BIOL 328 2024W2 – Ecology and Evolution of Parasites (draft 8th April 2024)

Calendar Description: Virtually all organisms are infected at some point in their life, as being a pathogen/parasite is the most dominant lifestyle on the planet. In Ecology and Evolution of Parasites, we will explore how ecological and evolutionary principles can illuminate important aspects of the biology of host-parasite/pathogen systems. We will gain insight into the diversity and life-histories of different parasite/pathogen groups. We will study the factors shaping host defence and parasite infection strategies, drawing from examples across the host (plant and animal populations/communities) and parasite (virus, bacteria, worms) 'tree of life' and using empirical papers as case studies. Additional specific topics include host-parasite coevolution, host jumps, climate change and parasitism, the protective role of the microbiome, and how parasites can manipulate host behaviour. We will also address the challenges for biodiversity loss, conservation, and disease control in the face of spreading and evolving parasites.

Instructor:

Dr. Kayla King (Professor, Departments of Zoology and Microbiology & Immunology)
Office hours: Wed 11-12
Email: kayla.king@ubc.ca

Course structure: The class will meet on Wed and Fri 10-11. Lab component will be on Wed 2-5. Class meeting times will consist of lectures, in-class group discussions and lab work, as well as written assignments. Readings will be assigned to prepare for in-class discussions and written assignments. Since parasites are ubiquitous, this course covers a wide range of topics. BIOL 328 will focus on selected topics which illustrate the importance and impact parasites on life and the environment.

Course Schedule (draft)

Week	Day	Content
January 6-10	W AM	Lecture 1: Introduction to the course
	W PM	No laboratory session
	F	Lecture 2: The biodiversity of parasites
January 13-17	W AM	Lecture 3: Life strategies
	W PM	Laboratory 1: Direct life-cycle parasites
	F	Lecture 4: What makes a good parasite: life-histories, plasticity, sociality
January 20-24	W AM	Lecture 5: What makes a good parasite: sophisticated strategies
	W PM	Laboratory 2: Complex life-cycle parasites
	F	Lecture 6: What makes a good parasite: host-behaviour manipulation
January 27-31	W AM	Lecture 7: Evolution of virulence
	W PM	Laboratory 3: Complex life-cycle parasites
	F	Lecture 8: Host variation: resistance, tolerance, avoidance

February 3-7	W AM W PM F	Lecture 9: Host variation: parasite transmission Laboratory 4: Simulating epidemics (bring laptop) Lecture 10: Host variation: 'why isn't everything resistant?'
February 10-14	W AM W PM F	Lecture 11: Host variation: microbiome Midterm exams (laboratory) Midterm exams (theory)
February 17-21	W AM W PM F	No lecture (midterm break) No laboratory session (midterm break) No lecture (midterm break)
February 24-28	W AM W PM F	Lecture 12: Covid evolution and control (guest lecture) Laboratory 5: Experimental design in host-parasite systems Lecture 13: Climate change and infection
March 3-7	W AM W PM F	Lecture 14: Parasites and public health (guest lecture) No laboratory session Lecture 15: Parasites and conservation (guest lecture)
March 10-14	W AM W PM F	Lecture 16: Infection genetics 1 Laboratory 6: Experimental design presentation and written assignment due Lecture 17: Infection genetics 2
March 17-21	W AM W PM F	Lecture 18: Host-parasite coevolution Laboratory 7: Coevolution 'card game' (bring laptop) Lecture 19: Community epidemiology
March 24-28	W AM W PM F	Lecture 20: Host jumps and parasite communities Laboratory 8: Live parasite collections and dissections Lecture 21: Zoonoses
March 31-April 4	W AM W PM F	Lecture 21: Disease control intervention and evolution Laboratory 9: Science communication presentation and written assignment due Lecture 22: Disease control intervention and evolution

Grading and learning assessment

In-class participation	10%
Laboratory midterm	15%
Lecture midterm	15%
Presentations	15%
Written assignments	15%
Final exam (cumulative)	30%

Learning objectives and resources

By the end of this course, students will be able to:

- Recognise major parasite taxa and understand their life strategies.

- Understand and discuss the general principles and theories underlying the ecology and evolution of host-parasite interactions.
- Discuss specific examples of parasite ecology and evolution across host-parasite systems.
- Design experiments to test specific hypotheses
- Read and critically analyse scientific publications in the field
- Understand how to communicate with general public on issues related to parasites

Textbooks and additional resources

- Parasitism: The Diversity and Ecology of Animal Parasites (2nd edition); Goater, T.M., Goater, P.G., and Esch, G.W.; Cambridge University Press, 2014.
- Evolutionary Parasitology: The Integrated Study of Infections, Immunology, Ecology and Genetics; Schmid-Hempel, P.; Oxford University Press, 2021.

All logistical information and course updates will be communicated during lectures and via Canvas (Modules and Announcements). Students are required to bring a blank notebook for laboratory sessions.