

Phage Hunters Advancing Genomics and Evolutionary Science (PHAGES)
Introductory Biology Research Laboratory I – Spring 2023
BIOL 1750.501, MW 12:00-2:50pm and other times as needed
BIOL 1750.502, MW 3:00-5:50pm and other times as needed

INSTRUCTOR: **Dr. Lee Hughes**
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Student Hours: By appointment

TEACHING ASSISTANTS:

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Textbook: **“Phage Discovery Guide - *Streptomyces*” by the Howard Hughes Medical Institute (manual provided online through Canvas for student use)**

PHAGE Laboratory Courses:

The Phage Hunters Advancing Genomics and Evolutionary Science (PHAGES) experience at UNT is offered in association with the Howard Hughes Medical Institute’s Science Education Alliance. PHAGES is an undergraduate research experience in genomics for undergraduate students. UNT students who participate in this program will enroll in a two course sequence (BIOL 1750 for 2 SCH in the first semester and BIOL 1755 for 1 SCH in the following semester) in which research activities on bacteriophage genomics will be conducted. These two laboratory courses will serve as replacements for the normal BIOL 1760 laboratory in the biology or biochemistry degrees. **By participating in the PHAGES course for both semesters you will become published in a scientific genomic database and potentially become an author on scientific articles about the phages on which you work.**

Course Materials:

All course materials are available through Canvas at unt.instructure.com.

Laboratory Goals:

The goals for the first semester are as follows. Each student will:

- Learn the microbiological techniques necessary to cultivate bacteria and bacteriophage.
- Isolate a unique bacteriophage from an environmental sample of their choosing.
- Obtain a high-titer lysate of their isolated phage.
- Obtain an electron micrograph of their isolated phage.
- Obtain a clean DNA sample for their isolated phage and create a restriction digest.

Based on the electron micrographs, restriction digests, and quality of DNA preparations, the class will identify the DNA samples to be submitted for genome sequencing. At least one genome sequence will be obtained for study in the second semester of the laboratory sequence.

Laboratory Safety:

Following all laboratory requirements is important for the safety of you and your classmates. You must comply with all safety requirements as outlined during the lab safety training.

Students enrolled in BIOL 1750 are required to use proper safety procedures and guidelines as outlined in UNT Policy 06.038 Safety in Instructional Activities. While working in laboratory sessions, students are expected and required to identify and use proper safety guidelines in all activities requiring lifting, climbing, walking on slippery surfaces, using equipment and tools, handling chemical solutions and hot and cold products. Students should be aware that the UNT is not liable for injuries incurred while students are participating in class activities. All students are encouraged to secure adequate insurance coverage in the event of accidental injury. Students who do not have insurance coverage should consider Standard Syllabus Statements Related Policy 06.049 Course Syllabi Requirements obtaining Student Health Insurance. Brochures for student insurance are available in the UNT Student Health and Wellness Center. Students who are injured during class activities may seek medical attention at the Student Health and Wellness Center at rates that are reduced compared to other medical facilities. If students have an insurance plan other than Student Health Insurance at UNT, they should be sure that the plan covers treatment at this facility. If students choose not to go to the UNT Student Health and Wellness Center, they may be transported to an emergency room at a local hospital. Students are responsible for expenses incurred there.

Attendance Policy:

Attendance and on-time arrival are critical at all scheduled laboratory meetings. Communication with your TA is key in situations where you are unable to attend lab to ensure continued progress on your sample. Unexcused absences or failure to make arrangements for catch up work for excused absences may result in lower grades or zeroes on daily notebook checks, lab quizzes, and other graded course activities.

It is important that you communicate with the professor and the instructional team prior to being absent, so you, the professor, and the instructional team can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor and instructional team if you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community.

If you are experiencing any symptoms of COVID-19 or any other illness please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to returning to class. While attendance is an important part of succeeding in this class, your own health, and those of others in the community, is more important.

STUDENTS WITH DISABILITIES:

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with an accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information see the Office of Disability Access website at <http://www.unt.edu/oda>. You may also contact them by phone at 940-565-4323.

COMMUNICATION:

Please communicate with the instructor or TA during scheduled lab time or through email. You may also schedule other meeting times as needed. Please note that our email inboxes can become rather full during busy times, so if you do not receive a response within two business days, please send a follow-up email. A gentle nudge is always appreciated.

Course communications will be through Canvas. Be sure to check Canvas announcements regularly and to setup your Canvas notifications to send updates to an email address that you regularly check.

EMERGENCY NOTIFICATION & PROCEDURES:

UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

ACADEMIC INTEGRITY STANDARDS AND CONSEQUENCES:

According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University. Students in this course are expected to do their own work except when instructed to work in groups. Academic dishonesty in graded coursework may result in a grade of zero for that activity or additional penalties as allowed under university policy. All instances of academic dishonesty will be reported to the University.

GRADING:

Your course grade will consist of the following elements:

- 20% Pre-lab Activities/Quizzes
- 20% Laboratory Notebooks (averaged from multiple checks throughout the semester)
- 20% Concept Quizzes
- 5% Short Presentation (3-5 minute Powerpoint presentation highlighting the characteristics of your isolate)
- 15% Final Class Presentation and written report (5-8 minute presentation detailing semesters work; paper to follow scientific paper format as instructed)
- 20% Archiving of samples and electronic database completion*
- 100% Overall % Grade (*Letter grades will be assigned on a typical scale: 90+=A, 80-89=B, 70-79=C, 60-69=D, <60=F*)

*Must be received for all successful phage isolations to obtain passing grade in course.

TENTATIVE LABORATORY SCHEDULE INTRODUCTORY BIOLOGY RESEARCH LABORATORY I

Due to the nature of experimental research, the course syllabus schedule for this laboratory will be more flexible than in a normal course, and the schedule may change as experimental progress requires.

<u>Meeting</u>	<u>Date</u>	<u>Topic</u>	<u>Readings</u>
	Jan. 16	MLK Jr. Day – No class	
1	Jan. 18	Course overview; Safety; Introduction to Phage Hunting.	Welcome, Lab Basics, Phage basics, Module 1
2	Jan. 23	Laboratory Techniques and Sampling Methods. Begin Enrichment.	Protocol 5.1, Protocol 5.5 (Day 1), Module 2
3	Jan. 25	Harvest enriched samples and perform plaque assay. Sample 2 Enrichment	Protocol 5.5 (Day 2), Protocol 5.3, Host basics
4	Jan. 30	Pick plaques, perform spot assays from enrichments. Continue with sample 2 (if needed).	Protocol 5.4, Protocol 5.6,
5	Feb. 1	Perform Plaque assay on purified phage.	Protocol 6.1 and Protocol 6.2
6	Feb. 6	Continue Plaque assay for purification as needed.	
7	Feb. 8	Continue Plaque assay for purification as needed.	
	Feb. 13	Catch up day.	
8	Feb. 15	Harvest 1-plate lysate. Spot titer lysate.	Protocol 6.3, Protocol 6.4
9	Feb. 20	Calculate amounts for webbed plates.	Protocol 7.1
10	Feb. 22	Set up Webbed Plates from Lysate of Known Titer.	
11	Feb. 27	Harvest Multi-plate lysate and perform spot titer.	
12	Mar. 1	Calculate phage titer. Repeat as necessary. If HTL, name phage and enter into PhagesDB.	Protocol 7.2 Protocol 11.2
	Mar. 6	Catch Up Day Begin Lysogen testing (if needed).	Protocol 11.1
	Mar. 8	Catch Up Day Continue lysogen streak plates.	
	Mar.13-17	Spring Break – no labs	
13	Mar. 20	DNA day 1 (phage precipitation)	Protocol 9.1c
14	Mar. 22	DNA day 2 (extract and purify DNA) Verification of potential lysogens. Start lysogen broth.	Protocol 9.1
15	Mar. 27	DNA quantification; restriction analysis	Protocol 10.1
16	Mar. 29	Agarose gel electrophoresis of restriction analysis	Protocol 10.2, Protocol 10.3
17	Apr. 3	Analysis of restriction results and comparison with known actinobacteriophage in database. Calculate remaining DNA volume and amount in ug. Short Presentation Details. Set up DNA extraction if repeat needed.	Protocol 10.4

	Apr. 5	DNA extraction repeat if needed.	
18	Apr. 10	Host range testing. Restriction analysis repeat if needed.	Protocol 11.5
19	Apr. 12	Host Range results discussion. DNA gel repeat if needed. Prepare short presentations.	Protocol 8.1a, Protocol 8.1b
20	Apr. 17	Present short presentations. Assign Final Presentation and Paper.	
21	Apr. 19	Archive Samples. Clean lab and check out.	
22	Apr. 24	Complete PhagesDB archiving entry.	Protocol 7.3
23	Apr. 26	Work on final presentation and paper	
24	May 1	Present Final Presentation	
25	May 3	Final Paper due.	