

Seminar in Insect Microbiome
ENY 6934, 1 credit
Spring 2018

Instructor: Dr. Adam CN Wong
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Class period: Thursday, periods 7-8 (1:55 – 3:50)

Room: 1027 Steinmetz Hall and by Polycom

Office hours: Immediately after class and by appointment

Course Description:

Like all animals, insects are associated with a wide variety of microorganisms, collectively termed “the microbiome”. In this course, we will walk through the journey of a recent revolution in biology, i.e. the rise of omics technologies (especially highthroughput sequencing) and big data science that accelerate new understanding of insect-microbiome interactions and its relevance in basic science, agriculture and medicine. We will discuss key literature on the latest technological advances and discoveries concerning microbiome impacts on insect ecology and evolution, physiology, behavior and biocontrol. Additionally, students will have the opportunities to review research methods and give an oral presentation on a specific topic related to insect-microbiome interactions.

Learning Objectives:

- Define the different terms used in microbiome science
- Appreciate the diversity of microorganisms associated with insects
- Differentiate modes of insect-microbe interactions, from mutualism to pathogenesis
- Describe the working principles of highthroughput sequencing and other omics techniques (proteomics, metabolomics)
- Explain the advantages and limitations of different highthroughput sequencing platforms.
- Discuss the impacts of microbiome on various aspects of insect ecology and physiology
- Gives examples of microbes as biocontrol agents for insects
- Propose a novel or improved microbial-based strategy to manage insects
- Critique different research methods used in insect microbiome studies
- Practice delivering a 30-minute teaching-style presentation

Topics to be covered:

The course will be divided into two parts: during the first five weeks of class, the instructor will introduce students to the field of insect microbiome. Each class will comprise a 20-25 minute seminar by the instructor and/or guest speakers on relevant literature, followed by Q&A and group discussions.

In the second part, student will choose a broad topic of insect microbome (basic science, technological advance or applications, a new proposal of microbial-based insect control tactic) and prepare a 30-

minute presentation on the topic based on related publications, followed by questions and feedback by peers in audiences.

Readings to supplement the lectures will be posted online in Canvas (<https://lss.at.ufl.edu/> - click on e-Learning in Canvas), and listed below for each week.

January 11 Symbiosis: from endosymbionts to gut microbiome

Readings

1. Douglas AE. 2011. Lessons from Studying Insect Symbioses. *Cell Host Microbe*. 10(4): 359–367.
2. Engel P and Moran NA. 2013. The gut microbiota of insects - diversity in structure and function. *FEMS Microbiol Rev*. 37(5):699-735.
3. Feldhaar H. 2011. Bacterial symbionts as mediators of ecologically important traits of insect hosts. *Ecol. Entom.* 36: 533-543.

January 18 Omics in microbiome research

Readings

1. Shi et al., 2010. Molecular approaches to study the insect gut symbiotic microbiota at the 'omics' age. *Insect Sci*. 17(3): 199-219.
2. Chaston J. 2012. Making the most of "omics" for symbiosis research. *Biol Bull*. 223(1):21-9.
3. Preidis G and Hotez P. 2015. The Newest "Omics"—Metagenomics and Metabolomics—Enter the Battle against the Neglected Tropical Diseases. *PLOS Negl. Trop. Dis*. 9 (2), e0003382.

January 25 Microbiome impacts on insect biology

Readings

1. Wong AC et al. 2014. Gut microbiota dictates the metabolic response of *Drosophila* to diet. *The J Exp. Biol*. 217 (11), 1894-1901.
2. Weiss B and Aksoy S. 2011. Microbiome influences on insect host vector competence. *Trends Parasitol*. 27(11): 514–522.
3. Lewis B and Lize A. 2015. Insect behaviour and the microbiome. *Curr Opin Insect Sci*: 9: 86-90.
4. Hulcr J and Stelinski LL. 2017. The ambrosia symbiosis: From evolutionary ecology to practical management. *Annu Rev. Ent.* 62, 285-303.

Guest speaker – TBA.

February 1 Microbes in insect management

Readings

1. Crotti E et al., 2011. Microbial symbionts: a resource for the management of insect-related problems. *Microbiol. Biotechnol*. 5(3): 307-317.
2. Tabashnik et al., 2013. Insect resistance to Bt crops: lessons from the first billion acres. *Nature Biotechnology*. 31: 510-21.
3. Usta. 2013. Microorganisms in Biological Pest Control — A Review (Bacterial Toxin Application and Effect of Environmental Factors), *Current Progress in Biological Research*, Dr. Marina Silva-Opps (Ed.), InTech, DOI: 10.5772/55786.

Guest speaker – Dr. Kirsten Stelinski, Associate Professor UF/IFAS Citrus Extension.

February 8 Genetically-engineered microbes: what is the buzz?

Readings

1. Dutra HL et al., 2016. Wolbachia Blocks Currently Circulating Zika Virus Isolates in Brazilian *Aedes aegypti* Mosquitoes. *Cell Host Microbe*. 8;19(6):771-4.
2. Wang et al., 2017. Driving mosquito refractoriness to *Plasmodium falciparum* with engineered symbiotic bacteria. *Science*. 375(6385): 1399-1402.
3. Arora AK and Douglas AE. 2017. Hype or opportunity? Using microbial symbionts in novel strategies for insect pest control. *J. Insect Physiol.* 103: 10-17.

February 15 Critical review of insect microbiome literature and student presentation

Student Presentation Dates

February 15
February 22
February 24
March 1
March 8 – Spring Break – no class
March 15
March 22
March 29
April 5
April 12

Student Presentation Topics

Student presentations will begin on February 10. 2-3 students will present per week depending on how many students are in the class. Below are the topics to choose from, on a first come first serve basis (max. of 2 students per topics). If you have difficulty with any of the topics and want to propose a new topic, please consult with me.

- Diversity and selection of insect microbiome
- Genetically-modified microbes in insect control
- Insect-microbe co-evolution
- Insects as biomedical models for microbiome research
- Mechanisms of insect pathogens
- Microbes and insect behavior
- New omics methods in insect microbiome research
- Role of microbiome in insect nutrition
- Role of microbiome in insect invasion
- Proposal of a novel microbial-based strategy in insect management
- Ethics of insect controls using microbes.

After each student presents, all students in the audience shall fill in the evaluation form and turn it in before the end of class.

Prerequisites: Basic course in entomology (ENY 3005).

Textbook (Recommended): Angela E. Douglas. 2010. The Symbiotic Habit. Princeton University Press.

Assignments and Grading policies:

Final grade of the course will be determined as: 30% in attendance; 40% in the 30-minute presentation, 20% in providing peer evaluations (by filling in evaluation forms) and 10% in class discussion. Grading scale will be as:

A	94-100
A-	90-93.9
B+	87-89.9
B	83-86.9
B-	80-82.9
C+	77-79.9
C	73-76.9
C-	70-72.9
D	60-69.9
E	<59.9

More details can be found from the UF policies:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Attendance. An attendance sheet will be provided in each class for students to sign in. Students are required to attend all classes. A 10% grade reduction will be given for each missed class unless due to exceptional circumstances (e.g. family or personal medical emergencies).

“Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Critical Dates for Exams or related assessment: Student presentations will begin on February 15th. We will draw numbers to determine presentation order at end of the class on February 8th. You can switch dates with another student but do inform me in at least 1 week in advance. Peer evaluation forms shall be turned in after each student presentation class unless you miss the class. Failure to turn in the evaluation forms will result in 10% deduction in the final grade.

Absences and Make-Up Exams or Other Work: Missed presentations cannot be made up except in the case of exceptional circumstances mentioned above. Attendance and Make-Up Work Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Academic Courtesy / Class Rules:

- Respect the instructors and guest lecturer; call them by their title (e.g. Dr Wong).
- Keep cell phones on silence mode during lectures and discussions.

- Aside from laptops, no other electronic devices such as iphone will be permitted in class, unless a prior permission has been granted by the instructor.
- No food or drink will be allowed in class.
- Discussions about grade shall be made during office hours (not in class).

Online course evaluation:

Student assessment of instruction is critical to improve our teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.

Additional General Information:

Each student in the course is expected to abide by the UF Code of Academic Integrity.
<https://sccr.dso.ufl.edu/students/student-conduct-code/>

The following information applies to all courses at the University of Florida.

We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standard of honesty and integrity.

Academic Integrity and Plagiarism: As a result of completing the registration form at the University of Florida, every student has signed the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."

Copyrighted Materials and Software Use: All students are required and expected to obey the laws and legal agreements governing copyrighted material and software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

Accommodations for Students with Disabilities: Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/. The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues.

University Counseling Services: Resources are available on-campus for students having personal problems or lacking clear career and academic goals which interfere with their academic performance. These resources include:

1. University Counseling Center, 301 Peabody Hall, 392-1575, personal and career counseling.
2. Student Mental Health, Student Health Care Center, 392-1171, personal counseling;
3. Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161, sexual counseling.

4. U Matter We Care, www.umatter.ufl.edu/Links to an external site.
5. Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

Student Complaints:

1. Residential Course: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdfLinks to an external site.
2. Online Course: <http://www.distance.ufl.edu/student-complaint-process>Links to an external site.

Peer Evaluation Form of Oral Presentations

Student name _____

Presenter's talk Title _____

Presentation components	Grade 1.....10 poor....excellent	Comments
Scientific Content (40%) – <ul style="list-style-type: none"> • Introduction & background with pertinent literature cited (10 points) • Objectives of the study clearly described (5 points) • Materials & methods (study design) clearly described (10 points) • Results & discussion clearly described (10 points) • Significance of findings clearly described (5 points) 		
Organization (10%) <ul style="list-style-type: none"> • Logical orders, minimum redundancy (5 points) • Smooth transitions between presentation slides (5 points) 		
Delivery (20%) <ul style="list-style-type: none"> • Clear & audible speech (10 points) • Eye contact with audience (5 points) • Effective use of figures and/or tables (5 points) • Effective use of time (5 points) 		
Q&A and Discussion (10%) <ul style="list-style-type: none"> • Demonstrate a strong knowledge on the topics (5 points) • Handle the questions with confidences (5 points) 		
Slides (10%) <ul style="list-style-type: none"> • Legible with large fonts, color contrast, no conflicting backgrounds (5 points) • Text with no grammatical errors; not excessively wordy (5 points) 		
Interest (10%) <ul style="list-style-type: none"> • The talk stimulates my interests in the subject (10 points) 		