

MIP 462
PARASITOLOGY & VECTOR BIOLOGY

Instructors

- Dr. Rebekah Kading, Ph.D., Department of Microbiology, Immunology and Pathology
- Dr. Ashley McGrew, DVM, Ph.D., DACVM—Parasitology, Department of Microbiology, Immunology and Pathology

Teaching Assistants

Laurie Mack, Department of Microbiology, Immunology and Pathology
Alison Hall, Department of Bioagricultural Sciences and Pest Management

Texts & Lab Notes (Required)

- Sullivan, John. 2009. A Color Atlas of Parasitology. University of San Francisco.
- Marquardt, Demaree and Grieve. 2000. Parasitology and Vector Biology, 2nd Edition. Harcourt /Academic press. Specific chapters available through Canvas (no purchase necessary)
- Combes, Claude. 2005. The Art of Being a Parasite. University of Chicago Press.
- Class and laboratory notes for Dr. Ashley McGrew
- Class and laboratory notes for Dr. Rebekah Kading

Texts (Recommended)

- John, Petri. 2006. Markell and Voge's Medical Parasitology, 9th Edition. Saunders/Elsevier.

Protozoology and Helminthology: Ashley McGrew

	Points
LECTURE EXAM #1	75 Points
LECTURE EXAM #2	75 Points
LECTURE EXAM #3	75 Points
LAB:	
LAB PRACTICAL	100 Points
Final Project (project approval during laboratory)	100 Points
Lab Notebook (submitted twice)	30 Points (2 X 15 points)
Parasite Unknowns (assessment of techniques in laboratory)	20 Points
Lab Procedures and participation	25 Points
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	500 TOTAL POINTS

Parasitology Course Objectives:

- **Students will be able to:**
 - **Accurately describe parasitic life cycles, using correct terminology and definitions, and will be able to explain how aspects of a given life cycle relate to clinical signs, pathogenesis of disease, and epidemiology**
 - **Explain the relationship between host and parasite using basic immunologic terms and concepts**
 - **Recognize important morphologic characteristics of parasites of medical and veterinary importance**
 - **Select and perform appropriate diagnostic tests, given a clinical scenario, and describe the basic principles and techniques used in diagnosing parasitic disease**
 - **Describe aspects of distribution, morphology, life cycle, pathology, clinical signs, epidemiology, treatment, and control for representative parasites from each of the major taxonomic groups**
 - **Identify parasite elements and recognize their diagnostic stages**
- **Students will also be introduced to science-based literature (e.g. *The Art of Being a Parasite*, by Claude Combes) and peer-reviewed literature, enabling them to:**
 - **Effectively discuss evolutionary and ecological relationships between species**
 - **Recognize zoonotic diseases and the impact parasites have on public health**
 - **Identify how parasites of human and veterinary significance impact socioeconomic trends and perspectives relating to disease control**

Additional notes for the Protozoology and Helminthology portion of this course:

- The schedule below describes the intended daily focus for each lecture or laboratory session; any minor modifications that need to be made to this schedule during the semester will be announced in lecture and/or lab.
- The daily focus listed for each laboratory session is ***in addition to*** the examination of slides, viewing of gross specimens, and diagnostic techniques that will closely mirror the material being covered in lecture that week. Daily laboratory activities are carefully planned into the allocated timeframe and students should plan to be present in laboratories for the full duration.
- Handouts will be provided to students in the lecture-portion of class, on most days. These handouts ***will not be available*** in RamCT. Portions of handouts may be purposefully left blank and completed together during lecture, used to stimulate discussion, or reinforce important concepts. Among other material, students are responsible for learning all information on the provided handouts; therefore, if a class is missed, it is the student's responsibility to obtain a copy of the missed material during office hours, or find a classmate with whom they can meet with to discuss what was covered in class. As office hours are available both upon request, as well as at set times, there is the expectation that the student will seek out any missed material presented on the day of their absence.

Date	Subject
<u>Week 1</u>	Course Introduction Introduction to Parasites/Introduction to Protozoology Trypanosomatidae
Tues lab	Introduction/Lab safety/Lab notebook requirements/ Introduction to Final Projects
Thurs lab	
<u>Week 2</u>	Diplomonadorida/Trichomonadorida Turbulinida/Eucoccidiorida Haemosporida/Piroplasmorida
Tues lab	Funnels, and fluke-finders, tests and techniques “What <i>also</i> floats in... sugar?”
Thurs lab	
<u>Week 3</u>	LABOR DAY—NO CLASS Eucoccidiorida (continued) Eucoccidiorida (continued)
Tues lab	<i>Cryptosporidium</i> sp. and <i>Giardia</i> sp.—It's not easy being <i>green</i> Great <i>Xpect</i>-ations
Thurs lab	
<u>Week 4</u>	LECTURE EXAM 1: Protozoa Introduction to Trematodes/Schistosomatidae Fasciolidae
Tues lab	What a fluke! The host-parasite relationship: pathways to understanding
Thurs lab	
<u>Week 5</u>	Opisthorchidae Introduction to Cestodes: Pseudophyllidea and Cyclophyllidea Cyclophyllidea (continued)
Tues lab	Final Projects DUE/Final Project Presentations Final Project Presentations
Thurs lab	
<u>Week 6</u>	LECTURE EXAM 2: Cestodes and Trematodes

Introduction to Nematodes
Ancylostomatoidea/Rhabditoidea

Tues lab
Thurs lab

Final Project Presentations
Final Project Presentations
Unknown #1

Week 7

Ascaridoidea
Dracunculoidea/Filaroidea
Trichuroidea/Oxyuroidea

Tues lab
Thurs lab

“ζῆλον” & “νόσος *nosos*”... communicating information to the public
Unknown #2
Blood meals, vectors, and Knott’s: tying it together
(Lab Notebook DUE, Friday at 9:00am)

Week 8

LECTURE EXAM 3: Nematodes
The *art* of being a parasite...

Tues lab

Review
LAB PRACTICAL EXAM: Protozoa and Helminths

Medical/Veterinary Entomology - Dr. Rebekah C. Kading

LAB 1	External anatomy	25 points
LAB 2	Internal anatomy	15 points
LAB 4	Mosquito life cycle	35 points
LAB 5/6	Mosquito and fly ID quiz	25 points
LAB 9	Flea ID quiz	25 points
LAB 10	Tick ID quiz	25 points
LAB PRACTICAL EXAM		150 points
Final Exam (short answers)		100 points
Essay Questions over reading		<u>50+50 points</u>
		500 points total

NOTE: Labs are generally due 1 week after they are assigned. 5 points are deducted for each lab period that an assignment is turned in late.

Vector Biology Course Objectives:

- **Students will learn basic principles of entomology, natural cycles of arthropod-borne disease transmission, integrated pest management and application of these factors to reduce transmission of arthropod borne diseases**
- **Students in the laboratory will learn identification methods for medically important arthropods**
- **Laboratory exercises aid students in learning and understanding basic arthropod anatomy, behavior, and the mosquito life cycle**

Date Subject

Overview of Medically Important Arthropods
ESSAY 1 QUESTION HANDED OUT

Week 9

Biology of Arthropods (Development, Molting)
 Biology of Arthropods (Digestion, Excretion)
 Biology of Arthropods (Respiration, Circulation)
ESSAY 1 DUE (50 Points)

Tuesday Lab LAB1: External anatomy of medically important arthropods (Grasshopper)

Thursday Lab LAB 2: Internal anatomy of medically important arthropods (Cockroach)

Week 10

Biology of Arthropods (Neuroendocrinology)
 Biology of Arthropods (Reproduction, Diapause)
 Pathogen Transmission by Arthropods

Tuesday Lab LAB 3: Diptera: Nematoceros identification, **LAB 1 DUE**

LAB 4a: Begin mosquito life cycle exercise

Thursday Lab

LAB 4b: Mosquito life cycle exercise #2

LAB 5: Mosquito Identification (larvae), **LAB 2 DUE**

Week 11

Pathogen Transmission by Arthropods

Pathogen Transmission by Arthropods

Vectorial capacity

Tuesday Lab

LAB 4c: Mosquito life cycle exercise #3

LAB 5: Mosquito Identification (adults)

Thursday Lab

LAB 4d: Finish mosquito life cycle exercise

LAB 6: Brachycerous/Cylorrhaphous fly identification

Week 12

Mosquito Control

Simuliidae (Blackflies), Psychodidae (Sandflies)

Ceratopogonidae (Biting Midges) / TseTse Flies

Tuesday Lab

Lab 7: **MOSQUITO and FLY ID QUIZ**, Venomous Arthropods, **LAB 4 DUE**

Thursday Lab

Lab 8: Cockroach Identification

Week 13

Fleas and flea-borne diseases

Tick Biology

Tick Borne Diseases

Tuesday Lab

LAB 9: Flea Identification

Thursday Lab

LAB 10: **FLEA ID QUIZ**, Tick Identification

November 21-25

THANKSGIVING

Week 14

Mite Biology/Chiggers - Mite Borne Disease

ESSAY 2 QUESTION HANDED OUT (50 points)

Triatominae and Bedbugs

Louse biology/Louse borne disease

Tuesday Lab

LAB 11: **TICK ID QUIZ**, Mite Identification

Thursday Lab

LAB 12: Identification of lice, bedbugs, triatominae

Week 15

Dec. 5 Special topics: Zika virus
ESSAY QUESTION 2 DUE
Dec. 7 Special topics: Heartland virus
Dec. 9 Review Session

Tuesday Lab REVIEW

Thursday Lab LAB PRACTICAL EXAM

**Thursday, Dec. 15 FINAL EXAM (100 points)
7:30 a.m. – 9:30 a.m., in lecture hall**

Grading Rubric

**89.5-100% = A
79.5-89.4% = B
69.5-79.4% = C
59.5-69.4% = D
<59.5% = F**

NOTE: This class is NOT curved. You start the semester with zero points and therefore begin to earn points with the first graded assignment. There are a total of 1000 points that can be earned.

You will be graded according to the total points you have earned by the end of the semester.

Be aware this is a 5-credit upper division Microbiology course that requires approximately 2 hours of study/lab time for every 1 hour of time spent in class/lab. Since we will be spending approximately 6.5 hours in class/lab per week, you should be prepared to spend about 13.5-14 hours per week on this class. This may include extra time spent in lab completing the assignments or reviewing material already presented.

Laboratory: You are expected to come to lab with all pre-lab assignments completed. There is substantial material covered in every lab, and you will not have time during the lab to complete everything unless you are prepared and well organized.

Since we will be working with BSL-1 and BSL-2 organisms in the lab, you are not permitted to participate in any laboratory procedure or procure points for those assignments until you have taken the lab safety quiz and have signed the lab compliance form. Make-up labs are offered only to students with instructor-approved excuses, and make-up labs must be set up with the GTA. Any make-up lab must be completed within one week of its assignment.

Lab practical: Attendance during the scheduled lab practical for each section is required (1 exam covering parasitology, 1 exam covering medical entomology). Dates for the lab practical exams are listed in the syllabus. NO excuses for missing the lab practical exams

are accepted, and there is NO make-up practical exam for either section. Because it requires approximately 16 hours of work to set up these exams, they cannot be set up for individual students. Each practical is worth 150 points, and if you miss the lab practical cannot be recovered.

Class attendance is mandatory on exam days, and highly recommended on a regular basis. Make-up exams will be given ONLY if you have a medical reason for missing the exam, or you have a family emergency. You must notify the instructor before the exam, and you must be able to provide documentation for verification. Make-up exams will not be given if no prior arrangements have been made with the instructor.

Student athletes are ONLY allowed to be absent on an exam day if you are participating in a CSU sanctioned activity. It is your responsibility to inform the instructor at the beginning of the semester if you are a student athlete, and a letter on CSU letterhead from the athletic office must be handed in to the instructor delineating scheduled CSU sanctioned activities along with expected absences. The timeline for giving a make-up exam to any student athlete is at the discretion of the instructor.

Cell phones MUST be turned off and stored in your backpack while in class. This includes both lecture and examination times.

Resources for Disabled Students:

Students with disability are encouraged to contact the Resources for Disabled Students Office to arrange for accommodations and support services. If you require special accommodations, you must obtain appropriate written notification and you must give a copy to the instructor. You will need to make an appointment with the instructor to hand in all paperwork. This must be completed within the first two weeks of class.

Honor Code and Student Conduct Code:

This course will adhere to the Academic Integrity Policy of the Colorado State University General Catalog and the Student Conduct Code.

“Credible Scholarship requires academic integrity, a direct result of responsible research and writing habits. As with all ethically driven behavior, such habits—and their foundational underpinnings—are not innate.

They are learned and—through practice—honed to a point where they become second nature, a character trait both much valued and much sought after in the professional world.

Preparing for success in your chosen profession begins with developing and practicing these habits. One follows the other: Academic integrity lays the groundwork for professional integrity.”

From <http://learning.colostate.edu/integrity/index.cfm>

The CSU Academic Integrity Policy as found in the General Catalog - 1.6, pages 7-9.

(<http://www.catalog.colostate.edu/Content/files/2012/FrontPDF/1.6POLICIES.pdf>)

Conduct in this class shall conform to the expectations of the student conduct code and be guided by the university policy found in the Student Conduct Code

(<http://www.conflictresolution.colostate.edu/conduct-code>). At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.