
ENTO/VIBS 426/626

Methods in Vector-borne Disease Ecology

Overview

Vector-borne diseases (VBDs) represent one of the fastest growing threats to human and animal population health. Patterns of climate change, global travel, urbanization, and species invasions suggest that VBDs will continue to challenge populations in both developed and developing countries. The One Health initiative calls for a synergy of efforts to protect human, animal, and ecosystem health, utilizing approaches from veterinary and human medicine, environmental science, and other disciplines. Because vectors and the pathogens they transmit often bridge humans, wildlife, and domestic animals, a One Health approach provides a useful framework for their research and management. In this course, we aim to equip future medical practitioners, public health officials, entomologists, disease ecologists, and biomedical researchers with a methodological understanding of how VBDs are studied in the field and laboratory. The emphasis will be hands-on activities to explore the ecology of disease systems, and we will utilize a One Health framework to guide lectures, field labs, and research projects. Students will apply course concepts to design, conduct, and present small group research projects.

Prerequisites: Undergraduate students must be Junior or Senior classification. No graduate prerequisites.

Learning Outcomes- ENTO/VIBS 426

- Demonstrate field and lab techniques used to study vector-borne disease.
- Identify vectors of disease.
- Relate the relevance of vector-borne diseases to the One Health initiative.
- Design a course project from 'start to finish', including data collection in the field and lab and dissemination of results to an audience.

Additional Learning Outcomes- ENTO/VIBS 626

- Evaluate published studies in a research area.
- Produce a manuscript based on original research that is suitable for peer-review and publication in a scientific journal.

Spring 2017; 3 credit hours

Lecture/Lab:

Mon and Wed

8-10:50am; HPCT 210

Field trips: Various times and locations

Co-Instructors

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Enrollment

Due to enrollment capacity of 15, enrollment is exclusively through an application process. Instructors will select enrollees based on:

1. Ratio of undergrad/graduate students to facilitate projects
2. Diversity of majors to provide complementary expertise and allow a focus on One Health
3. Career aspirations
4. Flexibility to participate in activities outside lecture/lab

Materials

Required Text: None

Readings: Available electronically through eCampus website

Notebooks: Two notebooks are required (one for field, one for lab)

Disease Detective Course Project

Students will select one of three pre-determined research topics and engage in hypothesis generation and study design, field-based sample collection, lab-based molecular diagnostics, and data analysis throughout the semester. Projects will be conducted in small groups with a graduate student leader. Teams will prepare an oral presentation to deliver at the end of the semester. Additionally, graduate students will prepare a manuscript including literature review. In some cases, these manuscripts could be submitted for publication, pending contributions of students beyond the expectations of the semester-long course.

Field Research Experiences

A series of field-based experiences are planned to expose students to vector and host populations in their natural environments. Because these experiences will include hands-on processing of vertebrate species (wild birds, rodents, etc), all students will be required to complete animal use trainings as required by the TAMU Institutional Animal Use and Care Committee (IACUC). Due to activity patterns of vectors and hosts, and travel to various field sites, not all such experiences can be attained within the restraints of regularly-scheduled class periods. Accordingly, some experiences will require meeting at night, early morning, or during weekends. Prior to any off-campus activity, students will be required to complete travel authorization forms with emergency contact information, and instructors will attain approval of department heads. Additionally, students will register with the Biosafety and Occupational Health Program and complete Blood-borne Pathogen Training.

Photo Policy

We want you to enjoy the hands-on field and lab work we will conduct this semester, and we invite you to take photographs of your experiences to share with others. While all the work we do will uphold to strict protocols and humane treatment of animals, some photos taken out of context may be confusing to those not involved with our class. Therefore, you must obtain oral or written consent from instructors before distributing or posting to social media any photos taken of class activities.

Laboratory Research Experiences

Analysis of field-collected biological specimens in vector-borne disease ecology research often occurs within the laboratory. Students will gain proficiency with common research techniques and laboratory equipment used to study vectors and pathogens. Because the biological samples with which we will work pose health risks, all students will be required to complete Biosafety Level 2 training.

Career Opportunity Guest Lectures

Guest lectures are planned to feature different professionals who focus in vector-borne diseases. Invited speakers may include medical entomologists or zoonosis control veterinarians from the state health department, military entomologists, academic researchers with expertise in particular disease systems, or others. Each guest speaker will show the real-world application of the concepts learned in class, and asked to share their educational background and career path.

Evaluation: A=90–100%; B=80–89%; C=70–79%; D=60–69%; F=<60%

ENTO/VIBS 426: A total of 200 points are available

ENTO/VIBS 626: A total of 300 points are available

- **Attendance and participation in class discussions (25 pts).** Students will receive 0.5 pts for attending each session and 0.5 pts for participating in each session. Participation includes discussion, engaging with guest lecturers, asking and answering questions, and hands-on work in the field and lab.
- **Quizzes (50 pts) and maintenance of field/lab notebooks (25 pts)**
- **Disease Detective course project (100 pts)**
- **The additional requirement of graduate students will be a manuscript (100 pts)**

Late Policy: Late assignments will have a 10% deduction in points for up to 1 week, after which no credit will be issued, except in the case of a University excused absence.

Attendance

Both the university and instructors view class attendance as an individual student responsibility. Your grade will be based in part by attendance and participation. After four absences for lectures or labs, students will have five points deducted from the attendance points for each additional absence. Make-up experiences/assignments for class activities that occur outside the scheduled meeting times will be available within reason. Absences will be excused as per TAMU Student Rule #7 (<http://student-rules.tamu.edu/rule07>).

ADA Policy Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit <http://disability.tamu.edu>.

Academic Integrity Statement

The Texas A&M University Honor Code, based on the long-standing affirmation that “An Aggie does not lie, cheat, or steal or tolerate those who do” is fundamental to the value of the A&M learning experience and requires that Aggies will not involve themselves in any form of academic dishonesty. According to the Office of the Aggie Honor System, academic dishonesty consists of cheating, fabrication, falsification, multiple submission, plagiarism, and multiplicity. Clarification of each of actions may be found at the Aggie Honor System website at <https://aggiehonor.tamu.edu/>. This list, however, is not exclusive of any other acts that may reasonably be termed academic dishonesty. The penalty for a violation of academic dishonesty in this class shall be an “F” in the course and filing of an Honor Code Violation Report with the Office of the Aggie Honor System. Less severe penalties may be imposed if the circumstances warrant.

SCHEDULE IS SUBJECT TO CHANGE

Week	Lecture/Lab Topics	Outside of classroom activities
1	<ul style="list-style-type: none"> • Introductions • Course overview • Presentation of group project topics • Compliance <ul style="list-style-type: none"> • BSL2 training video • Animal Use training web class • Emergency info collected for online form 	BSL2 training: Video: http://mediamatrix.tamu.edu/streams/521371/BL2_with_title Animal Use training: 'Working with the IACUC' course in CITI website; see eCampus for registration details
2	<ul style="list-style-type: none"> • Biosafety and Occupational Health compliance <ul style="list-style-type: none"> ○ Complete BOHP initial screening questionnaire ○ Blood-borne pathogen training course provided by Sherri Koepnick ○ Optional form for Hepatitis B vaccination. 	
2	<ul style="list-style-type: none"> • Vector sampling methods 	
3	Field Trip to Lick Creek Park for avian mist-netting, banding, and blood collection; tick drag sampling	Meet at Lick Creek Park instead of coming to class. Time/car pool to be determined.
3	Guest Lecture: Texas Department of State Health Services.	
4	<ul style="list-style-type: none"> • Vertebrate host sampling • Submit Disease Detective project preference 	
4	Field Trip to Biodiversity Research and Teaching Collections (BRTC) for mammal trapping, blood and tissue collections	Evening- set mammal traps at BRTC. Meet at BRTC instead of coming to class. Time/car pool to be determined. Grackle trapping in Kroger parking lot
5	Identification of major arthropod vectors; microscopy; mounting; dissection	
5	<ul style="list-style-type: none"> • Quiz 1 • Vector-borne diagnostics: molecular, virology, parasitology and serological diagnostics 	Grackle trapping
6	Field Trip to Sam Houston National Forest for tick collections	Camp at Stubblefield Recreation Area, Sam Houston NF, Huntsville, TX
6	NO CLASS	Grackle trapping
7	<ul style="list-style-type: none"> • Blood meal Analysis 	
7	<ul style="list-style-type: none"> • Spatial Epidemiology • Guest lecture/lab: Harris County Public Health & Environmental Services: Geographic Information Systems 	
8	Flex time; topic to be determined	Grackle trapping
8	Guest Lecture: State Medical Entomologist, Texas Department of State Health Services	Camp at Stubblefield Recreation Area
<i>SPRING BREAK</i>		

9	<ul style="list-style-type: none"> • Course updates • Selected hot topics in vector-borne disease epi • Chemical immobilization of wildlife 	
9	Guest Lecture: Wildlife Disease Ecology	Grackle Trapping Camp at Stubblefield Recreation Area
10	<ul style="list-style-type: none"> • Quiz 2 • Epidemiological modeling • Vectorial capacity 	Grackle Trapping and mosquito trapping at roosts
10	Group planning/writing time. Draft Introduction section of manuscript due via email by end of class Mosquito identification from various traps deployed the night before.	Subset of students collect mosquito traps during class time Camp at Stubblefield Recreation Area
11	Dedicated Lab Time: Sam Houston group <ul style="list-style-type: none"> • Tick ID and photography • DNA extractions from ticks, ear biopsies, blood • PCRs for tick-borne pathogens <ul style="list-style-type: none"> ○ <i>Borrelia</i> genus ○ <i>Rickettsia</i> genus ○ <i>Ehrlichia</i> genus • Gel electrophoresis • DNA sequence preparation • Sequence analysis 	
11	Dedicated Lab Time: Grackle Hemoparasite group <ul style="list-style-type: none"> • Staining and screening of blood films • DNA extractions from blood • PCRs for hemoparasites <ul style="list-style-type: none"> ○ Filarial nematodes ○ Trypanosomes ○ Avian malaria • Gel electrophoresis • DNA sequence preparation • Sequence analysis 	Overnight trip to Mad Island Marsh Preserve in Matagorda Co. (plan to camp; bunk house if needed) <ul style="list-style-type: none"> • Assessment of exotic ticks arriving on spring migratory birds • Small mammal trapping • Saturday evening field guest lecture
12	Guest Lecture: CDC-NCEZID Division of Vector-borne Disease, Ft. Collins, CO	Grackle and mosquito trapping with Komar Subset of students to collect mosquito traps, identify mosquitoes
12	Dedicated Lab Time: Grackle WNV group <ul style="list-style-type: none"> • ELISA for WNV antibody detection 	Camp at Stubblefield Recreation Area
13	Guest lecture, 9am start time: US Army Medical Command at Fort Sam Houston, TX. Revised Introduction, Draft Methods, outline of Results and Discussion of manuscript due via email by end of day	
13	Insect Radio-telemetry! ***Bring large bugs to class as candidates for transmitters!*** Glue on radio-transmitters; release around Heep Center	Students and instructors will attempt to relocate the bugs using telemetry
14	<ul style="list-style-type: none"> • Quiz 3 • Revised Introduction, Draft Methods, outline of Results and Discussion due via email by end of day 	Telemetry, opportunistically
14	LAST CLASS: Course Evaluations; Presentation of Disease Detective Research Projects; Food party	
	Prep/Reading Days- No class meeting	

****There will be NO FINAL EXAM during finals week for ENTO/VIBS 426/626****