Arba Minch University

College of Natural Sciences

Department of Biology

Curriculum for Master of Science (MSc) in

Medical Entomology & Vector Control

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Table of contents

1. Background

1.1. Historical Development of the Institute/Department

Arba Minch University (AMU) is locating in 505 km south-west of Addis Ababa. It is founded at the eastern foot of the Gamo Mountains and adjacent to the Lake Abaya and Chamo which are part of the East African Rift valley. Arba Minch Water Technology Institute was established in 1986 with the objective of creating skilled and qualified manpower vital for the effective utilization and exploitation of water resources. Arba Minch University was officially inaugurated in June 2004. During this time, it comprised four faculties, one institute and one school. Currently, there are 5 colleges such as College of Social Sciences and Humanities, College of Business and Economics, College of Natural Sciences, College of Medicine and Health Sciences and College of Agricultural Sciences, and Institute of Technology and School of Graduate studies. The enrollment capacity of the university is now more than 20,000.

College of Natural Sciences has nine undergraduate (Biology & Biotechnology, Chemistry& Industrial Chemistry, Geology, Mathematics, Meteorology and Hydrology, Physics, Sport Sciences and Statistics) and eleven graduate programmes. Six of the eleven graduate programs are in the department of biology (Biotechnology, Botany, Fishery, Aquatic Sciences & Aquaculture, Environmental Sciences, Medical Entomology & Vector Control, and Wild Life Management).

1.2. Mission and Vision statement of the Department

Vision

Biology department aspires to be a leading department in college of computational and natural sciences in the field of biology in Ethiopia and East Africa by 2020.

Mission

The Department of biology has a mission of offering relevant and quality education and training; conducting demand driven research and rendering accessible community services.

The department shall have the following goals and objectives

- Ensure the quality and expansion of undergraduate and graduate trainings
- Develop a conducive environment for learning and teaching
- Advance research and consultancy works in various fields
- Increase the revenue, minimize the costs

2. Rationale of the Program

Vector-borne diseases are of worldwide concern and a significant cause of human and animal morbidity and mortality throughout the world. The burden of the disease is concentrated in the poorest regions of the world, in Africa [1]. Mosquitoes, ticks, and biting flies spread viruses, bacteria, and parasites within and among a variety of warm-blooded hosts [2]. In Ethiopia, vector borne diseases represent major public health problems, and are among the leading cause of sickness and deaths. Such diseases frequently affect farming communities, and leads to great loss of productivity and contribute to poverty [3].

Vector-borne diseases control efforts are entering a new era, requiring improved entomological surveillance for more efficient and well-monitored vector control investments [4]. So that, the Ministry of Health, Regional and local vectors control programs require personnel with knowledge and expertise to deal with the different vector borne diseases, operational decision-making, and monitoring, evaluation and surveillance of vector control programmes. Entomologists spend hundreds of hours trekking through villages, inspecting breeding sites, and collecting vectors to provide essential information on vectors behavior and to guide which anti-vectors tools to use where, and at what time. The expertise of entomologists is critical in guiding anti-vectors efforts. This leads to a better knowledge to improved planning, implementing, monitoring, and evaluating disease vector programs and evidence based health policy and decision making.

Arba Minch University is situated in an area with much vector borne diseases, and is well suited to serve as a regional centre for training on prevention and control malaria and other vector-borne diseases. We imagine that this programme will make a considerable contribution to the

national efforts to improve the public and animal health through the pursuit of excellence in research, postgraduate teaching, and consultancy in national and local vectors control.

2.1. Need assessment: Institutes and organizations participated in need assessment

Moreover, we communicated with the stalk holders taking part in this consortium to identify the challenges in the current vector control practices, and to design courses in the way which support the country vectors and vector-borne disease control strategies. We also assessed the job opportunities for the graduates in the area of vectors and vector-borne disease controls. We shall also define the research topics after close consultation with the Regional Health Bureau, Zonal Health Departments and other institutes. Such a procedure will ensure that the research is relevant for the needs of the region. These priorities are also in line with available scientific literature and international recommendations.

Institutes and organizations participated in need assessment

No.	Institutes/organizations involved	Units
1.	Ethiopian Health & Nutrition Research Institute (1)	Vector Control
2.	Aklilu Lemma Institute of Pathobiology (1)	Vector Biology and Control Unit (Medical Entomologist)
3.	Jimma University (1)	Tropical and Infectious Diseases (Medical Entomologist)
4.	Health Bureau (3)	Disease prevention & Health Promotion Core process
5.	Segen Zone Health Department (1)	Disease prevention & Health Promotion Core process
6.	Gamo Gofa Zone Health Department (2)	Disease prevention & Health Promotion Core process
7.	South Omo Zone Health Department (3)	Disease prevention & Health Promotion Core process
8	USAID/PMI (1)	Senior Malaria Advisor

2.2. Response of the stallholders

Response (4 = very high, 3 = moderately high, 2 = fairly low, 1 = very low)

No.	Questions	Rate	No. Respondents	%
1	Appropriateness of the site (geographical location) for the program	Very high	13	100
2	Appropriateness of the program for control of vector borne diseases	Very high	13	100
3	Appropriateness of the program in preventive approach policy of the country	Very high	13	100
4	Appropriateness of the program in controlling & elimination of vector borne diseases like malaria, leishmaniasis e.t.c	Very high	13	100
5	Job opportunities of the graduates	Fairly low	11	84.6
		Very high	2	15.4
6	Interest to participate in research collaboration	Very high	12	92.3
7	Need to send candidates for training in this field	Very high	11	84.6
		Fairly low	2	15.4
8	Need to forward research questions for study	Very high	12	92.3
9	Need to work consultancy together	Very high	12	92.3
10	Interest to communicate the research findings and use for planning programs	Very high	12	92.3
11	Resource sharing (laboratories, co-supervision etc)	Very high	12	92.3

We identified some risk factors. One risk is getting adequate number of students particularly female students to join this program. We will put a great emphasis in making our programme widely known, and will have use resources to attract students to join port-graduate training. Another risk is a fairly low level of job opportunity at the government health sector. Because of several reasons this risk will be minimal and more entomologists will be needed in the health sector because of the following reasons:

1. The elimination plan of the country forces to include medical entomologist (this phase is very technical and need continuous surveillance and monitoring) in the field of vector borne disease control and elimination activities, and **re-emergence of some vector borne diseases** increase the need of the entomologist.

2. Most importantly, the WHO in September 2013 identified the gaps and recommended the countries:

- Ministries of health should ensure that each national malaria control programme has the basic capacity of human and infrastructure to support vector control and **entomological monitoring** – including insecticide resistance
- Establish/strengthen an inter-sectoral coordination mechanism, led by the Ministry of Health, responsible for developing a long-range strategic plan for building human resources and systems for **public health entomology and vector control.** The Plan should include the following:

✓ Ministry of Health to conduct training needs assessments and curricula review for pre-service and in-service training (including epidemiology and management) to ensure training is directly relevant to the expected skills of cadre tasked with **entomological monitoring and vector control**

✓ Ministry of Health to review, revise or establish posts and career development structures **for entomology and vector control specialists** at national and sub-national levels within ministries of health or other appropriate government structures

- ✓ In cases where the basic capacity is lacking within the NMCP, the inter-sectoral coordination mechanism should include the establishment of agreements with national universities, training and research institutions to provide ongoing training and technical support, including reference laboratory services, for entomological monitoring and vector control

- As the program is new in the country, the graduates will be needed by **the higher education institutions** and other non-governmental organizations working on tropical medicine and vector control.

3. Program Objectives

3.1. General Objectives

The aim of the program is to improve the public and animal health through providing training in the theoretical and practical aspects of the biology and control of diseases vector as well as the pathogens that they transmit to facilitate careers that demand knowledge of the biology of vectors of infectious diseases.

3.2. Specific Objectives

- To produce competent graduates with adequate and advanced knowledge and skills in public health and veterinary entomology for vector-borne diseases control who can work at national and international vector control units

- To produce graduates who can demonstrate advanced knowledge and understanding of the biology of vectors and vector borne diseases relevant to the country together with methods for their control
- To produce graduates who can design, carry out and evaluate vector control interventions using the specialized knowledge and skills

4. Graduate Profile

By the end of the program, students will able to:

- Demonstrate advanced knowledge and understanding of the biology of vectors and vector borne diseases relevant to the country together with methods for their control
- Increase fundamental understanding of the complex interactions among parasites and the vectors responsible for their transmission
- Demonstrate a range of specialized technical and analytical skills relevant to vectors and vector-borne diseases control, e.g. sampling, identification, incrimination, dissection, experimental design, data analysis, control technologies and strategies;
- Plan, implement, monitor and evaluate vector control programs based on integrated vector management approaches
- Design and carry out a small research project on the biology or control of disease vectors, analyze and interpret the results and prepare a written report
- Design, carry out and evaluate vector control interventions using the specialized knowledge and skills mentioned above
- Show competence, both written and verbal, in communicating scientific information and findings

- show a positive attitude toward controlling vector-borne disease control and work hard to achieve the goals and objectives set by the government
- describe the purpose and role of entomological monitoring in vector borne disease control

4.1. Quality assurance mechanisms

The program will implement the following quality assurance mechanisms to increase the competence. Different institutions will participate in the program implementation.

Quality assurance approaches

No.	Activities	Outcome
1.	Workshop with stakeholders	Evaluating the progress of the program/assessing the gaps
2.	Inviting external reviewers during thesis defense	Ensuring the standard with the other institutes
3.	Training the supervisors	Increasing the competence of the supervisors /supervisory skill
4.	Scientific presentation on national conferences	Ensuring the quality of the study/ disseminating the output
5.	Sample thesis evaluation by external reviewers	Ensuring the quality of the program/increasing the competence of the program
6.	Evaluation workshop with stakeholders	Assessing the impact of the graduates on the health system
7.	Introducing plagiarism checkers	Ensuring the competence of the graduates
8.	Publications in peer-reviewed journals	Ensuring the quality of the research work/communicate with scientific community

4.2. Collaborating Institutes (institutes in the network)

No.	Institute/university	Location	Activities
1.	Arba Minch College of Health Sciences	South	Supervision/ course offering
1	Aklilu Lemma Institute of Pathobiology, AAU	South	Supervision/course offering
2.	Hawassa University, College of Health Sciences	South	Course offering/co- supervision
3.	Centre for International Health, University of Bergen in Norway	North	Supervision/course offering, Training on supervision skills for AMU advisors
4.	Norwegian University of Life Sciences	North	Supervision/course offering

5. Admission Requirements

Applicants should satisfy Arba Minch University general entrance and program-specific entrance requirements to be considered for admission. Applications must be submitted in accordance with the procedures and deadlines given in the web-based or printed prospectus. Applications for

places are reviewed and offer letters are issued based on their performance. The minimum entrance qualification for registration is at least a bachelor degree of Ethiopian universities, or an overseas qualification of an equivalent standard in biology, public health, laboratory technologists, veterinary medicine, and animal sciences. An additional preferred requirement for the programme is an interest in medical and veterinary entomology, public health and vector-borne disease control.

The entrance examination will be program specific; it focuses on public health and veterinary entomology and disease vectors control. Thirty percent of quota will be given for female applicants and, both male and female applicants will compete for the remaining seventy percent.

6. Graduation Requirements

The University Senate awards the graduates Master Degree in **Medical Entomology & Vector Control** after passing all the courses and scoring a CGPA of 3.00 or above and successfully completing the requirements of the research dissertation. But, students with 2Cs and above shall repeat the course.

7. Program duration and degree nomenclature

The program will comprise four semesters. The first two semesters are dedicated to course work, culminating in an end-of-semester examination. All the courses of the program are taught 'face-to-face'. The remaining time is to be used to complete seminar and dissertations. In the third and fourth semester all students shall conduct an intensive field research work. If appropriate, part or the whole of the project period may be spent away from the University, whether in the in research institutes or research centers.

The program is Master of Science Degree (MSc) in **Medical Entomology & Vector Control (.** All courses and awards offered under the program are at Masters Level of the Framework for Higher Education Qualifications in Ethiopia. Awarding, Registering and Examination body is Arba Minch University.

8. Program profile

The program is taught through a variety of teaching methods including: lectures, small group seminars, practical, and group work with peers. In addition, there is a compulsory field courses. All elements of the program have specific learning objectives, with content designed to help students achieve these outcomes. Students are expected to learn through both directed and self-directed study. A candidate shall be permitted to appear for the final examination in any particular subject only if the candidate secures not less than 80% of the attendance. Examinations shall be conducted at the end of each semester as per the academic calendar of the Arba Minch University.

All courses of **Medical Entomology & Vector Control (ሜዲካል ኢንቶሞሎጂ እና በሽታ አስተላላፊ ነፍሳት ቁጥጥር**) will have "P**VEDC**" tag followed by three digit numbers: the first digit refers to year; the second one digit indicates the discipline (0 for supportive courses; 1 for compulsory courses and 2 for elective courses); the third digit refers to semester (odd for first semester and even for second semester).

8.1. List of Courses

	Compulsory Courses	**Course Code**	**Credit Hours**
1	Biostatistics	PVEDC 601	3
2	Epidemiology	PVEDC 602	3
3	Advanced Medical & Veterinary Entomology	PVEDC 611	3
4	Techniques in Medical &Veterinary Entomology	PVEDC 612	2
5	Disease Vector Control & Insecticide Resistance Management	PVEDC 613	3
6	Entomological Surveillance, Monitoring & Programme Management	PVEDC 614	2
7	Epidemiology of Arthropod-Borne Human Diseases	PVEDC 615	3
8	Arthropod-Borne Animal Diseases and Zoonosis	PVEDC 616	2
9	Research Methods & Scientific Communications	PVEDC 619	2
10	Advanced Ecology of Disease Vectors	PVEDC 618	3
11	Seminar	PVEDC 711	1
12	MSc Thesis	PVEDC 712	6
13	Elective	PVEDC	2

	Total		35

	Elective courses	**Course Code**	**Credit Hours**
1	Immunology of Infectious Diseases	PVEDC 622	2
2	Emerging Zoonosis and a One Health	PVEDC 624	2
	Total		4

8.2. Courses in semester bases

Year 1 first semester

No	**Course description**	**Course Code**	**Credit Hours**
1	Biostatistics	PVEDC 601	3
2	Advanced Medical & Veterinary Entomology	PVEDC 611	3
3	Disease Vector Control & Insecticide Resistance Management	PVEDC 613	3
4	Epidemiology of Arthropod-Borne Human Diseases	PVEDC 615	3
5	Research Methods & Scientific Communications	PVEDC 619	2
	Total		**14**

Year 1 second semester

No.	**Course description**	**Course Code**	**Credit Hours**
1	Epidemiology	PVEDC 602	3
2	Techniques in Medical &Veterinary Entomology	PVEDC 612	2
3	Entomological Surveillance, Monitoring and Programme Management	PVEDC 614	2
4	Arthropod-Borne Animal Diseases and Zoonosis	PVEDC 616	2
5	Advanced Ecology of Disease Vectors	PVEDC 618	3
6	Elective 1	PVEDC	2
	Total		**14**

Year 2 semester one

No.	Course description	Course Code	Credit Hours
1	Seminar	PVEDC 711	1
2	MSc. Thesis	PVEDC 712	3
	Total		4

Year 2 semester two

No	Course description	Course Code	Credit Hours

1.	MSc. Thesis	PVEDC 712	3
	Total		3

9. Course profile (course outline)

9.1. Biostatistics

Course Code: PVEDC 601

Credit Hours: 3 **(**2 lecture hours and 1 practical hours per week**)**

Prerequisite: Knowledge of basic mathematics

Required Resources: Computer, statistical software packages (SPSS 16, Epi Info 7)

Course description

This course covers both descriptive and intermediate (some are advanced) level statistics for public health. The descriptive statistics deals with frequency distribution, measures of central tendency and variability; probability and probability distributions; sampling and sampling distributions; statistical estimation; hypothesis testing and sample size determination. It also covers some demographic and health services statistics. The intermediate advance course deals with statistical methods that help understand relations between two or more variables. The techniques to be covered in this course include analysis of categorical data from epidemiological studies, correlation analysis, regression analysis, analysis of variance and survival Analysis.

Course objectives

At the end of the course students will be able to:

- Discuss the role of statistics in health science and explain the main uses of statistical methods in the broader field of health care
- Describe methods of collection, recording, coding and handling data;
- Calculate measures of central tendency and dispersion and present data in the form of tables, graphs etc
- Identify and make use of data from existing health records;
- Apply different techniques of sampling;
- Explain and apply statistical estimation and statistical significance
- Get basic application skill of SPSS

Course Content

1. **Descriptive Statistics**

   1.1. Methods of data Collection

1.2. Types of Scales of Measurement

1.3. Frequency distributions (absolute, relative, cumulative): exercise in Excel

1.4. Data summarization: Measures of Central tendency (Mean, Median, Mode) and Measures of Variability (Range, Inter-quartile range, Percentiles, Variance, Standard deviation, Coefficient of variation)

1.5. Diagrammatic Representations: Bar graph, Histogram, Pie chart, Box and Whisker plot, Line graph and Scatter diagram: exercise in SPSS

2. Probability and Probability Distributions:

2.1. Independent events, Mutually exclusive events

2.2. Classical definition of probability, Conditional probability

2.3. Probability Distributions (Discrete & Continuous): the Binomial distribution, the Normal distribution, the Poisson distribution.

3. Sampling and Sampling Distributions:

3.1. Sampling theory in public health;

3.2. Random numbers and their uses;

3.3. Types of sampling (probability (simple random, systematic, stratified random, cluster, multi-stage sampling) and non probability sampling); Sampling distribution of the mean.

4. Statistical Estimation:

4.1. Biased and Unbiased estimates;

4.2. Point and interval estimates;

4.3. C.I. for a single population mean,

4.4. C.I. for the difference between two Independent population means;

4.5. Paired Samples C.I. for the difference between two population means,

4.6. C.I. for a single population proportion,

4.7. C.I. for the difference between two population proportions.

5. Hypothesis Testing: Hypothesis (Null and Alternative);

5.1. Steps involved in testing a hypothesis;

5.2. Type I and Type II errors;

5.3. Critical region;

5.4. One- tailed vs. Two-tailed tests;

5.5. Test of hypothesis about a single population mean,

5.6. Test of hypothesis about the difference between two independent population means;

5.7. Test of hypothesis about paired difference of two population means,

5.8. Test of hypothesis about a single population proportion

5.9. Test of hypothesis about the difference between two population proportions.

6. Sample Size Determination (for different study designs)- (with exercise in Epi-Info), Applications of selected statistical tests (with exercise in SPSS)

   6.1. Chi-square test

   6.2. '95% CI for OR'

   6.3. T-test

   6.4. One-way ANOVA

   6.5. Bivariate correlation

   6.6. Linear regression

   6.7. Binary logistic regression

   6.8. Survival analysis

   6.9. Cox-regression

   6.10. Kaplan-Meier curve

   6.11. Non-parametric tests

   6.12. Sign test

   6.13. Mann-Whitney

   6.14. Wilcoxon

7. Demographic and health service statistics (reading assignment- documents will be provided)

   7.1. Questionnaire design

   7.2. Reporting output of statistical analysis

8. Design & Analysis of Operational Studies

Teaching and learning methods: Lecture/discussion, assignment, class work, uses of computer (Statistical packages, SPSS)

Evaluation: Assignments (20%), quiz (10%), mid examination (30%) and final examination (40%).

References

1. Kirkwood B. and Sterne J. (2006) ***Medical Statistics***. 2nd edition

2. Daniel, WW. (2010) ***Biostatistics: Basic Concepts and Methodology for the Health Sciences***. 9th ed. John Wiley and Sons (Asia) Pte Ltd.

9.2. Epidemiology

Course code: PVEDC 602

Credit hr: 3 (2 lecture hours and 3 hours practical exercise per week)

Prerequisite: Biostatistics

Course description

This course covers the principles and methods of descriptive and analytic epidemiology. Emphasis is on the underlying concepts and approaches of epidemiological research and on critical appraisal of epidemiologic studies including: observational study designs and their vulnerabilities to bias, measures of frequency and association, basic methods for addressing sampling variability, confounding, and effect modification. Concepts related to causal judgment in epidemiology are also introduced.

Course Objectives

At the end of this course students are expected to:

- Understand the concept, scope and classification of epidemiology
- Acquaint with important concepts in infection disease epidemiology including natural history of a disease, spectrum of disease, chain of infection, carrier stages and principles of communicable disease control,
- Explain measures of disease incidence (e.g. risk, rate, odds) measures of effect (e.g. relative and absolute risk)
- Understand study designs: cohort, case-control and intervention studies and appreciate the strengths and limitations of each
- Develop skill on interpretation of evidence and critical consumers of published articles

Course Content

1. Introduction to epidemiology
    1.1. The scope and significance of epidemiology
    1.2. Evolutionary roots of epidemiology
    1.3. Define epidemiology
    1.4. Assumptions of epidemiology

2. Epidemiology of Vector Borne Disease (malaria, leishmaniasis, yellow fever etc)
3. An overview of epidemiologic study designs
    3.1. Descriptive studies
        3.1.1. Ecological studies, case report, cross sectional studies
        3.1.2. Practical exercises SPSS
    3.2. Analytic studies
        3.2.1. Observational studies: case control & cohort studies
        3.2.2. Calculation problems in cohort & case control studies
        3.2.3. Practical exercises SPSS
        3.2.4. Interventional/experimental studies
        3.2.5. Calculation problems in intervention studies
        3.2.6. Practical exercises SPSS
4. Accuracy of epidemiologic studies
5. Measures of morbidity and mortality
    5.1. Rate, Ratio and Proportion
    5.2. Crude, category specific, and adjusted rates
    5.3. Measurement of disease frequency: Prevalence and Incidence
    5.4. Measurement of mortality
    5.5. SPSS practical exercise
6. Measures of strength of association and impact
    6.1. The two-by-two table
    6.2. Relative risk
    6.3. Odds ratio
    6.4. Practical exercise SPSS
    6.5. Attributable risk and attributable risk percent
    6.6. Population attributable risk and population attributable risk percent
    6.7. Practical exercise SPSS
7. Causal Inference and evaluating the role of bias, confounding and chance
    7.1. Types of bias
    7.2. Evaluation the role of bias
    7.3. Control of bias

7.4. The nature of confounding

7.5. Control of confounding factors

7.6. Evaluating the role of chance

7.7. Confounding and effect modification

7.8. Bradford Hill's criteria for causal inference

8. Screening and prevention
9. Sources of epidemiological data (with major focus on surveillance)
    9.1. Census, vital registration, survey
    9.2. Hospital data
    9.3. Disease notification
    9.4. Surveillance
        9.4.1. Characteristics
        9.4.2. Purpose
        9.4.3. Selection of disease/problems for surveillance
        9.4.4. Surveillance vs survey
10. Outbreak Investigation
    10.1. Patters of Epidemics
    10.2. Causes of Epidemics
    10.3. Justification for outbreak investigation
    10.4. Steps in outbreak investigation
11. Ethics of epidemiologic research
    11.1. Historical development of research ethics
    11.2. Major principles of research ethics
    11.3. Protection of vulnerable subjects
    11.4. Major national and international ethical guidelines

Teaching Methods: Interactive lectures, class exercises and self reading

Mode of Evaluation: Assignments (20%), mid (20%) and final examinations (40%), Practical activities (20%).

References

1. Gordis L. Epidemiology 3rd ed. Philadelphia: Elsevier; 2008.
2. Lilienfeld DE, Stolley PD. Foundation of Epidemiology 3rd ed. New York: Oxford; 1994.

3. Rothman KJ, Greenland S, Lash TL. (2008) Modern Epidemiology 3rd ed. Philadelphia: Lippincott Williams and Wilkins

9.3. Advanced Medical & Veterinary Entomology

Course Code: PVEDC 611

Credit hours: 3 (2 lecture hours and 3 practical hours per weeks)

Prerequisite: Basic knowledge on vectors and parasites

Course description

This course presents the major insect, mite, and tick vectors of disease to man and animals. Students will learn to identify and understand the life cycles, morphology, and behavior of mosquitoes, ticks, mites, lice, fleas, and other disease vectors. The interaction between the disease-causing pathogen and the arthropod vector will be covered, including biological and mechanical transmission of pathogens. Collecting and preserving medically important insects is also discussed.

Course Objectives

By the end of this course students should be able to:

- Define and compare the primary vectors of medical and veterinary entomology and provide vector management solutions
- Explain the role arthropods in disease transmission to humans and animals
- Identify medically important arthropods through the recognition of diagnostic features
- Collect and identify some medically important insects

Course contents

1. **Arthropods**
   - 1.1. Classification of arthropods
   - 1.2. Insects
   - 1.3. Spiders
   - 1.4. Mites and ticks
   - 1.5. Scorpions
   - 1.6. Centipedes and millipedes
2. **Introduction to arthropods of public and veterinary importance**
   - 2.1. Direct and indirect effects

2.2. Medical conditions caused by Arthropod Stings or Bites

3. Arthropods as vectors of human and animal diseases

3.1. Mode of diseases transmission

3.2. Introduction to mosquitoes (Culicidae)

3.3. Anopheline mosquitoes (Anophelinae)

3.4. Culicine mosquitoes (Culicinae)

3.5. Black-flies (Simuliidae)

3.6. Phlebotomine sand-flies (Phlebotominae)

3.7. Biting midges (Ceratopogonidae)

3.8. Horse-flies (Tabanidae)

3.9. Tsetse-flies (Glossinidae)

3.10. House-flies and stable-flies (Muscidae) and latrine-flies (Fanniidae)

3.11. Flies and myiasis

3.12. Fleas (Siphonaptera)

3.13. Lice (Anoplura)

3.14. Bedbugs (Cimicidae)

3.15. Triatomine bugs (Triatominae)

3.16. Soft ticks (Argasidae), Hard ticks (lxodidae) and Mites

4. Prevention and control of disease vectors

Teaching and learning methods: Lecture/discussion, assignment, class work/group assignment, sample collection, reporting writing, term paper and presentation

Evaluation: Mid examination (30%), final examination (40%), practical examination (10%) and term paper writing and presentation (15%).

References

1. Survice M. (2012) ***Medical Entomology for students***, Cambridge University Press: fifth edition (Text Book)

2. Eldridge, BF & Edman JD (2004) ***Medical Entomology: A text book on public health & veterinary problems caused by arthropods,*** Kluwer academic Publications: revised edition

9.4. Techniques in Medical & Veterinary Entomology

Course Code: PVEDC 612

Credit hours: 2 (1 lecture and 3 hours practical works)

Prerequisite: **Advanced Medical & Veterinary Entomology**

Course description

This course is designed to provide students with a practical understanding of the methods for sampling, identification and vector incrimination applicable to the most important arthropod vectors. Students will gain hands-on experience of sampling insects from the field, preparation of material, dissection, use of identification keys, use of ELISA and PCR.

Course Objectives

By the end of this module, students should be able to:

- Appreciate the importance of accurate identification of the major groups of arthropods in relation to disease transmission and control
- Select appropriate sampling methods for the major groups of vectors
- Identify the major groups of vectors from non-vectors
- Differentiate between anopheline and culicine eggs, larvae, pupae and adult
- Use a species identification key
- Apply a range of modern techniques available for the identification in areas where the use of conventional methods are problematic, i.e. species complex identification
- Array out practical laboratory identification of parasite stages both in vectors and in hosts
- Understand the principles and the methods of vector incrimination.

Course contents

1. Introduction to entomological techniques
2. Collection/sampling
   2.1. Adults
   2.2. Immatures
3. Identification

3.1. Morphological

3.2. Cytogenetics

3.3. Inbreeding

3.4. Isoenzyme

3.5. Molecular

3.5.1. Classical genetic markers

3.5.2 Mitochondrial DNA

3.5.3 Ribosomal DNA

3.5.4. Microsatellite DNA

3.5.5. Random Amplified Polymorphic DNA

4. Preservation

4.1. Adult (Dry, alcohol)

4.2. Immature (alcohol)

5. Curation (Pinning, slide mounting)

6. Age determination (Dissection ovary, accessory glands)

7. Parasite isolation/detection

7.1. Isolation by dissection of salivary glands, gut, thorax muscle

7.2. Detection by ELISA and PCR

8. Blood meal analysis

8.1. Blood meal collection and preservation

8.2. Analysis by ELISA and PCR

9. Rearing and insectary maintenance

10. Monitoring insecticide susceptibility tests (WHO tube test and CDC bottle bioassay)

11. Detection of insecticide resistance mechanisms (biochemical and molecular)

Teaching and learning methods: Lecture, insect sampling, identification, incrimination (practical activities), independent work on ELISA, reporting the results

Evaluation: Written examination (40%), Practical examination (40%), report writing (**20%)**

Reference

1. WHO (2013). ***Malaria entomology and vector control*****, guide for participants**

2. MR4 (2010). ***Methods in Anopheles Research***

9.5. Disease Vector Control & Insecticide Resistance Management

Course Code: PVEDC 613

Credit hours: 3 (2 lecture hours per week, 3 hours practical per week & 2 weeks field)

Prerequisite: Basic knowledge on vectors and parasites

Course description

Vector-borne diseases including Chagas disease, dengue, human African trypanosomiasis, leishmaniasis, lymphatic filariasis, malaria, onchocerciasis and schistosomiasis remain unacceptably high in spite of the proven efficacy of current vector control tools/methods. This course covers both core and complementary vector control methods and discusses the action that is required to prevent and manage the increasing challenge of vector resistance to insecticides. This course emphasizes an Integrated Vector Management, an essential tool for a rational decision-making process to optimize the use of resources for vector control.

Course Objectives

By the end of this course students should be able to

- Demonstrate knowledge and understanding of chemical, physical and biological methods of controlling vectors
- Make provisional recommendations, based on scientific evidence, about the appropriateness and cost-effectiveness of particular methods for addressing vector control problems in particular settings
- Select methods based on knowledge of local vector biology and disease transmission
- Utilize a range of interventions, often in combination and synergistically
- Collaborate within the health sector and with other public and private sectors that impact on vector breeding
- Understand the role of engagement with local communities and other stakeholders
- Formulate accurate responses to key questions about side effects and resistance problems arising from application of vector control
- Synthesize the cross-cutting principles of the course and apply to the design of their own control program, intervention trial or elimination strategy.

Course contents

1. Introduction to Disease Vectors
2. Approaches to Disease Vectors Control

    2.1. Environmental Management **&** Source Reduction Methods

        2.1.1. Water Management

    2.2. Biological Control

        2.2.1. Control with Arthropods

        2.2.2. Use of Larvivorous Fishes

        2.2.3. Microbial Control

    2.3. Chemical Based Disease Vector Control

        2.3.1. Larvicidals

        2.3.2. Adulticidals

        2.3.3. Biorational Pesticides

        2.3.4. Problems Associated with Insecticides

    2.4. Genetic control of Disease Vectors

    2.5. Physical measures : House Screening

    2.6. Immunological Control Disease Vectors

    2.7. Insecticide Resistance Mechanisms and its Management

        2.7.1. Behavioral Resistance

        2.7.2. Metabolic Resistance

        2.7.3. Target site Resistance

        2.7.4. Cross and Multiple Resistance

        2.7.5. Insecticide Resistance Management Strategies

    2.8. Integrated Vector Management (IVM)

        2.8.1. Principles of Integrated Vector Management (IVM)

        2.8.2. Concept and definition of IVM, feasibility, merits and limitations, and success stories in public and animal health

        2.8.3. Basic structures of IVM

2.8.4. Key elements of an IVM strategy

2.8.4.1. Integrated approach

2.8.4.2. Evidence-based decision-making

2.8.4.3. Collaboration within the health sector and with other sectors

2.8.4.4. Capacity building

2.8.4.5. Advocacy, social mobilization and legislation

2.8.5. Driving forces for IVM polices

2.8.6. Monitoring and Evaluation of Indicators for IVM

2.9. Health Education

2.10. Community Participation

3. Designing Vector Control Program
4. National and International Policies of Vector Control
5. Emerging Concepts and Practices in Vector Control

5.1. A ‘‘One Health’’ Approach to Address Emerging Zoonoses

References

1. Matthews, GA (2011*). **Integrated vector management: controlling vectors of malaria and other insect vector borne diseases,** John Wiley & Sons, Ltd.

2. van Emden HF and Service MW (2004). ***Pest and Vector Control ,*** Cambridge University Press

Teaching and learning methods: Lecture/discussion, assignment, class work/group assignment, independent case study on vector control activities, reporting Writing

Evaluation: Assignments (10%), mid examination (30%), final examination (40%), assessment of case study (20%).

Practical exercises

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

9.6. Entomological Surveillance, Monitoring & Programme Management

Course Code: PVEDC 614

Credit Hrs: 2 (1 theoretical hour per week and 3 field work)

Prerequisite: Techniques in Medical & Veterinary Entomology, Advanced Medical and Veterinary Entomology

Course description

Entomological investigations are important and essential aspect of vector control, as these investigations provide information on vector species, their distribution, density, bionomics and susceptibility/ resistance to insecticides used for malaria control. In addition these investigations are useful for the monitoring of potential vectors and the role they could play in disease transmission. This course also provides information on principles and roles of vector control program management.

Course Objectives

The learning of the course will enable students to

- Understand the role of entomological surveillance in controlling disease vectors
- Design and conduct surveillance in the field
- Develop critical skill to monitor impact of vector control interventions
- Develop vector control programmes management skills that essential in disease vector control

Course content

1. Entomological field techniques (methods of surveillance)
    1.1. Hand collection
    1.2. Pyrethrum spray sheet collection
    1.3. Outdoor collection of vectors
    1.4. Cattle baited net trap collection
    1.5. Cattle baited hut collection
    1.6. Window trap collection
    1.7. Human landing catches

1.7.1. Direct landing catches

1.7.2. Landing catches from human baited trap nets - double trap method

1.8. Larval surveys

1.9. Using traps

1.10. Insecticide susceptibility test (adult & larvae)

1.11. Bioassay test for insecticide deposits on wall surfaces

1.12. Bioassay test for insecticide treated net surfaces

1.13. CDC type light trap collections

2. Design of surveillance programes
3. Monitoring vector control interventions
   3.1. Monitoring and impact indicators for Indoor residual spraying (IRS)
   3.2. Monitoring and impact indicators for long lasting insecticidal nets
   3.3. Monitoring and impact indicators for larval control (larval source management)
   3.4. Monitoring and impact indicators for genetic control (e.g SIT)
4. Significance of surveillance and monitoring in vector control
5. Vector Control Program Management
   5.1. Functions of vector control programs
   5.2. Entomological Services
   5.3. Planning (IRS, LLINS, Larval source management etc.,) , budget etc.,
   5.4. Distribution and replacement of nets
   5.5. Management of information
   5.6. Management of insecticides
   5.7. Partnership in vector control
   5.8. Situation analysis
   5.9. Operational research and data collection analysis

Teaching Strategy / Methods/

Students will be encouraged to conduct field studies. Strong supervision and guidance in field data collection will be provided for students.

Assessment criteria: Situation analysis (20%), Final examination (50%), Field report (30%).

References

1. Integrated Vector Management: Controlling Vectors of Malaria and other Insect Borne Diseases. 2011. Graham Matthews. Wiley-Blackwell

2. Biology of Disease Vectors. 2005. Edited by William C. Marquardt *et al*. Second Edition. Elsevier Academic Press

9.7. Epidemiology of Arthropod-Borne Human Diseases

Course Code: PVEDC 615

Credit Hours: 3 (2 theoretical and 3 practical hours per week and field studies)

Prerequisite: Basic knowledge on parasites and vectors

Course Description

Arthropod vectors such as mosquitoes, ticks, and flies are responsible for transmitting bacteria, viruses, and protozoa causing such deadly diseases such as malaria, dengue fever, and trypanosomiasis. The course will present principles of transmission of human pathogens by insects, mites and ticks. It also discusses basic arthropod biology with special attention to biological properties of vectors and their interactions with pathogens. Special topics will include emergent pathogens, traditional and modern disease control strategies.

Course Objectives

After completing this section students should be able to

- Discusses major groups of arthropod-borne pathogens and vectors
- Conduct surveillance, investigations, and studies of vector-borne diseases
- Explain the control and prevention strategies of vector-borne diseases
- Discusses the causes and prevention strategies of myiasis

Course contents

1. Arthropods of Public Health
2. Mosquito-Borne Human Diseases
3. Sand fly-Transmitted Diseases
4. Tsetse flies (Glossindae) Transmitted Diseases
5. Black flies (Simuliidae) Borne Diseases
6. Culicoides-Borne Infections
7. Bug-Transmitted Diseases
8. Fleas (Siphonaptera) Borne Diseases
9. Louse-Borne Infections

10. Public Health Importance Tabanidae

11. Public Health Importance of Ticks

12. Public Health Importance of Mites

13. Immunology of Vector-Borne Diseases

14. Emerging Vector-Borne Diseases

15. Prevention and Control Methods

Teaching Methods: Interactive lectures, class exercises, seminar presentation, self reading, and field visit to assess vector borne diseases, report writing, laboratory work

Mode of Evaluation: Assignments (20%), final examinations (50%), assessment of seminar (written and oral presentation) (20%) and laboratory report and practical exam (10%).

References

1. Goddrad, J. (2008). ***Infectious Diseases and Arthropods*, second edition**. Human Press

2. Guerrant, RL, Walker, DH. MD, Weller PF. (2011). ***Tropical Infectious Diseases: Principles, Pathogens and Practice.*** Third Edition

Practical Activities

1. Preparation of blood smears and staining for detection of vector borne pathogens
2. Observation of prepared slides of different stages of vector borne pathogens
3. Staining and examination of blood smears for detection of blood parasites
4. Field observation at endemic areas of vector borne pathogens

9.8. Arthropod-Borne Animal Diseases & Zoonosis

Course Code: PVEDC 616

Credit Hours: 2 (2 theoretical hours and 1 week field work)

Prerequisite: Advanced Medical & Veterinary Entomology

Course Description

Arthropod vectors such as mosquitoes, ticks, and flies are responsible for transmitting bacteria, viruses, and protozoa diseases of animals. The course will present principles of transmission of animal pathogens by insects, mites and ticks. It also discusses basic arthropod biology with special attention to biological properties of vectors and their interactions with pathogens. Special topics will include the perspective of One Health in controlling Zoonotic and emerging diseases.

Course Objectives

After completing this section students should be able to

- Discusses major groups of arthropod-borne pathogens and vectors
- Conduct surveillance, investigations, and studies of vector-borne diseases
- Explain zoonosis and emerging zoonotic diseases
- Explain the control and prevention strategies of vector-borne diseases
- Discusses the causes and prevention strategies of myiasis

Course content

1. Arthropod of Veterinary Importance
2. Veterinary Importance of Ticks
    2.1. Direct Effect of Tick Infestation
    2.2. Tick Paralysis
    2.3. Tick Toxicoses
    2.4. Tick-Borne Diseases
        2.4.1. Tick-Borne Encephalitis
        2.4.2. African Swine Fever
        2.4.3. Lyme Disease or Borreliosis

2.4.4. Bovine Anaplasmosis

2.4.5. Babesiosis

2.4.6. East Coast Fever

2.4.7. Theileriosis

3. Veterinary Importance of Mites

3.1. Mite-Borne Diseases

4. Veterinary Importance of Mosquitoes

4.1. Mosquito-Borne Diseases

4.1.1. Eastern Equine Encephalomyelitis (EEE) Virus

4.1.2. Western Equine Encephalomyelitis (WEE) Virus

4.1.3. Rift Valley Fever (RVF) Virus

4.1.4. Japanese Encephalitis (JE) Virus

4.2.5. Wesselsbron (WSL) Virus

1.1.1. Non-Human Malarias

1.1.2. Dog Heartworm

5. Veterinary Importance of Tsetse flies

1.2. Nagana /Animal African Trypanosomiasis/

6. Culicoide Transmitted Diseases

1.3. Bluetongue Disease

1.4. African Horse Sickness /AHS/

1.5. Other Orbivirus Disease

7. Horse flies and Deer flies Transmitted Diseases

1.6. Equine Infectious Anemia

1.7. Anaplasmosis

1.8. Elaeophorosis

8. Veterinary Importance of Black flies

1.9. Bovine onchocerciasis

1.10. Leucocytozoonosis

1.11. Simuliotoxicosis

9. Zoonotic Diseases

10. A ‘‘One Health’’ Approach to Address Emerging Zoonoses

11. Prevention and Control of Vector-Borne Animal and Zoonotic Diseases

Teaching Methods: Interactive lectures, class exercises, seminar presentation, self reading, and field visit to assess vector borne diseases and report writing

Mode of Evaluation: Assignments (10%), mid (30%) and final examinations (40%), assessment of seminar (written and oral presentation) (10%) and field report (10%).

References

1. Armon, R, Cheruti U. (2011). Environmental Aspects of Zoonotic Diseases. IWA Publishing, pp 492.

2. Mehlhorn H. (2012). Arthropods as Vectors of Emerging Diseases. Springer, pp 400

9.9. Advanced Ecology of Disease Vectors

Course code: PVEDC 618

Credit hrs: 2 hrs (2 theoretical sessions per week and 1 week field work)

Prerequisite: Advanced Medical & Veterinary Entomology

Course description

We will discuss the complex biology and ecology of disease vectors including their life histories, transmission patterns, links to reservoirs, and vector competency to identify points for management and to develop a better understanding of transmission to minimize disease spread and incidence. Host-vector-parasite interactions' aims to provide a rapid overview of recent developments in the field of parasite-vector interactions and how this can be used for more effective and sustainable disease control.

Course Objectives

- Demonstrate knowledge and understanding of key aspects of vector behavior and vector biology relevant to the epidemiology and control of vector-borne diseases
- Discuss the environmental, biological, and social roots of disease vectors as a public and veterinary health problem
- Identify genetic and physiological determinants of vector competence and vector-parasite specificity
- Demonstrate effects of parasites on vector behavior, survival and parasite transmission

Course contents

1. Introduction to Ecology of Disease Vectors
2. Behavioral Ecology
    - 2.1.1. Feeding and resting behaviors
    - 2.1.2. Dispersal and Learning
    - 2.1.3. Diapauses
    - 2.1.4. Application of Behavioral Approaches to Vector Control

3. Ecological interactions

3.1. Vector-Host Interactions

3.2. Chemical Ecology of Vector-Host Interactions

3.3. Olfaction in Host-Vector Interactions

3.4. Blood-feeding behavior and mechanisms of orientation to host odours

3.4.1. The role of saliva in blood-feeding

3.4.2. Salivary components and host's immunity

3.4.3. Strategic use of chemical ecology for vector control

3.5. Species specific vector-pathogen interactions

3.5.1. Interactions between *Plasmodium* parasites, the gut microbiota, and mosquito midgut epithelial cells??

3.5.2. Immune pathways that mediate antiplasmodial responses

3.5.3. Plasmodium evasion of the mosquito immune system

3.5.4. Parasite life cycle and developmental bottlenecks for sporogonic development

3.5.5. Vector-parasite interactions (sand flies and Leishmania, black flies and Onchocerca, ticks and viral pathogens)

3.5.6. Evolutionary aspects of vector-parasite interactions

3.6. Strategic issues concerning vector-parasite interactions

3.6.1. Effects of parasites on vector behavior, survival and parasite transmission

3.6.2. Parasite-mediated enhancement of transmission by haematophagous insects

3.6.3. Plant-sugar feeding and vectorial capacity

3.6.4. Genetic and physiological determinants of vector competence and vector-parasite specificity

3.7. Ecology of Vector-parasite interactions

3.7.1. Environmental derivers, ecosystem states, and their effects on vector-borne diseases

3.7.2. The relationship between ecological conditions and vector-borne diseases

4. Effects of ecosystems on pathogen-vector interactions

4.1. Effects of host diversity on disease dynamics

4.2. Role of vector diversity on disease dynamics

4.3. Understanding host-multipathogen systems

4.4. Multi-host pathogen, biodiversity and disease: the "dilution effect"

5. Ecology of neglected tropical vector borne diseases
6. The ecology and derivers of emerging infectious diseases????
7. Application of molecular and immunological assays in vector and host infection

Teaching Methods: Interactive lectures, class exercises, seminar presentation, self reading

Mode of Evaluation: Assignments (10%), mid (30%) and final examinations (40%), assessment of seminar (written and oral presentation) (10%) and field report (10%).

References

1. Carde RT, Millar, JG. (2004). ***Advances in insect chemical ecology***, Cambridge University Press
2. Muirhead-Thomson RC. (1968). ***Ecology of insect vector populations***

Field work

1. Identifying the breeding sites of vectors
2. Determining the feeding and resting behaviors of vectors in the communities

9.10. Research Methods & Scientific Communications

Course code: PVEDC 619

Credit Hrs: 2

Prerequisite: None

Course Description

Scientific research articles provide a method for scientists to communicate with other scientists about the results of their research. A standard format is used for these articles, in which the author presents the research in an orderly, logical manner. The aim of the course is to enhance the capability of participants to write good scientific papers. The course emphasizes quality of writing and dissemination with a view to improve readability, maximize the contribution of the research done and improve the opportunities for publishing.

Course Objectives

The learning of the course will enable students to

- Understand some basic concepts of research and its methodologies
- Describe the scientific writing process and its key stages
- Organize and compose a scientific paper in accordance with the IMRAD (Introduction, Methods, Results and Discussion) model
- Analyze and review scientific papers in terms of key message, consistency and justification
- Reflect on the benefits of working in teams in scientific writing and describe the rules of co-authorship
- Write scientific review paper, thesis manuscript, research paper
- Reflect on the ethics in scientific writing
- Prepare scientific research presentation material for oral and poster presentations in a seminar or scientific conferences

Course Outline

1. Concepts of research
    1.1. The need for research
    1.2. Types of research
    1.3. Steps in conducting research
    1.4. Writing Research Reports and Thesis
2. Basic rules of writing
3. Elements of the scientific paper
    3.1. Title
        3.1.1. Developing an effective title
    3.2. Abstract : Steps to writing an effective abstract
    3.3. Introduction: Steps to writing an effective introduction
    3.4. Methods
    3.5. Result s: Steps to writing an effective results section
    3.6. Discussion : Steps to writing an effective discussion section
    3.7. Conclusion: Steps to writing an effective conclusion
    3.8. Acknowledgments
    3.9. References
4. Preparing a graph and tables: steps to developing effective tables and figures
5. Publication process
    5.1. Choosing a journal in which to publish
    5.2. Developing an effective first draft of your manuscript
    5.3. Manuscript revision and review
    5.4. Responding to reviewers
    5.5. Manuscript publication
6. Reasons why manuscripts are rejected
7. Common errors in scientific manuscripts
8. Publishing ethics and intellectual property rights; Ethics in scientific publication
9. Plagiarism
10. Preparing poster presentation: developing an effective poster presentation
11. Oral presentations

12. Communicating science to non-scientific audiences – the popular media, governments, policy- and decision-makers
13. Writing of research proposal
14. Writing grant proposal

Teaching/learning methods: The course will encompass specific facilitator inputs (e.g. Lecture presentations), combined with a variety of interactive learning activities, including: structured group work, group and individual reflection, self-study and writing and plenary discussions), published article evaluation

Assessment: Written paper (seminar) (50%), Oral presentation (30%) and Paper Evaluation (20%)

References

1. Wankhade L. (2010). How to write and publish a research paper?

2. Wankhade LN. (2012). How to write and publish a research paper: A complete guide to writing and publishing a research paper?

9.11. Immunology of Infectious Diseases

Course Code: PVEDC 622

Credit hour: 2

Pre-requisite: Epidemiology of Arthropod-Borne Human Diseases

Course Description

The general introduction will provide a concise overview and analysis of the immune defense against viruses, bacteria, fungi and parasites. Special attention will be given to the various components of the immune system that play a role in the induction of innate and adaptive immunity against infectious diseases

Course Objectives

At the end of the course, students will be able to:

- Demonstrate specialist knowledge and understanding of the basic principles of host immunity to infection against the diverse range of pathogens which confront human populations
- Recognize the significance of the immune system in combating infection and disease.
- Demonstrate knowledge and understanding of the various t ypes of immune responses elicited by parasites
- Distinguish the most important immunological features relating to the major vector borne infections of man
- Compare the mechanisms used by parasites to avoid/exploit the immune response

Course Content

1. Overview of the Immune system
2. Cells and Organs of the Immune System
3. Innate (Non-specific) Immunity
4. Adaptive immunity

   4.1. Humeral immunity receptors

4.2. Cell mediated immunity

5. Receptors and Signaling: Cytokines and Chemokines
6. Complement system
7. Antigen and Immunogenicity
8. Parasite Escape within Hosts
   8.1. Natural selection of antigenic variants
   8.2. Pathogen manipulation of host immune dynamics
   8.3. Sequence of variants in active switching from archives
   8.4. Ecological coexistence of variants within a host
   8.5. Problems for future research
9. Human-pathogen interactions (Immune responses to infections)
   8.1. Immunology of malaria
   8.2. Immunology of Leishmania
   8.3. Immunology of Chagas' disease
   8.4. Immunology of sleeping sickness
   8.5. Immunology of schistosomiasis
   8.6. Immunology of filarial worms and gut nematodes
   8.7. Yellow fever

9. Infectious Diseases and Vaccines

Teaching Methods: Interactive lectures, class exercises, seminar presentation and self reading

Mode of Evaluation: Assignments (10%), mid (30%) and final examinations (40%) and seminar writing and oral presentation (20%)

References

Roitt I, Brostoff J and Male D (2002). Immunology, 6th Edition, 460pp, London.

Frank SA. (2002). Immunology and Evolution of Infectious Diseases, Princeton University Press

9.12. Emerging Zoonosis and a One Health Perspective

Course Code: PVEDC 624

Credit hour: 2

Pre-requisite: Epidemiology of Arthropod-Borne Human Diseases and Arthropod-Borne Animal Diseases and Zoonosis

Course Description

'One Health' proposes the unification of public and veterinary sciences with the establishment of collaborative ventures in clinical care, surveillance and control of cross-species disease, education, and research into disease pathogenesis, diagnosis, therapy and vaccination. This course is designed to promote the concept of 'one health' by dealing with health problems in both people, their livestock and other domestic and wild animals they depend on through the development of integrated 'control packages' that address several disease/health problems.

Course Objectives

At the end of the course, students will be able to:

- Demonstrate knowledge and understanding of emerging zoonotic diseases and their burden
- Understand the principle of a one health perspective
- Make provisional recommendations, based on scientific evidence, about the appropriateness and cost-effectiveness of a one health perspective
- Formulate accurate responses to key questions the role of one health perspective in controlling emerging zoonotic diseases
- Synthesize the cross-cutting principles of the course and apply to the design of their own control program against emerging zoonotic diseases

Course Content

1. The Emerging Concepts of Zoonosis and Human Health

2. Need for Integrated Health Approaches
3. Human and Animal Health: Problems, Impact and Challenges
   3.1. The Global Challenge of Epidemic and Endemic Zoonosis
4. Intervention and Control of Zoonotic Diseases
5. Public and Animal Health Policies and Delivery systems: Need to Improve?
   5.1. Engaging Stakeholders: Creating Networks in Controlling Zoonotic Diseases
6. Neglected Tropical Zoonotic Diseases in Ethiopia

Teaching Methods: Interactive lectures, class exercises, seminar presentation, self reading, and field visit to assess zoonotic diseases and control approach, report writing

Mode of Evaluation: Assignments (10%), mid examination (25%), final examinations (35%), assessment of seminar (written and oral presentation) (20%), and field report (10%).

References

1. Armon, R, Cheruti U. (2011). Environmental Aspects of Zoonotic Diseases. IWA Publishing, pp 492.

2. Mehlhorn H. (2012). Arthropods as Vectors of Emerging Diseases. Springer, pp 400

9.13. Seminar

Course Code: PVEDC **711**

Credit Hr: 1

Prerequisite: Research Methods & Scientific Communications

Course Description

The course is mainly intended to enable students acquire skills in extracting, organizing and synthesizing scientific information and presenting it to an attending audience. The students critically analyze the role of arthropods as vectors of pathogens, or as parasites, causing disease in humans. The principles involved will be illustrated with examples from selected diseases. The interaction of host and parasite and the dynamic nature of the epidemiologic system will be stressed.

Teaching Strategy

Encourage and reinforce in-depth literature review by students, supervision and guidance in literature search and consultation in identifying topic for review, guidance on how to write a review paper, guidance on how to present and defend a review paper.

Assessment criteria: Quality and competence of both written (70%) and oral presentation (30%) of the review paper.

9.14. MSc Thesis

Course Code: PVEDC 712

Credit Hr: 6

Prerequisite: Seminar, Research Methods & Scientific Communications

The overall goal of the thesis is to provide students with comprehensive and deep knowledge of in the field of medical entomology for disease control. The thesis work also provide skills in following and analyzing current research practices in the field of vector borne disease control as well as the necessary abilities for lifelong learning and continuous development of their own professional competence. It is also important to develop and demonstrate the students' ability to apply research data, to use selected methods for analyzing and solving problems and to carry out research work independently.

Course Objectives

The learning of the course will enable students to

- transform an international health/disaster management issue into a research question,
- identifying the nature of the problem, as well as the process needed to solve it
- choose appropriate research methods
- collect necessary data/information and critically analyze, review and interpret one's own research and the relevant literature
- draw conclusions as to the nature of the problem and how to solve it
- present well argued and referenced recommendations as to future practice(s) in the field of medical entomology and vector borne disease control
- manage and plan the thesis writing process within the given time frame
- where relevant, include feedback and practical policy implications for local authorities (if research is based on local data) to contribute to improvements at the local level

Teaching Strategy /Methods

Encourage and reinforce in-depth literature review by students, supervision and guidance in laboratory and / or field data collection, advice and consultation in data organization and analysis, guidance on how to write a thesis, guidance on how to present and defend a thesis.

Assessment criteria: Quality and competence of both written and oral presentation of the thesis.

10. Grading Scheme

The program operates a credit system which is consistent with the Higher Education Credit framework for Ethiopia and Arba Minch University. Grading is also based on the AMU legislation as indicated bellow.

Mark Interval-[100 %]	Corresponding Letter Grade
[90,100]	A^+
[85, 90)	A
[80, 85)	A^-
[75, 80)	B^+
[70, 75)	B
[65, 70)	B^-
[60, 65)	C^+

[50, 60)	C
<50	F

11. Resources and facilities required to properly run the program

The sustainability of the program depends on available infrastructure, available human resources, and funds to run the programmes. Most of the infrastructures are already in place and many post graduate programmes are functioning well. We plan to strengthen the existing entomology

laboratory with real time PCR machines which are essential to do a public health research and strengthen teaching programmes.

12. References

1. WHO: **World Malaria Report 2010. Geneva: World Health Organization.** 2010
2. Service M: ***Medical Entomology for students*** *Third edition, Cambridge university press* 2004**:**285.
3. Tulu A: **The Ecology of Health and Disease in Ethiopia. In: Malaria. Edited by Kloos H, Zein AZ.** 1993**:**341-352.
4. Ulrich JN ND, Alimi TO, Muller GC Beier JC: **How much vector control is needed to achieve malaria elimination? .** *Trends Parasitol* 2013, **29:**104-109.