

ZOO4926 Disease Ecology & Evolution (Fall 2019)

Course Description

The focus of this course is to understand how ecological patterns and evolutionary processes shape host-pathogen interactions. Topics will include: pathogens in plants, animals, and humans; evolution of host defenses; disease-diversity relationships; microbiomes and dysbiosis; antibiotic resistance, herd immunity and vaccination; among others.

Pre-requisites and Co-requisites

No pre-requisites or co-requisites

Instructor

Ana V. Longo, PhD
Department of Biology
Office Location: 412 Carr Hall
Student Hours: Wednesday 9:30 am – 10:30 am, or by appointment.
Phone: 352.273.4982
Email: ana.longo@ufl.edu
Canvas mail should be used for all course-related communications.

Course Meeting Times Period 2 – 211 Bartram Hall

Monday: 8:30 am – 9:20 am
Wednesday: 8:30 am – 9:20 am
Friday: 8:30 am – 9:20 am

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, including finding reliable sources of information.

Course Textbook (s) and/or Assigned Readings

This course does not have an assigned textbook. Reading material will be available on Canvas. All homeworks will be graded online using OneNote.

Grading

Class attendance and participation: 20 points (5% of final grade)

Homework: 100 points (20% of final grade)

Quizzes: 10 points each x 10 = 100 points (20% of final grade)

Writing assignment (Referenced essay): 50 points (15% of final grade)

Exams: 100 points each x 2 = 200 points. (40% of final grade)

Total: 470 points

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

Class attendance is required. 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. Every 3 absences will deduct 1.5 points from *Class attendance and participation*.

Late assignments will not be accepted. A makeup written exam will be provided for students who miss either exam due to extreme, documented circumstances. A cumulative make-up quiz will be provided at the end of the semester for all quizzes missed. This score will replace all missing quiz grades.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students>. 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 <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

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 discussion.

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	Assignment/Quiz	Reading Material (confirm in Canvas if any changes)
1	Wed Aug 21	1	Welcome and Class Introduction		
	Fri Aug 23	2	What is Disease Ecology? <i>Learning activity: Disease triangle</i>	Participate in Online Discussion (Canvas) Return answers at the end of the class.	Scholthof, K. 2007. The disease triangle: pathogens, the environment and society. <i>Nature Reviews Microbiology</i> 5:152-156. Pirofski, L., and A. Casadevall. 2012. Q&A: What is a pathogen? A question that begs the point. <i>BMC Biology</i> 10:6.
2	Mon Aug 26	3	Measuring Disease I: Host susceptibility		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.
	Wed Aug 28	4	Measuring Disease II: Host specificity	Quiz #1	Casadevall, A., and L. Pirofski. 2018. What Is a Host? Attributes of Individual Susceptibility. <i>Infection and Immunity</i> 86:e00636-00617.
	Fri Aug 30	5	<i>Learning activity: Analyzing susceptibility data</i>	Bring computer with <i>RStudio</i> and <i>R</i> installed, return Figure/interpretation before next class (M Sept 2, 8:30am)	
3	Mon Sept 2		HOLIDAY: NO CLASS		
	Wed Sept 4	6	Evolution of defense strategies I: Pre-infection	Quiz #2	Hedrick, S. M. 2017. Understanding Immunity through the Lens of Disease Ecology. <i>Trends in Immunology</i> 38:888-903.
	Fri Sept 6	7	<i>Literature Search for Host-Pathogen Matchups I</i>	Bring computer for literature search (<i>Endnote Basic</i> installed and working with word processing software), return annotated bibliography before next class (M Sept 9, 8:30am)	
4	Mon Sept 9	8	Evolution of defense strategies II: 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.
	Wed Sept 11	9	Trade-off theory	Quiz #3	Alizon, S., A. Hurford, N. Mideo, and M. Van Baalen. 2009. Virulence evolution and the trade-off hypothesis: history, current state of affairs and the future. <i>Journal of Evolutionary Biology</i> 22:245-259.
	Fri Sept 13	10	<i>Challenge-based learning activity: Host-Pathogen Matchups II</i>		
5	Mon Sept 16	11	Red-Queen Dynamics		Brockhurst, M. A., T. Chapman, K. C. King, J. E. Mank, S. Paterson, and G. D. Hurst. 2014. Running with the Red Queen: the role of biotic conflicts in evolution. <i>Proceedings of the Royal Society B: Biological Sciences</i> 281:20141382.

Week	Date	Class	Topic	Assignment/Quiz	Reading Material (confirm in Canvas if any changes)
	Wed Sept 18	12	Evolution of Host Range	Quiz #4	Agrawal, A. A. 2000. Host-range evolution: Adaptation and trade-offs in fitness of mites on alternative hosts. <i>Ecology</i> 81:500-508.
	Fri Sept 20	13	Learning activity: Analyzing host Range	Bring computer with <i>RStudio</i> and <i>R</i> installed, return Figure/interpretation now or before next class (M Sept 23, 8:30am)	
6	Mon Sept 23	14	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.
	Wed Sept 25	15	Antibiotic Resistance	Quiz #5	Gillings, M. R., and H. W. Stokes. 2012. Are humans increasing bacterial evolvability? <i>Trends in Ecology & Evolution</i> 27:346-352.
	Fri Sept 27	16	Challenge-based activity: Antibiotic Resistance		
7	Mon Sept 30	17	Guest Lecture – Behavior and Disease		
	Wed Oct 2	18	Disease Superspreaders	Term Paper outline due today (until 11:59pm)	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.
	Fri Oct 4		HOME COMING: NO CLASS		
8	Mon Oct 7	19	Exam 1		
	Wed Oct 9	20	Parasite-parasite interactions in the wild		Hellard, E., D. Fouchet, F. Vavre, and D. Pontier. 2015. Parasite-Parasite Interactions in the Wild: How To Detect Them? <i>Trends in Parasitology</i> 31:640-652.
	Fri Oct 11	21	Learning activity: Analyzing interactions	Bring computer with <i>RStudio</i> and <i>R</i> installed, return Figure/interpretation now or before next class (M Oct 14, 8:30am)	
9	Mon Oct 14	22	Introduction to Biological Invasions		Young, H. S., I. M. Parker, G. S. Gilbert, A. Sofia Guerra, and C. L. Nunn. 2017. Introduced Species, Disease Ecology, and Biodiversity. 2013. Disease Relationships. <i>Trends in Ecology & Evolution</i> 32:41-54.
	Wed Oct 16	23	Disease-diversity Relationships	Quiz #6	
	Fri Oct 18	24	Learning activity: Analyzing diversity-disease data	Bring computer with <i>RStudio</i> and <i>R</i> installed, return Figure/interpretation now or before next class (M Oct 21, 8:30am)	
10	Mon Oct 21	25	Wildlife Diseases in Plants and Animals		Altizer, S., R. S. Ostfeld, P. T. J. Johnson, S. Kutz, and C. D. Harvell. 2013. Climate Change and Infectious Diseases: From Evidence to a Predictive Framework. <i>Science</i> 341:514-519.
	Wed Oct 23	26	Seasonality and Disease Dynamics		

Week	Date	Class	Topic	Assignment/Quiz	Reading Material (confirm in Canvas if any changes)
	Fri Oct 25	27	Challenge-based activity: Climate change and Wildlife Diseases		
11	Mon Oct 28	28	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.
	Wed Oct 30	29	Parasites in Hybrid Zones	Quiz #7	Theodosopoulos, A. N., A. K. Hund, and S. A. Taylor. 2019. Parasites and Host Species Barriers in Animal Hybrid Zones. <i>Trends in Ecology & Evolution</i> 34:19-30.
	Fri Nov 1	30	Outreach & Social Media Activity: Host-Pathogen Matchups III		
12	Mon Nov 4	31	Primer in Microbial Ecology		Christian, N., B. Whitaker, and K. Clay. 2015. Microbiomes: unifying animal and plant systems through the lens of community ecology theory. <i>Frontiers in Microbiology</i> 6.
	Wed Nov 6	32	Microbiomes: Dysbiosis and Disease	Quiz #8	
	Fri Nov 8	33	Learning-based activity: Analyzing microbiome data	Bring computer with RStudio and R installed, return Figure/interpretation now or before next class (W Nov 13, 8:30am)	
13	Mon Nov 11		HOLIDAY: NO CLASS		
	Wed Nov 13	34	One Health Concept		Lerner, H., and C. Berg. 2015. The concept of health in One Health and some practical implications for research and education: What is One Health? <i>Infection, Ecology & Epidemiology</i> 5:25300.
	Fri Nov 15	35	Challenge-based activity: Global and sustainability challenges		
14	Mon Nov 18	36	Emerging Disease Hotspots		Allen, T., K. A. Murray, C. Zambrana-Torcelio, S. S. Morse, C. Rondinini, M. Di Marco, N. Breit et al. 2017. Global hotspots and correlates of emerging zoonotic diseases. <i>Nature Communications</i> 8:1124.
	Wed Nov 20	37	Eradication of Infectious Diseases	Quiz #9	
	Fri Nov 22	38	Learning activity: Herd Immunity and Vaccination		
15	Mon Nov 25	39	Exam 2		
	Wed Nov 27		THANKSGIVING BREAK		

Week	Date	Class	Topic	Assignment/Quiz	Reading Material (confirm in Canvas if any changes)
16	Mon Dec 2	40	<i>Learning Activity Post-It Parade: Infectious diseases Misconceptions in Mass Media</i>	Bring examples to discuss in class	
	Wed Dec 4	41	Flash Essay Summaries	Quiz #10	
			FINAL TBD	Writing essay due!	