

PCB3402 Disease Ecology & Evolution (Fall 2023)

Course Description

Disease Ecology and Evolution is an integrative course that focuses on both sides of the host-pathogen relationships. I built this course based on the One Health approach which considers that human health is closely connected to animal and ecosystem health. Thus, we rely on primary literature to discuss the latest cases of wildlife diseases, changes in host susceptibility, and theoretical approaches to study disease ecology and evolution. Although the course does not have sharp divisions into units, we focus on the first half on evolutionary topics, and then discuss topics related to ecology and the environment. Our topics for the evolution part include: evolution of defense strategies, which includes both host and pathogens; trade-off theory, red-queen dynamics. Then we transition to topics about species interactions such as: sequence and timing of infections, the mathematical concept of superspreaders, disease networks, diversity disease relationships, seasonality and disease dynamics, and microbiomes. We discuss examples from different types of infections and diseases caused by viruses, bacteria, and parasites. We integrate concepts of community ecology to understand changes in the force of infection through time and space. Disease Ecology and Evolution also offers active learning activities using the R statistical language. This course contributes to broadening the perspective of our future health practitioners and scientists studying outbreaks.

Pre-requisites and Co-requisites

No pre-requisites or co-requisites

Instructor

Ana V. Longo, PhD
Department of Biology
Office Location: 412 Carr Hall
Office Hours: Thursdays 9:30 AM – 10:30 AM (see below).
Phone: 352.273.4982
Email: ana.longo@ufl.edu

Preferred Methods for Public and Private Communications

*Canvas mail should be used for all course-related communications. I will **NOT** answer emails from external accounts (e.g., GMAIL).*

Note: Participation in Canvas Discussions is considered a public conversation within the class.

Course Meeting Times (Periods 2 and 3)

Location: CRR 0521

Tuesdays: 8:30 AM – 10:25 AM

Thursdays: 8:30 AM – 9:20 AM

Office Hour Policies

Drop-in Office Hours will be on Thursdays 9:30 AM – 10:30 AM. I understand that these times might not work for everyone, therefore contact me to explore other options. Please use this website to schedule your meeting:

<https://outlook.office365.com/owa/calendar/UFL2@uflorida.onmicrosoft.com/bookings/>

If you choose to meet via ZOOM, please use this link for our meetings:

<https://ufl.zoom.us/j/97571004054>

Meeting ID: 975 7100 4054

*Requires authentication to join: UFL Participants Only.

Course Objectives

After successfully completing this course, students will be able to:

1. Compare and contrast major infectious diseases in plants, animals, and humans.
2. Understand how species can persist with pathogens/parasites.
3. Analyze case studies and identify the ecological and evolutionary factors promoting disease emergence.
4. Apply concepts from ecology and evolution to mitigate disease emergence or control spread of infectious diseases.
5. Communicate infectious disease information to broad audiences.
6. Find reliable sources of information about infectious diseases.

Course Textbook (s) and/or Assigned Readings

This course does not have an assigned textbook. Reading material will be available on Canvas.

Grading

Learning Activities: 25 points each x 5 = 100 points (includes option to drop 1)

Quizzes: 25 points each x 5 = 100 points (includes option to drop 1)

Class Project: 100 points

Total: 300 points

Grading Scale

Total points will be rounded (for example: 94.4% = 94% = A-; 94.5 % = 95% = A).

Percent (out of 100)	Grade
≥95-100	A
≥90	A-
≥87	B+
≥85	B
≥80	B-
≥77	C+
≥75	C
≥70	C-
≥67	D+
≥65	D
≥60	D-
<60	E

Information on current UF grading policies for assigning grade points can be found in

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

Class Attendance and Make-Up Policy

Participation in the class will contribute to your success in the course. Class time provides an extremely valuable opportunity to interact with me and your classmates.

Excused absences are consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation.

Late assignments will not be accepted. I will offer 5 learning activities and 5 quizzes, but you will only need to complete 4 of each. If you complete all 5, I will drop the lowest score. This policy allows for flexibility and maintains structure. I will ask no questions if you miss a quiz or learning activity. No extra assignments will be provided.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. [Click here for guidance on how to give feedback in a professional and respectful manner](#). Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via ufl.bluera.com/ufl/. [Summaries of course evaluation results are available to students here](#).

COVID-19 Best Practices

Based on epidemiological parameters, the COVID-19 pandemic is still going on. The following practices are highly recommended to maintain your learning environment, to enhance the safety of our in-classroom interactions, and to further the health and safety of ourselves, our neighbors, and our loved ones:

If you are not vaccinated, get vaccinated. Vaccines are readily available and have been demonstrated to be safe and effective against the COVID-19 virus.

If you get sick, stay home and self-quarantine. Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work.

Online Privacy

Our class sessions may be audio/visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat is automatically recorded, but not shared. As in all courses, **unauthorized sharing of recorded materials without instructor/student knowledge is prohibited.**

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Class Demeanor

Students are expected to arrive to class on time and behave in a manner that is respectful to the instructor and to fellow students. Please avoid the use of cell phones. Opinions held by other students should be respected in discussions.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor.

Basic Needs, Counseling and Wellness Center

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact UF food pantry: <https://pantry.fieldandfork.ufl.edu> or the Dean of Students for support. If you or a friend is in distress, please contact umatter@ufl.edu or 352-392-1575 so that a team member can reach out to the student (<https://counseling.ufl.edu/>). Sexual Assault Recovery Services (SARS) available at Student Health Care Center 352-392-1161;

University Police Department: 392-1111 or 9-1-1 for emergencies.

Class Schedule

Week	Date	Class	Topic	Instructions	Reading Material (always confirm on Canvas)
1	Thurs Aug 24	1	Welcome and Class Introduction		
2	Tues Aug 29	2	Basic concepts in host-pathogen interactions		Owen, J.C., Adelman, J.S. & Henschen, A.E. (2021). 2 The Nature of Host-Pathogen Interactions. In: <i>Infectious Disease Ecology of Wild Birds</i> (eds. Owen, J.C., Hawley, DM & Huyvaert, KP). Oxford University Press, p. 7-24. Casadevall, A., and L. A. Pirofski. 2000. Host-pathogen interactions: basic concepts of microbial commensalism, colonization, infection, and disease. <i>Infection and Immunity</i> 68: 6511-6518.
	Thurs Aug 31	3	Immunity and Disease Ecology		Hedrick, S. M. 2017. Understanding Immunity through the Lens of Disease Ecology. <i>Trends in Immunology</i> 38:888-903.
3	Tues Sept 5	4	Learning Activity 1: Working with infection data in R	Make account in R Studio Cloud. Upload answers before Sun Sept 10, 12:00pm (25 points)	
	Thurs Sept 7	5	Evolution of defense strategies: Resistance and Tolerance		Schneider, D. S., and J. S. Ayres. 2008. Two ways to survive infection: what resistance and tolerance can teach us about treating infectious diseases. <i>Nature Reviews Immunology</i> 8:889-895.
4	Tues Sept 12	6	Learning Activity 2: Red-Queen Dynamics Card Game	Upload answers before Sun Sept 17, 12:00pm (25 points)	
	Thurs Sept 14	7	Brief recap and Quiz	Quiz #1 (25 points)	
5	Tues Sept 19	8	Measuring Host Specificity		Poulin, R. 2007. Chapter 3. Evolutionary Ecology of Parasites. Pages: 41-47.
	Thurs Sept 21	9	Sequence and Timing of Infections		Karvonen, A., J. Jokela, and A.-L. Laine. 2019. Importance of Sequence and Timing in Parasite Coinfections. <i>Trends in Parasitology</i> 35:109-118.
6	Tues Sept 26	10	Symbiont-mediated Immunity		Daisley, B.A., J.A. Chmiel, A.P. Pitek, G.J. Thompson, and G. Reid, Missing Microbes in Bees: How Systematic Depletion of Key Symbionts Erodes Immunity. <i>Trends in Microbiology</i> , 2020. 28(12): p. 1010-1021.
	Thurs Sept 28	11	Learning Activity 3: Analyzing Networks	Upload figures/discussion before Mon Oct 9, 12:00pm (25 points).	
7	Tues Oct 3	12	Disease Superspreaders		Martin, L. B. B. Addison, A. G. D. Bean, K. L. Buchanan, O. L. Crino, J. R. Eastwood, A. S. Flies et al. 2019. Extreme Competence: Keystone Hosts of Infections. <i>Trends in Ecology & Evolution</i> 34:303-314.
	Thurs Oct 5	13	Brief recap and Quiz	Quiz #2 (25 points)	
8	Tues Oct 10	14	Macroecological Patterns of Host Competence	Instructions for Final projects will be posted	Downs, C.J., L.A. Schoenle, B.A. Han, J.F. Harrison, and L.B. Martin, Scaling of host competence. <i>Trends in parasitology</i> , 2019. 35(3): p. 182-192.
	Thurs Oct 12	15	Landscape Genetics and Disease Risk		Archie, E. A., G. Luikart, and V. O. Ezenwa. 2009. Infecting epidemiology with genetics: a new frontier in disease ecology. <i>Trends in Ecology & Evolution</i> 24:21-30.

Week	Date	Class	Topic	Instructions	Reading Material (always confirm on Canvas)
9	Tues Oct 17	16	Global challenges in Wildlife Diseases		TBD
	Thurs Oct 19	17	Brief Recap and Quiz	Quiz #3 (25 points)	
10	Tues Oct 24	18	NO CLASS	Dr. Longo out of town @ invited seminar	
	Thurs Oct 26	19	Overview of Amphibian Diseases		Fisher, M.C. and T.W.J. Garner, Chytrid fungi and global amphibian declines. <i>Nature Reviews Microbiology</i> , 2020. 18(6): p. 332-343.
11	Tues Oct 31	20	Learning Activity 4: Analyzing diversity- disease data	Upload figures/discussion before Sun Nov 7, 12:00pm (20 points).	
	Thurs Nov 2	21	Brief Recap and Quiz	Quiz #4 (25 points)	
12	Tues Nov 7	22	Climate Change and Infectious Diseases 1		Lafferty, K.D., The ecology of climate change and infectious diseases. <i>Ecology</i> , 2009. 90(4): p. 888-900.
	Thurs Nov 9	23	Climate Change and Infectious Diseases 2		
13	Tues Nov 14	24	Seasonality and Disease Dynamics		Altizer, S., A. Dobson, P. Hosseini, P. Hudson, M. Pascual, and P. Rohani. 2006. Seasonality and the dynamics of infectious diseases. <i>Ecology Letters</i> 9:467-484.
	Thurs Nov 16	25	Learning Activity 5: Analyzing Seasonal Data	Upload figures/discussion before Mon Nov 28, 5:00pm (25 points).	
14	Tues Nov 21		Independent study Learning activity/Presentation: NO CLASS		
	Thurs Nov 23		THANKSGIVING BREAK: NO CLASS		
15	Tues Nov 28	26	One Health Concept and Eradication of Infectious Diseases	Quiz #5 (25 points)	Klepac, P., S. Funk, T.D. Hollingsworth, C.J.E. Metcalf, and K. Hampson. Six challenges in the eradication of infectious diseases. <i>Epidemics</i> , 2015. 10: p. 97-101. https://www.cdc.gov/onehealth/basics/index.html
	Thurs Nov 30	27	Student presentations		
16	Tuesday Dec 5	28	Student presentations		