BSC 426/526 Medical Entomology Syllabus, Fall 2018

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4 Credit Hour course. Meeting times: Tu Th 5:00 to 8:00 PM.
Text: Kettle, D. S. Medical and Veterinary Entomology

Course Overview: "Entomology" is the general study of insects, with "Medical Entomology" focusing on those relatively few insect groups that transmit pathogens to humans. The United Nations Development Program, the World Bank, and the World Health Organization established the Special Program for Research and Training in Tropical Disease. In 1975 this agency identified the world's most intractable human diseases as malaria, African trypanosomiasis, American trypanosomiasis, leishmaniasis, filariasis, schistosomiasis, and leprosy. Interestingly, the first five of those diseases are transmitted by insects, or another way of thinking about it is, those diseases literally affecting hundreds of millions of people worldwide could not exist without their arthropod "delivery systems."

To that list of "intractable" diseases, we might add the "arboviruses", or arthropod borne viruses, like yellow fever and dengue fever, and other "hemorrhagic" viral diseases. And we may experience an increase in the incidence of these diseases in human populations because global warming trends provide added aquatic habitats for arthropods that serve as the transmitting agents (i.e., vectors) of such etiologic (disease-causing) agents.

The term "medical entomology" is, however, a misnomer because acarines (ticks and mites) often serve as important vectors of pathogenic agents. The term "medical" can be misleading too, because many of the pathogens linked to diseases we will discuss are often found in populations of domestic and wildlife animals (i.e., "reservoir" animals) as well as humans. Diseases of animals that can be transmitted to humans are referred to as zoonotic diseases, or zoonoses (sing. zoonosis)). This "reservoir animal" concern is great enough in West Virginia for the state to have developed a Zoonosis Task Force under the aegis of the Division of Surveillance and Disease Control in the WV Department of Health and Human Resources.

As a result of the complex relationships between pathogen, vector, reservoir and final host species, the science of medical entomology cannot be the realm of a single investigator. This science requires the expertise of many disciplines: medical and veterinary practitioners, entomologists and acarologists, virologists, mammalogists, statisticians, and even engineers who may be called upon to plan water drainage systems or reservoir (the water holding kind, in this case) construction.

In addition to studying insects (i.e., their identification and means of population growth and dispersal) of medical and veterinary importance, and the pathogens that they vector, we will focus on the practice of epidemiology. Epidemiology is the study of disease outbreaks, how, when and why those outbreaks occur, and how they may be controlled. It is, after all; ***"…naïve to try to control an infection without knowledge of how the infectious agent reproduces and gets from one individual to another."***

Ecologists and environmental biologists have an important role to play in the study of medically important arthropods, and these scientists should be acutely aware of

how human activities affect diseases associated with such arthropods. For example, in Brazil, where the World Bank loaned the Brazilian government funds to pave highways into the Amazon region to settle poor urban workers for farming, malaria increased and spread to new geographic areas as workers returned to the cities after their farms had failed.

Learning Objectives: The aim of this course is to provide students – in lecture and laboratory settings – with the skills to identify various insect vectors by their morphology. In addition, we will study the life histories of certain important insect vectors, and how insect populations can be controlled.

Content: To gain an overall understanding of medically important arthropods in terms of:

- The relation between morphology, physiology and habitat;
- The function of major organ systems in various groups;
- Their life histories (i.e., strategies for survival…feeding, reproduction, excretion, sensory perception of their environment);
- Principles of epidemiology/epizootiology;
- Surveillance and control methodologies.

Critical Thinking: To improve students' ability to think critically about the role(s) of arthropods in the ecosystem; especially their role(s) in human and animal disease.

Lecture: Lecture sessions generally make up half of any given scheduled class period. The course begins with introductory remarks on animal associations (i.e., symbioses) and some basic epidemiologic and immunologic principles. After those introductory sessions we begin by examining the various acarine groups, followed with a treatment of insects.

Lab: The purpose of the laboratory sessions is really quite straightforward; to actually see organisms that we have talked about in lecture sessions. This observation experience will be presented through PowerPoints and hands-on microscopic work. Microscopic work is especially important as it provides the student first hand experience at diagnosing various arthropods representing diverse groups in a diagnostic laboratory setting. It is, for example, essential for one to be able to differentiate between the various species, or kinds, of mosquitoes because some are vectors of pathogens, whereas others are not.

Exams: There will be an exam on introductory principles and acarines. This **initial exam** may include an "on-line" component dealing with morphological structures of acarines (i.e., ticks & mites). Since lecture and laboratory studies are closely integrated the exam will cover both lecture and laboratory material that has been presented in class.

The **second exam** will cover identification of insects in the Order Diptera (i.e., flies and mosquitoes) that vector pathogens of major medical and veterinary importance (e.g., malaria, trypanosomiases, onchocerciasis). This exam will also have both lecture and lab components based in part on PowerPoint presentations.

The **third exam** will cover identification of various groups of insects, exclusive of the Order Diptera (e.g., fleas, lice), important to the medical or veterinary practitioner. This exam will have both a lecture component and a lab component, the latter being based primarily on PowerPoint slides featuring morphological features of these insects.

And finally, a **fourth exam** will cover pathogenic agents (e.g., malarial, leishmania and bacterial etiologic agents) and the diseases associated with these vectors/etiologic agents. This exam will be based on material presented in lecture sessions, and on identifications of selected etiologic agents observed in laboratory sessions.

Note: All make-up exams will be given at a time agreed upon by the instructor and student making up the exam. If scheduling of a make-up exam (date/time) becomes a problem because of conflicts between the student's schedule, and that of the instructor, then the make-up exam will automatically go to 10 AM on study day (Dec. 12th) of exam week. Only one make-up exam can be allowed for a student.

Bonus points: Students will have opportunities to earn bonus points throughout the semester (you'll get your first opportunity on the first class day). These opportunities come in a variety of ways, like: (1) something "new", pertaining to the class, found by a student who can earn points identifying what he/she has found; (2) showing the instructor something he hasn't seen before (and there's lots of that); (3) finding an insect or acarine that isn't already in our medical/veterinary collection, or a specimen that is better than the one(s) we have in the collection; or (4) providing answers to problems occasionally provided by the instructor. These points can be used to the student's advantage in one of two ways. **First**, you may let your point total accumulate throughout the semester to the point where you can use those points to "opt out" of any exam (or replace the score of an exam where you didn't perform well). **Second**, you can divide your point total in half and use that point value to add to the score of a single exam. (Note: One cannot earn more than 100 pts for any given exam).

Other Course Components: If the opportunity* presents, we will introduce a "forensics component" into the course materials. This will be scored as a chance for the student to earn bonus points, and, as such, would be added to the points earned on exams.

*we find a good road kill

Grading:	Exam 1 (introduction; ticks & mites)	100 pts
	Exam 2 (dipteran insects)	100
	Exam 3 (non-dipteran insects)	100
	Exam 4 (diseases; pathogens)	100
	Course Total	400 pts*

*Students enrolled in BSC 526 will have a higher total (not to exceed 460 pts). This total will come about by additional questions on regularly scheduled exams.

90% to 100% of Total points = A
80% to 89.9% of Total points = B
70% to 79.9% of Total points = C
60% to 69.9% of Total points = D
< 60% of Total points = F

When will we have our exams? Fair question. There are no set dates because, for one, any forensics component inserted into the instructional schedule would alter exam times. Still, you might consider the following tentative exam dates as you plan your semester.

Exam 1 – Sep 13th
Exam 2 – Oct 16th
Exam 3 – Nov 13th
Exam 4 – Dec 11th

Attendance Policy: There is none; you are adults and able to determine what is in your best educational interests (and you've paid for the class sessions, but I digress). I offer, however, one observation, based on 42 years of teaching a variety of classes populated by both undergraduate and graduate students. And that is that grades are HIGHLY correlated with class attendance. You may get by on the notes of classmates taken in your absence in a few instances, but there is no substitute for your own notes, hearing the lectures, examining and discussing the materials studied in lab. I cannot overemphasize the fact that grades are HIGHLY correlated with class attendance…..oh, I said that (but redundancy is not always a bad thing). And remember, we practice the "Fair Game Blackboard Rule", which is, that if I write something on the blackboard (even if you've left lab early) it is "Fair Game" on an exam.

Electronic Devices: The West Virginia Symphony Orchestra (and many others too, I'm confident) require that all electronic devices (i.e., calculators, laptop and handheld computers, instant messaging devices, PDA's, cell phones, pagers, data-bank watches, etc.) be turned off during performances. It is a good rule because such devices can be disruptive to the performers and to those seeking to enjoy the performance. Because it is a good rule it will be applied in our classroom setting to curtail disruption while we are studying.

Goals of the Course: In these days of "modern biology" more and more students are graduating from our institutions without any instruction on arthropod groups beyond what they have gleaned from sections of lectures (and part of one lab) in introductory biology. As a result, this may be your only exposure to a thorough treatment of the extensive diversity of arthropods. My objective in teaching this class is to ensure that you learn to appreciate this biological diversity, and learn how to identify medically important arthropods, based on certain key features, even if you have not seen them before.

Miscellaneous: If you have a learning disability and require special teaching or testing conditions, please see the instructor during the first week of class so that the appropriate arrangements can be made.

And one Final Note: This syllabus is provided as a guide for the convenience of the student. It does not constitute a legally binding contract between the student and the instructor. Engaged students often ask questions that are not a part of the syllabus, or some current event takes place that cries out for discussion. I try to accommodate such questioning/discussion, encourage it in fact, and so we cannot be locked into a rigid system of compliance when there is a need for “critical discussion” as well as “critical thinking.” As a result, the instructor reserves the right to change the lecture/lab sequence and exam dates (with the exception of the Final Exam) during the course of the term. Any such changes will be announced in class, giving students sufficient time to make the necessary accommodations.