BIOL 3123 FA01: Parasitology

Part 1: Course information

Professor

Dr Todd Smith (he/him/his)
Biology Building, room 334 (office), room 341 (research laboratory)
phone: (902) 670-3122 (office)
e-mail: todd.smith@acadiau.ca
office hours: Wednesday from 11:30 to 16:30
note: send e-mail from your Acadia e-mail address only

Course description and prerequisites

Parasites are everywhere, and some cause devastating diseases of humans and other animals. Through exploration of parasite diversity, with focus on protozoa, worms, and arthropods, this course analyses benefits and drawbacks of parasitic existence, strategies to enhance transmission, evasion of host immunity, manipulation of host behaviours, and parasite epidemiology. Laboratories feature experimentation with live parasites and examination of preserved material. The prerequisites for this course are BIOL 2013 (Cell and Molecular Biology), BIOL 2053 (Microbial Biodiversity), and BIOL 2073 (Animal Biodiversity), each with a minimum grade of C-.

Textbooks

Parasitism: the diversity and ecology of animal parasites, second edition (strongly recommended)
Goater TM, Goater CP, Esch GW
Cambridge University Press, 2014

Foundations of parasitology, ninth edition (used as a source of figures, do not buy!)
Roberts LS, Janovy J
McGraw-Hill Companies Inc, 2012

Course requirements

- computer, tablet, or phone to access PowerPoint lecture slides and Word documents (i.e., syllabus, other documents) from the ACORN page for the course

Course structure

- lecture material will be presented as 50-min lectures in Slot 2 (Monday, Wednesday, and Friday from 9:30 to 10:20) in BAC 141 (see **Section 2.1: Lecture outline** for more details):
- laboratory sections will meet weekly according to the following schedule, and will begin on Monday, January 6 (see **Section 2.2: Laboratory outline** for more details):
  BIOL 3123L WI01: Slot 31 (Monday, 13:00 to 16:00), BIO 250
  BIOL 3123L WI02: Slot 40 (Monday, 18:30 to 21:30), BIO 250

Student learning outcomes

- understand the diversity of all major groups, and some minor groups, of parasitic eukaryotes (i.e., parasitic protozoa, worms, and arthropods) that infect and infest animals
- understand structural and functional features of parasitic eukaryotes, with emphasis on how these features enable successful invasion, replication, and transmission
- understand how parasitic eukaryotes of medical and veterinary importance cause disease in humans and non-human mammals
- understand how interactions with parasitic eukaryotes affect the evolution of immune systems of animals
- understand the crucial roles that parasitic eukaryotes play in communities and ecosystems and to assess how the impact of this lifestyle affects animal biodiversity
- examine parasitic eukaryotes, either from prepared slides or dissected animals, to observe important biological features
- identify common species of parasitic eukaryotes to a level of proficiency that would be expected in a medical or veterinary setting
- you will meet the objectives listed above through a combination of:
  - reading the relevant topics in the textbook before each lecture, and attending all lectures
  - taking notes during lecture and asking for clarification in lecture or during office hours if you are unsure of material
  - studying on a regular basis: for each hour of lecture, students should spend at least one hour rereading or rewriting lecture notes, and reviewing and studying material for tests
  - preparing for, attending, and actively participating in, all laboratories (see **Part 2.2: Laboratory outline**)

Part 2.1: Lecture outline

List of lecture topics (chapters and page numbers refer to Goater textbook)

Date	Lecture	Topic
January 6	1	Introduction to Parasitology
January 8	2	What is parasitism? (Chap 1)
January 10	3	Immunological aspects of parasitism 1 (Chap 2, pages 16-26)
January 13	4	Immunological aspects of parasitism 2 (Chap 2, pages 26-37)
January 15	5	Introduction to parasitic protozoa (Chap 3, pages 40-45, 80-81)
January 17	6	Transmission strategies of parasitic protozoa (Chap 3)
January 20	7	Amitochondriate flagellates and amoeboflagellates (Chap 3, p 45-56)
January 22	8	Kinetoplastid flagellates (Chap 3, pages 45-56)
January 24	9	Amoebae, opalines, ciliates & apicomplexans (Chap 3, p 56-60, 78-80)
January 27	10	Gut-dwelling apicomplexans (Chap 3, pages 60-66)
January 29	11	Blood-dwelling apicomplexans (Chap 3, pages 67-78)
January 31	12	Microsporidians (Chap 4) and Myxozoans (Chap 5)
February 3	13	Introduction to parasitic flatworms (Chap 6, pages 113-116, 169-174)
February 5	14	Flukes 1 (Chap 6, pages 116-133)
February 7	15	Flukes 2 (Chap 6, pages 133-145)

February 10	16	Flukes 3 and monogeneans (Chap 6, pages 145-153)
February 12	17	Tapeworms 1 (Chap 6, pages 153-162)
February 14	18	Tapeworms 2 (Chap 6, pages 162-169)
February 17		HERITAGE DAY
February 19		READING WEEK
February 21		READING WEEK
February 24	19	Thorny-headed worms (Chap 7) and leeches (not covered in text)
February 26	20	Introduction to parasitic nematodes (Chap 8, pages 199-211)
February 28	21	Nematodes 1 (Chap 8, pages 211-221)
March 3	22	Nematodes 2 (Chap 8, pages 221-228)
March 5	23	Nematodes 3 (Chap 8, pages 228-237)
March 7	24	Hairworms (Chap 9) and tongueworms (Chap 10)
March 10	25	Introduction to parasitic arthropods (Chap 11, page 263-270, 328-330)
March 12	26	Ticks and parasitic mites (Chap 11, pages 289-308)
March 14	27	Parasitic crustaceans (Chap 11, pages 270-289)
March 17	28	Parasitic bugs, lice, and fleas (Chap 11, pages 308-317)
March 19	29	Parasitic flies (Chap 11, pages 317-325)
March 21	30	Parasitoids and other parasitic insects (Chap 11, pages 325-328)
March 24	31	Population ecology of parasites (Chap 12)
March 26	32	Community ecology of parasites (Chap 13)
March 28	33	Effects of parasites on host individuals (Chap 15, pages 396-411)
March 31	34	Effects of parasites on host populations (Chap 15, pages 411-431)
April 2	35	Evolution of host-parasite interactions (Chap 16)
April 4	36	Environmental parasitology (Chap 17)

Part 2.2: Laboratory outline

Instructor

Dr Todd Smith (he/him/his)
Biology Building, room 334 (office), room 341 (research laboratory)
phone: (902) 670-3122 (office)
e-mail: todd.smith@acadiau.ca
office hours: Wednesday from 11:30 to 16:30
note: send e-mail from your Acadia e-mail address only

Teaching assistants

BIOL3120L WI01 (afternoon lab): Mackenzie Wheaton (162014w@acadiau.ca)
BIOL3120L WI02 (evening lab): Joshua Nockles (161359n@acadiau.ca)

Outline

The laboratories in this course will feature examination of parasites, either preserved on microscope slides, preserved as whole animals in display jars, or live from freshly dissected invertebrates, to observe biological features that suit this highly successful lifestyle.

List of laboratory topics

Date	Lab	Topic
January 6		NOT A LAB
January 13		NOT A LAB
January 20	1	Parasitic protozoa of grain beetles (assignment 1%)
January 27	2	Biodiversity of parasitic protozoa (pre-lab quiz 2%, assignment 2%)
February 3		Lecture test 1 on Lectures 2 to 11 (in lab period, in BIO 250)
February 10	3	Biodiversity of parasitic flatworms (pre-lab quiz 2%, assignment 2%)
February 17		READING WEEK
February 24	4	Observation of living flatworms
March 3	5	Biodiversity of parasitic nematodes (pre-lab quiz 2%, assignment 2%)
March 10		Lecture test 2 on Lectures 12 to 23 (in lab period, in BIO 250)
March 17	6	Epidemiology of parasites in host populations (assignment 1%)
March 24	7	Biodiversity of parasitic arthropods (pre-lab quiz 2%, assignment 2%)
March 31	8	Laboratory test on Labs 2, 3, 5, and 7 (12%)

Laboratory quizzes, assignments, and test (30% of the overall grade in the course)

- there are two assignments for each of the biodiversity labs (i.e., Labs 2, 3, 5, and 7)
  - pre-lab multiple-choice quiz with six questions (2% x 4 labs = 8%)
  - open-book hand-in assignment with six questions (2% x 4 labs = 8%)
- there is only an open-book, hand-in assignment for Eukaryotic microbes as parasites (Lab 1, 1%), and for Epidemiology of parasites in host populations (Lab 6, 1%)
- there is a multiple-choice lab test with 36 questions based on the four biodiversity labs (i.e., labs 2, 3, 5, and 7), worth 12% of overall grade in the course
  - test will be conducted in Lab 8 (Monday, March 31)
  - all specimens will be shown on projection screen
  - you will have 60 s for each specimen to answer one or two questions

Part 3: Grading policy

Graded course activities

Lecture test 1 on Lectures 2 to 11 on Monday, February 3 (in lab period, in BIO 250)	20%
Lecture test 2 on Lectures 12 to 23 on Monday, March 10 (in lab period, in BIO 250)	25%
Lecture test 3 on Lectures 24 to 36 during exam period on date TBA in room TBA	25%
Laboratory quizzes, assignments, and test (see Part 2.2: Laboratory outline)	30%

Grading system (for all courses at Acadia University that use a numerical grading scheme)

A+	90-100	C+	67-69
A	85-89	C	63-66
A-	80-84	C-	60-62
B+	77-79	D+	57-59
B	73-76	D	53-56
B-	70-72	D-	50-52
		F	0-49

Part 4. Course policies

Lectures

1 PowerPoint slides for each lecture are posted on ACORN before class
- download or print off slides, take supplementary notes during lecture
- research has shown that students who take notes by hand perform significantly better in situations that evaluate their ability to retain information

2 not **all** the information in the lecture is included on slides
- you are expected to attend every lecture in person whenever possible; please do not skip lectures, or you will miss material that I provide verbally (i.e., not on slides)

3 when using electronic devices during lectures, limit their use to classroom material **only**
- using these devices for other purposes (e.g., social media) will negatively impact your ability to learn, and is rude and disrespectful to other students

4 do not chat to other students during lectures
- this behaviour is disruptive to me, and is disruptive to students who are not involved in the conversation

Tests

1 there will be three tests on lecture material (i.e., Lecture tests 1 to 3 in Part 3: Grading policy), and lab material will **not** be included on these tests

2 tests are based on topics covered on slides in lecture, information provided verbally in lecture, and any assigned readings or articles

3 for some test questions, you will be asked to apply what you have previously learned in lecture to new situations

4 the format of Test 1 and Test 2 will be as follows (Test 3 is during exam period and has special rules that will be explained closer to the date of the test):

- tests will be run in your regularly scheduled lab period (i.e., Monday afternoon or Monday evening), in your regular lab room (i.e., BIO 250)
- time for these tests is 120 min for Test 1 (60 marks, 20%) and 150 min for Test 2 (75 marks, 25%), which should ensure that time is not a factor for completing the test
- tests will be run on Moodle on your laptop, and can be accessed at 13:00 (afternoon lab) or at 18:30 (evening lab) in BIO 250
- questions consist of long-answer questions and multiple-choice questions, and you may navigate between questions as often as you wish during the time limit
- there is **not** a penalty for changing your answer or choosing a wrong answer on the multiple-choice questions
- any test that is still open at the time limit will be submitted automatically, i.e., you do not have to submit the test before time expires

5 you will be allowed a crib sheet to use during tests, with specific instructions as follows:
- you can write anything on **one** side of **one** 8.5" x 11" sheet of paper that is to be kept on your desk when writing and then handed to me when you leave the test room
- all writing must be transcribed by hand; writing on an iPad and then printing is fine, but tablet notes cannot be shrunk to a size that I cannot read (i.e., with my glasses on)
- you are **not** allowed to cut and paste textbook diagrams or other media (e.g., photos) from lecture slides onto the sheet, i.e., everything must be written or drawn by hand

Missed tests or laboratories

1 if a **legitimate** activity is scheduled at the same time as a test or laboratory, please inform me at least two weeks prior to the scheduled date
- list of legitimate activities: varsity or club games, essential appointments
- list of illegitimate activities: varsity or club practices, vacations, lack of time to study due to other commitments, helping friends move their belongings to another house (!)

2 if you are unable to write a test or attend a laboratory due to a sudden medical or compassionate issue, provide the Registrar with a Declaration of Cause for Absence form: https://registrar.acadiau.ca/files/sites/registrar/Forms/Forms/Declaration of Cause fillable.pdf

3 I will attempt to reschedule a missed test at some point **after** the regularly scheduled date, but not **before**

4 if you or the Registrar do not provide me with a legitimate reason for missing a test or laboratory, you will be assigned a mark of zero for that test or laboratory

5 I do not provide opportunities for make-up tests for poor performance, nor do I drop the lowest test mark or adjust the values of previously written tests

Part 5. University policies

University policies

University policies, including important calendar dates and the last day to drop a course and receive a W, are available in the Acadia University Academic Calendar: https://registrar.acadiau.ca/AcademicCalendars.html

Equity, diversity, and inclusion

Acadia University is committed to becoming a culturally safe and anti-oppressive community. This can only be achieved where there are simultaneous efforts to eliminate all forms of discrimination and harassment from our campus community, including the elimination of all discrimination, harassment and violence based on one's identity, including but not limited to, gender, race, class, ethnicity, sexual orientation, disability, gender identity, gender expression, and Indigeneity. The policy against harassment and discrimination, and resources for students who believe they may have experienced or witnessed discrimination or harassment, are available here: https://www2.acadiau.ca/student-life/equity-judicial/equity.html

Students requiring accommodations

Acadia University is dedicated to improving access to campus life for all students with disabilities. Although we attempt to ensure that all courses are accessible, we recognize that there are barriers that need to be addressed on an individual basis. Students who require accommodations to complete coursework or otherwise fully participate in class should contact Accessible Learning Services as soon as possible: accessible.learning@acadiau.ca

Use of animals in teaching and research

The use of animals in teaching and research at Acadia University is done in accordance with guidelines on the care and use of animals published by the Canadian Council on Animal Care (CCAC). For more information on the CCAC, please visit their website at http://www.ccac.ca

Commitment to integrity

It is standard practice in the Department of Biology to check exams and assignments for cheating and plagiarism. Cheating in the lecture or laboratory sections of the course, including plagiarism, will absolutely not be tolerated. Please read the appropriate sections of the current Acadia University Academic Calendar: https://registrar.acadiau.ca/AcademicCalendars.html

Spoken and written course content, including the syllabus, lectures, laboratories, assignments, quizzes, tests, and exams, are the intellectual property of the instructor and may only be copied for personal use. Sharing these materials or uploading them where other people may access them is a violation of copyright. If you wish to make audio, video, or photographic recordings in class, you must first obtain the consent of the instructor and of any other persons (e.g., guest speakers, other students) who may be captured in such recordings. In the case of personal use by students with disabilities, the instructor's consent shall not be unreasonably withheld. Information on copyright and course content from Acadia University is available through Vaughan Memorial Library: http://libguides.acadiau.ca/c.php?g=433650&p=5027078

Part 6. Program level outcomes

Foundations of knowledge		Course specific examples	Proficiency 1-Introduction 2-Reinforcement 3-Proficient
Scientific method, inquiry, and hypothesis testing	Find, understand, and apply information from the literature; understand how to use the scientific method to examine problems from different perspectives	Emphasis throughout course on observation, hypothesis testing, methodologies (developmental, molecular biological, ecological), data analysis, and interpretation	2
Historical concepts and contributions by important figures	Explain foundational concepts in biology, Two-eyed Seeing, and ethical implications of scientific discoveries	Foundational concepts in parasitology; contributions to field by important historical figures, with emphasis on contributions by women and BIPOC	2
Biodiversity and ecology	Understand the genetic, taxonomic and ecosystem levels of biodiversity; focus on SW Nova including the Acadian Forest and Bay of Fundy ecosystems	Heavy emphasis on biodiversity of parasites and the ecological role that they play in all environments, including human, veterinary, and wildlife	3
Genetics and evolution	Understand the chemical basis of heredity, genetics, and genomics; integrate concepts across disciplines to understand evolution	Six-lecture unit on parasites as drivers of adaptation and evolution of hosts, as well as role of parasites in communities of aquatic and terrestrial ecosystems	2
Human and environmental health	Understand form and function in health and disease within a One Health framework, integrating human and environmental health	Heavy emphasis on effects of parasites of humans, veterinary animals, and wildlife; importance of epidemiological and epizootiological studies	3
Lab and field skills			
Experimental design	Gain experience in applying the scientific method	Labs focus on knowledge of parasite structures and life history adaptations as a means for identification, which build toward a final lab test on identification proficiency	2
Safety	Work safely and productively in lab and field settings	Investigation of live specimens from biological supply companies to augment static material; safety in handling live and preserved material is consistently emphasised	2
Lab skills	Gain experience with basic and advanced lab techniques and understand their application in research, health science, and industry	Lab skills acquired by students include advanced parasite identification for careers in medicine, epidemiology, or research; dissection of insects for isolation of parasites	3
Field skills	Gain experience in basic and advanced field skills and understand their application in ecology, conservation biology, and environmental change	Proposed lab exercise where students collect snails for experiments that investigate shedding of worm parasites from their bodies into pond water	2
Data acquisition, analysis, and interpretation	Collect data, present results both qualitatively and quantitatively, and interpret outcomes in light of the literature	Iterative collection and analysis of data in a simulated study of R0 of a parasitic roundworm under changing conditions of medication, vaccination, and climate change	2
Statistical analysis	Use R and or other programs to analyze biological data	Use of Excel to build a spreadsheet to analyse perturbations in basic reproductive number (R0) under conditions of medication, vaccination and climate change	2

Professional skills			
Ethical practices	Demonstrate ethical conduct, apply principles of academic integrity, and understand the principles of EDI in science	Biomedical ethics and ethical use of animals in research; emphasis on inequities of health care among and within nations, and resulting prevalence of disease	2
Collaboration and group work	Work effectively in groups within and across disciplines	Students work in pairs or as a four-person bench in laboratory sections; resolution of conflicts is encouraged at student level before intervention by TA's or Instructor	2
Critical thinking	Analyze and evaluate information to make science-based decisions	Tests do not involve regurgitation of material, but rather application of knowledge and concepts from lectures and laboratories to answer novel, critical-thinking questions	2
Computer proficiency	Use common and discipline- specific software	Expectation and enhancement of proficiency with websites, databases, Word, Excel, and PowerPoint for both lectures and laboratory sections	2
Scientific communication	Communicate science effectively to both scientific and general audiences	Emphasis in lectures and laboratories of disseminating novel results in literature and on using multiple sources to build lectures and lab exercises	2