification - PCR assays - types genotyping of parasites - population genetics and molecular phylogeny of vectors and parasites using molecular markers - RAPD - RFLP - AFLP and Microsatellites.

Unit V Bioinformatics

Basic knowledge of computer aided biology, genome characteristics, databases - search and retrieval - sequence alignment and annotation - comparative genomics - principles of phylogenetic analysis and recovering evolutionary history. Proteomics - protein structure prediction and implications in bioinformatics.

Unit VI Immunology

Principles of innate and acquired immunity - antigens - antibodies - monoclonal and polyclonal -antigen-antibody reaction - cellular and humoral immunity - complement system - types of immuno diagnostics for Vector Borne Diseases - Insect cell culture and its applications.

PRACTICALS

30 Hrs

1. Isolation of nucleic acids from parasite and mosquito vector.
2. Isolation of plasmid DNA.
3. Quantification of nucleic acids.
4. Agarose gel electrophoresis of nucleic acids.
5. Primers designing for amplification of DNA fragments.
6. Gel purification of nucleic acids.
7. RAPD and RFLP analysis.
8. Antigen-Antibody reactions, Immuno-diffusion, Immunoblot, Og4C3-ELISA, ICT.
9. Bioinformatics databases (Nucleic acid, protein and structure databases) and data retrieval
10. Homology search by BLAST and ExpASy.
11. DNA/Protein sequence analysis and phylogenetic analysis using BioEdit, ClustalW, ClustalX and Mega.

Suggested Readings:

1. David Freifelder, George Malacinski. 2005. Essentials of Molecular Biology. - 4th edition.
2. Benjamin Lewin 2004. Gene VIII., Pearson Education, Limited.
3. Genomes, T. A. Brown. 2006. 2nd edition, Garland Science publisher.
4. Principles of Gene Manipulation: An Introduction to Genetic Engineering. R.W. Old and S. B Primrose, 6th edition, Blackwell Science Inc, 2001.
5. Albert L. Lehninger, David Lee Nelson, Michael M. Cox, 2008. Principles of biochemistry.
6. Andreas D. Baxeavanis and B.F. Fancis Ouellette 2002. Bioinformatics: A practical guide to the analysis of genes and proteins 2nd edition Wiley Interscience.
7. David Webster. 2000. Protein Structure prediction: Methods and Protocols, , Human Press. .
8. Goldsby RA et al. 2006. Kuby Immunology (with web support) W.H. Freeman Co. 6th ed.
9. Goldsby RA et al. 2006. Roitt's Essential Immunology. Delves PJ, et al. Wiley Blackwell, 11th ed.

MPHE203: Pesticides used in Public Health

THEORY

70 Hrs

Unit I Introduction to pesticides

Pesticides in public health - Use of pesticides - History of Insecticides- Definition of various terms - Advantages of chemical control and its utility in vector control - Classification of insecticides - Chemical Pesticides - Biolarvicides - Insect growth regulators - Mode of action - Pesticide formulations: Types of formulations - Selection of formulations - Adjuvant - Combining insecticides: Physical and Chemical incompatibility.

Unit II Pesticide Application Equipments

Equipments: Types - Application - Types of nozzle - Determination of droplet size - classification of different sprays - Application procedures: Application rates - conversion factors - preparation of spray suspension - conversion tables for dosages - Area measurement and dosage determination.

Unit III Pesticide Regulation

Pesticide regulation policies - International policies: The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) - Registration - Approval criteria for registration - Pesticide issues and related legislation - Regional Policies: Pesticide problems in Asia - Policy and monitoring guidelines - National Policies: Insecticide Act in India - CIB - Registration - Licensing - Notification of poisoning and cancellation of registration - Offences and Punishment.

Unit IV Management of Public Health Pesticides

Elements of management of public health pesticides: Product registration - Procurement - Label - Storage and transport - Distribution - Application - Disposal - surveillance of pesticide poisoning - Quality control; Safe use of pesticides: general principles of safety measures - medical surveillance; Operative procedures: Preparation of spray materials - House treatment with residual spraying - Larvicidal - Rodenticidal - Herbicidal treatments - Diagnosis and treatment of poisoning.

Unit V Evaluation of Insecticides

WHO evaluation scheme - Evaluation of chemical Larvicides/IGRs/bio-larvicides: Phase I: Laboratory studies - Phase II: Small-scale field trials - Phase III: Medium and large scale field trials - Effect on non target organisms - Operational and community acceptability - Evaluation: Repellents - Adulticides - insecticide treated Nets and Fabrics - Evaluation indicators: Process indicators - Entomological indicators - Impact indicators.

Unit VI Insecticide Resistance and Management

Present status of insecticide resistance - Impact of insecticide resistance on the control of vectors - Socio economic impact of resistance (Administrative, operational, Financial, Social and Agricultural implications) - Detection and monitoring of vector resistance - Insecticide targets and mechanism of resistance - Resistance management.

PRACTICALS

40 Hrs

1. Handling of different pesticide application equipments-Pneumatic sprayer for indoor residual sprayer, Knapsack sprayer for larviciding, thermal fogger for space spraying.
2. Droplet size determination.
3. Determination of larval susceptibility to different insecticides: Preparation of stock solutions and various concentrations; Methods of testing.
4. Determination of adult susceptibility to different insecticides: Preparation of insecticide impregnated papers; methods of testing using WHO test kit.
5. Determination of adult susceptibility of house flies by topical application.
6. Laboratory evaluation of insecticides against different surfaces.
7. Evaluation of vaporizers/ aerosols/fumigants (vapour borne toxicity).
8. Evaluation of larvicides/ biolarvicides/insect growth regulators under field conditions
9. Evaluation of adulticides under field conditions.
10. Monitoring of insecticide resistance in field strains against larvicides/adulticides.
11. Maintenance of spray equipments.
12. Residue analysis (Colorimetric methods; HPLC Technique).

Suggested readings:

1. Service M.W. 1996. Medical Entomology for students. Chapman & Hall, London
2. Rozendaal, A.J. 1997. Vector Control. Methods for use by individuals and communities. World Health Organization, Geneva.
3. World Health Organization. 2005. Guidelines for laboratory and field testing of mosquito larvicides WHO/CDS/WHOPES/GCDPP/2005.13.
4. World Health Organization. 1975. Manual on practical entomology in malaria. Part II. Methods and Techniques., Geneva.
5. World Health Organization. 1990. Pesticide application equipment for vector control. Twelfth Report of the WHO experts Committee on Vector Biology and Control. Technical Report Series 791. Geneva.
6. World Health Organization. 1997. Chemical methods for the control of vectors and pests of public health importance, Geneva. WHO/CTD/WHOPES/97.2.

MPHE204: Control of Vectors of Public Health Importance**THEORY**

70 Hrs

Unit I Introduction to vector control

Vector control : Aims - objectives - goals - Importance and advantages - History and background - Recent trends - Alternatives to the use of insecticides (chemical & microbial) – Vector control at individual or at community or at both levels - Selection of appropriate control measures - Self protection measures - Types of vector control - Selective, integrated and comprehensive vector control

Unit II Control of mosquitoes and flies (Black flies, Sand flies, Biting midges, Tabanids, Stable flies)

Selection of suitable site specific control measures - Personal protection measures - zooprophylaxis - Insecticide treated fabrics - Long lasting insecticide treated mosquito nets (LLINs) - Insecticide spraying (larviciding - indoor residual spraying - space spraying) - Alternatives - biological control - environmental management including source reduction.

Unit III Control of Tsetse flies and Triatomine bugs

Tsetse fly: Prevention and control - Traps and insecticide impregnated screens - Insecticide spraying (ground and aerial).

Triatomine bugs: Introduction to control measures - Application of insecticides - insecticides and formulations - House modification/ improvement - improvement of peridomestic environment - insecticide treated bed nets - fumigant canisters.

Unit IV Control of bedbugs, fleas, lice, ticks, mites and others

Bedbugs: Detection - repellents - household measures - insecticide treated bed nets - smoke generators - residual insecticide spraying; prevention and control of sand fleas or jigger fleas - lice (head, crab or pubic and body lice) - ticks and mites - Cyclops - fresh water snails - rodents - venomous arthropods.

Unit V Control of cockroaches and house flies

Cockroaches: Environmental management: cleanliness and hygiene, reduction of accessibility - chemical and biological control - baits and traps - repellents - modern methods.

House flies: Inspection - Exclusion: Environmental sanitation and hygiene - habitat destruction - prevention of fly pathogen contact - food protection - prevention of man fly contact - Mechanical - Biological and Chemical control.

35 Hrs

PRACTICALS

35 Hrs

1. Characterization of mosquito breeding habitats.
2. Demonstration of environmental control measures.
3. Demonstration of application of biocontrol agents
4. Demonstration of personal protection materials / measures.
5. Demonstration of Insecticide treatment of mosquito nets/curtains.
6. Demonstration of indoor residual spraying.
7. Demonstration of space spraying.
8. Use of bait formulations for housefly and cockroach control.
9. Demonstration of housefly control using chemical and biological methods.

Suggested Readings:

1. Rozendaal, J. A. 1997. Vector Control. Methods for use by individuals and communities. World Health Organization, Geneva.
2. World Health Organization. 1986. Epidemiology and control of African trypanosomiasis. Report of a WHO Expert Committee, Geneva, (WHO Technical Report Series, No. 739).
3. Samba E.M. 1994. The Onchocerciasis Control Programme in West Africa. An example of effective public health management. Geneva, World Health Organization, (Public Health in action, No. 1).
4. World Health Organization. 1990. Control of the leishmaniases: report of a WHO Expert Committee, Geneva, (WHO Technical Report Series, No. 793).
5. De Barjac. 1990. Bacterial control of mosquitoes & black flies: biochemistry, genetics & applications of *Bacillus thuringiensis israelensis* & *Bacillus sphaericus*.
6. Lacey, L. A. and Undeen, A.H. 1986. Microbial Control of Black Flies and Mosquitoes. Annual Review of Entomology, 31: 265-296.
7. Marquardt, W. H. 2004. Biology of disease vectors (2nd Ed.).
8. Cox, F. E. G. Modern Parasitology. 1993. A Text Book of Parasitology. Edition: 2. Blackwell Science Ltd. Oxford.
9. Wall, R., Shearer, D. 2001. Veterinary ectoparasites: biology, pathology and control. Blackwell Science.
10. Wall, R., Shearer, D. 1997. Adult flies (Diptera). In: Wall, R., Shearer, D. (eds.): Veterinary Entomology. Chapman & Hall, London.
11. Potts, W.H. Glossinidae (tsetse flies). 1973. In: Smith, K.G.V. (ed.): Insects and other Arthropods of Medical Importance. British Museum (Natural History), London.

MPHE 301: Epidemiology and Biostatistics

THEORY

70 Hrs

Unit I Principles of Epidemiology

Definition, aim and scope of epidemiology - target population - study population - sampled population.

Unit II Epidemiological studies

Descriptive studies - Case reports/Case series - ecological and cross sectional studies. Analytical studies - observational (case-control, cohort), experimental (clinical/community trials). Surveillance concepts -tools and methods for vectors and disease; epidemic outbreak investigations.

Unit III Epidemiological measures

Rates - ratio - proportions (incidence, prevalence, risk difference, relative risk, odds ratio, attributable risk). standardization of rates (direct/indirect). Association and causation (spurious, direct/indirect). Screening for disease (types and uses, sensitivity, specificity, positive and negative predictive values)

Unit IV Sampling methods

Data types: qualitative - quantitative, Tables - Graphs - Averages (mean, median, mode), Dispersions: range - mean deviation - variance - standard deviation - standard error. Coefficient of dispersion.

Unit V Descriptive statistics

Population/sample; parameter/statistic. Sampling frame - sampling unit. Methods of sampling: simple random - systematic - stratified – cluster. Determination of sample size.

Unit VI Basics of probability distributions

Binomial - Poisson - negative binomial - normal distribution.

Unit VII Tests of significance

Level of significance: type I - type II errors. Null and alternative hypotheses. Chi-square tests - t-tests. ANOVA (one and two way)

Unit IX Correlation and regression

Scatter diagram – Pearson's correlation coefficient - rank correlation - least square regression
- Probit analysis: calculation of LC50 / LC90 values.

PRACTICALS

30 Hrs

1. Epidemiological Survey: Development & application of questionnaires.
2. Case studies on epidemiology of vector-borne diseases: (i) incidence and prevalence, (ii) relative risk, (iii) odds ratio
3. Determinations of sample size for cross sectional, prospective, case-control studies.
4. Sampling design - immature and adult mosquitoes.
5. Descriptive statistical measures (e.g. mosquito larval, parasite counts, etc.)
6. Charts and graphs (e.g. meteorological data, species composition by space and time)
7. Student's t-tests for paired and un-paired samples.
8. Chi-square test (2×2 ; $2 \times n$) comparing proportions (e.g., susceptibility status by species)
9. One-way/two-way ANOVA (e.g. bioassay data by species /larval density by type of habitats and collection methods).
10. Ordinary least- square linear regression (e.g. vector infection vs human infection).
11. Probit model to biological assay data and lethal concentrations.

Suggested Readings:

1. Park, K. 2009. Park's text book of Preventive and Social Medicine. Banarsidas Bhanot Publishers, India.
2. Bonita, R., Beaglehole, R. and Kjellstrom, T. 2006. Basic Epidemiology. WHO, Geneva.
3. Daniels, S.R. and Flanders W.D. 2000. Medical Epidemiology. McGraw Hill. Medical Publishing Division, London.
4. Altman, D. G. 1991. Practical Statistics for Medical Research. Chapman and Hall, London.
5. Bourke, G. J., Daly L. E. and McGilvray, J. 1985. Interpretation and uses of Medical Statistics. Blackwell Scientific publications.
6. Snedcor, G. W. and Cochran, W.G. 1985. Statistical Methods. IOWA State University Press.

MPHE302: Environment and Public Health

THEORY

65 Hrs

Unit I Environment and Health

Introduction to Environment and Health - Definition - Role of Vectors and Pests - Communicable and Infectious Diseases - Pollution - Allergy and allergens Lifestyle on health and diseases.

Unit II Environment Risk Factors

Environmental conditions and Spatial spread of diseases - Vulnerable populations - Environmental risk factors and risk assessment: urbanization and industrialization - climate change - impact on Health - direct and indirect.

Unit III Environmental Health in Emergencies and Disasters

Health in emergency - The importance of communicable diseases in emergencies and disasters - Measures of controlling communicable diseases - Vector and pest control in disasters and emergencies - Preventing epidemics and outbreaks through Environmental management - Human wastes and Health - Solid waste and Waste water management.

Unit IV Public Health Promotion

Public Health Surveillance - Opportunities and needs for community in Health promotion - Basic sanitation - Hygiene and personal protection - Harnessing strategies between health and environment.

Unit V Application of GIS in Public Health Service

Introduction to GIS - Spatial dimension of health -GIS for Health Service - GIS and Remote Sensing in model prediction and early warning system.

Unit VI Managing Health & Environmental Linkages

Environmental and health impact assessment - Current practice and problems in Health Impact Assessment (HIA) and Environmental Impact Assessment (EIA) - Healthy Public Policy - National health policy in India.

PRACTICALS

25 Hrs

1. Visit to Pollution control Board - identify the operational aspects on solid waste and waste water management.
2. Visit to voluntary organization /community centre to assess their perception and role in the control of disease of public health importance.
3. Training on GIS technology and usage of GPS for different situations.
4. Environmental and entomological risk assessment for vector borne diseases in a selected site.

Suggested Readings:

1. World Health Organization. 2008. Public Health significance of urban pests (WHO - Europe 2008) ISBN 978 -92-890-7188-8.
2. World Health Organization. 2008. Health Environment: Managing the linkages for sustainable development. A toolkit for decision makers: SynProject report. WHO/ UNEP, ISBN 97892 4 1563 727, www.who.int/heli Health and environment linkages initiative (HELI). 2008.
3. World Health Organization. 2002. Environmental health in emergencies and disasters a practical guide edited by B.Wisner and J.Adams WHO (2002) ISBN 92 4 154541 0.
4. Walton Purdom, P. 1971. Environmental health, Edited by Academic press, INC, London.
5. Richard P. Meyer, Ph.D. and Minoo B. Madon. 2002. Arthropods of public health significance in California, Training Manual. MOSQUITO and VECTOR CONTROL ASSOCIATION of CALIFORNIA, 660 J Street, Suite 480, Sacramento, CA 95814.
6. World Health Organization. 1991. Insect and rodent control through environmental management: A community action programme WHO (1991) ISBN 92 4 154411 2.
7. Melnick, A. L. 2002. Introduction to Geographic Information Systems in Public Health Aspen Publishers, Mayland ISBN 0 8342 1878 X.

MPHE303: Integrated Vector Management

THEORY

70 Hrs

Unit I Principles of Integrated Vector Management (IVM)

General introduction - concept and definition of IVM - feasibility, merits and limitations - success stories - India, Thailand & Sri Lanka.

Unit II Key elements of IVM

Key elements of IVM - role of vector control in controlling/preventing vector borne diseases - planning IVM - situation analysis and needs assessment - implementation plan - monitoring and evaluation.

Unit III Ecosystem and vector borne diseases

Responses to vector borne disease in an ecosystem frame work - food chain and food web - prey and predator interactions - water management - eco-epidemiological approach to address multiple vector borne diseases.

Unit IV Evidence based integration of vector control options

Principles of vector control - personal protection measures - evidence based decision making process for integration of vector control options. Transgenic mosquitoes - goal - perspectives - advantage -disadvantage - ecological concern.

Unit V Intersectoral collaboration

Partnership - mechanisms of achieving intersectoral collaboration - importance of Public Health Acts in IVM strategy.

Unit VI Social Mobilization for IVM

KAP assessment - health awareness and behavior - strategies for promoting community involvement - Communication for Behavioural Impact (COMBI) and Behavioural Change Communication - experiences in the control of vector borne diseases.

Unit VII Public Health and Agriculture practices

Public Health and Agriculture practices - healthy public policies - water, fertilizers and pesticides effects on insects - integration of IPM and IVM - environment and health impact assessments - IPM farmer's field schools and achievements.

PRACTICALS

25 Hrs

1. Situation analysis and needs assessment for planning IVM in a given locality.
2. Survey on health awareness and behavior in a given community.
3. Visit to IVM partners / stakeholders.
4. Visit to Farmers' Field School.
5. Demonstration of community mobilization techniques.

Suggested Readings:

1. World Health Organization. 2003. Guidelines for Integrated Vector Management.
2. Beier et al. 2008. Integrated vector management for malaria control. *Malar J.* 7 (Suppl 1): S4.
3. A Field Guide to Designing a Health Communication Strategy, Population Communication Services, Johns Hopkins Bloomberg, School of Public Health/Centre for Communication Programmes.
4. Diarmid Campbell-Lendrum, David Molyneux. 2004. Ecosystems and Vector-borne Disease Control, Implementation of Integrated Vector Management in the WHO-African Region: Progress Report 2000-2003.
5. Guidelines for integrated vector management for control of dengue/dengue haemorrhagic fever, NVBDCP, 2008.
6. World Health Organization. 2004. Integrated Vector Management - Strategic Framework for the Eastern Mediterranean Region 2004-2010. WHO, 2004 World Health Organization Regional Office for the Eastern Mediterranean Cairo 2004.
7. Chanda, E. et al. 2008. Integrated vector management: The Zambian experience. *Malaria Journal* 2008, 7:164 doi:10.1186/1475-2875-7-164 World Health Organization, Regional Office for the Eastern Mediterranean.
8. World Health Organization. 2004. Will Parks and Linda Lloyd. 2004. Planning social mobilization and communication for dengue fever prevention and control A STEP-BY-STEP GUIDE. WHO/CDS/WMC/2004.2.
9. Berg H van den, Das P K, von Hilderbrand A, Rangunathan V. 2008. Evaluation of the Integrated Pest and Vector Management (IPVM) project in Sri Lanka Mission Report WHO.
10. World Health Organization. 2007. Report of the WHO consultation on integrated vector management (IVM) 2007. WHO headquarters, Geneva, Switzerland.
11. World Health Organization. 2004. Global Strategic Framework for Integrated Vector Management 2004. World Health Organization Geneva 2004 WHO/CDS/CPE/PVC/2004.10.

12. World Health Organization. 2007. Global plan to combat neglected tropical diseases, 2008-2015. Geneva, World Health Organization, 2007 (WHO/CDS/NTD/2007.3).
13. Morner F, Bos R, Fredrix M. 2002. Reducing and eliminating the use of persistent organic pesticides: guidance on alternative strategies for sustainable pest and vector management. Geneva, Interorganization Programme for the Sound Management of Chemicals (available at www.chem.unep.ch/pops/pdf/redelipops/redelipops.pdf; accessed April 2008).
14. World Health Organization. 2008. Position statement on Integrated Vector Management WHO/HTM/NTD/VEM/2008.2.
15. World Health Organization. 2005. MALARIA CONTROL TODAY Current WHO Recommendations WORKING DOCUMENT March 2005 Roll Back Malaria Department World Health Organization Geneva Switzerland 2005.
16. World Health Organization. 1983. Integrated Vector Control, WHO. Technical Report Series No.688, 1983.
17. Implementing Integrated Vector Management I(IVM) at District Level in South-east-Region - A step by step approach, WHO, 2007.
18. Rozendaal, J.A. 1997. Vector Control - Methods for Use by Individuals and Communities, World Health Organization, Geneva.
19. World Health Organization. 1982. Urban vector and pest control, WHO, Technical Report Series, 767, 1988.

MPHE304: Management of Vector Borne Diseases

THEORY

60 Hrs

Unit I Malaria

Clinical course and different clinical manifestations - Chemotherapy and general management of patients - Stable and unstable malaria - Epidemic and endemic situations - Autochthonous, imported, transfusion and other types - Principles of malaria control - Malaria control programmes and strategies - NMCP, NMEP, MPO, PfCP, UMS, RBM, EMCP, NVBDCP.

Unit II Filariasis

Natural history and clinical manifestations - Diagnosis and morbidity management - Chemotherapy and chemoprophylaxis: selective treatment, mass drug administration and medicated salt - Control strategies: NFCP - NVBDCP - LF Elimination Strategy (GPELF).

Unit III Japanese encephalitis, Dengue and Chikungunya

Case definition and clinical presentations - Risk factors - Diagnosis - Case management – Prevention and control.

Unit IV Leishmaniasis

Case definition and clinical presentations - Risk factors - Diagnosis - Case management - Chemotherapy – Prevention and Control.

Unit V Tick borne diseases

Tick borne diseases of public health importance - Kyasanur Forest Disease (KFD) - Typhus fever and Q fever - Case management – Prevention and control.

Unit VI Mite borne diseases

Rickettsial diseases - Murine typhus and Rickettsial Pox - Other diseases associated with mites: scabies and allergy - Case management – Prevention and control.

Unit VII Diseases associated with rodents

Plague - Salmonellosis - Leptospirosis - chemotherapy and prevention and control.

PRACTICALS

30 Hrs

1. Case demonstration of malaria.
2. Case demonstration of filariasis.
3. Filariasis morbidity management methods.
4. Demonstration of Dengue, Chikungunya and JE - clinical features.
5. Case reporting procedures.
6. Visits to District Health office/ Primary Health Centre: National Programme - Organization – Functioning.

Suggested Readings:

1. Manson- Bahr, R. E.C. and Bell, D.R. 1987. Manson's Tropical Disease. ELBS.
2. Nutman T. B. 2002. Lymphatic filariasis.
3. Bruce-Chwatt, L.J. 1985. Essential Malariology, The Alden Press, Oxford.
4. Warnsdorfer, W.H. and Sri..Mc Gregor, I. 1988. Malaria: Principles and Practice of Malariology. Vol. I and II, Churchill Livingstone, New York.
5. World Health Organization, 1985. Bench Aids for the diagnosis of malaria.
6. Richard L. Guerrant, David H., Walker and Peter F.Weller. 1999. Tropical infectious diseases, Principles, Pathogens and Practice Vol. -1.
7. Davis Warrell and Herbert M. Gilles. 2002. Essential Malariology, Fourth Edition. Arnold pub.
8. Stephen H. Gillespie and Richard D. Pearson. 2001. Principles and practice of Clinical Parasitology. John Willey and Sons, Ltd.
9. Richman, D., Richard J. Whitley. 2002. Clinical Virology - 2nd Edition Douglas.
10. Robert G. Webster and Allan Gramoff. 1994. Encyclopedia of Virology - Academic Press.