

Topics in the Study of Life I (BIOL 1107; CRN 19164)
Special PERSIST/FYRIS Section: Cell Science Investigations I

Fall 2017

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Textbook: There is no textbook. Each research group will select from a menu of available references and actively participate in the selection of others. Each student will download the relevant articles from publishers' websites.

Course Objectives

In *Cell Science Investigations I & II*, a laboratory research class, introduces first year students to molecular virology with an immersive research experience. Students will learn the basis of virus-host interactions while they solve the mystery of how an animal virus affects the structure and function of the mitochondria, the so-called powerhouse of the cell. Our objectives are:

1. To understand the molecular mechanisms of virus-host interactions and key cellular pathways, including the structure and function of the mitochondria, mitochondrial dynamics, RNA virus genome replication complex formation, potential virus-host protein-protein interactions, and intracellular protein localization.
2. To gain practical experience of these basic laboratory skills: pipetting, dilutions, sterile technique, microscopy, and use of basic statistics for data analysis.
3. To build a foundation of basic scientific and research principles in critical reading, identifying strengths and weaknesses in assays, designing experiments and inclusion of appropriate controls, keeping records, interpreting data and presenting results in a lab report format.
4. To develop familiarity with and understanding of standard methods and procedures used in virology research, including mammalian cell culture, transfection, localization of proteins by immunofluorescence confocal microscopy, isolation of proteins, and analysis of proteins by SDS-PAGE and Western blot.

Course Goals

1. Learn the fundamental concepts of molecular virology
2. Learn to critically evaluate papers from the current virology literature
3. Apply the concepts you've learned
4. Extrapolate information and facts from what you already know
5. Communicate your understanding of virology both orally and in writing

Experimental Problem: To identify and characterize the molecular interactions between the Nodamura virus (NoV) RNA-dependent RNA-polymerase and cellular proteins localized at the outer mitochondrial membrane.

COURSE APPROACH

Each 3-hour intensive laboratory session will combine experimental objectives with supplemental lecture topics designed to give you the opportunity to participate in the learning process. In the first lab session, we will form small groups of 4 students. You will remain a member of your group for the duration of the semester.

EXPERIMENTAL APPROACH. Student groups will focus on the interactions between the NoV RdRp and a protein localized at the OMM with direct implications on mitochondrial dynamics. It has been hypothesized that the perturbation of mitochondrial dynamics regulates the induction of NoV replication complexes. Lab groups will select from a list of three possible cellular proteins and help characterize their interaction with the viral RdRp and other involved proteins through various biochemical approaches. The target proteins are Drp1, SUMO-01, and Fis1. One additional protein, Mfn1, will serve as an internal control for localization of the outer mitochondrial membrane.

BLACKBOARD. Your TA or I will post all course materials on Blackboard. It is your responsibility to download anything required for the class session and to bring it with you to class. I strongly recommend that you visit the course Blackboard site before each class. The required quizzes will be given on Blackboard.

RESPONDUS LOCKDOWN BROWSER. The Respondus Lockdown Browser is designed to prevent the use of external online sources during an exam. This helps the student focus on the exam without any external distractions. Students will be required to download Respondus Lockdown Browser prior to the exam, update both your computer software and the Respondus Lockdown Browser, and participate in a practice exam BEFORE the Data Interpretation Exam. On the date of the exam, the student should:

1. Bring a laptop to the classroom ([Laptop rentals are available from UTEP's Technology Support Center](#)).
2. Sign in to the UTEP Secure Wi-Fi network.
3. Start the Respondus Lockdown Browser.
4. Log in to your UTEP Blackboard Account.
5. Access the exam at the announced time.

THE UNIVERSITY WRITING CENTER (<http://academics.utep.edu/writingcenter>). The UWC is located in room 227 of the Library. They offer writing assistance to all students, free of charge. The Center's services include help with analyzing your audience; understanding different types of writing (e.g., response papers, research reports, summaries, and arguments); brainstorming ideas and organizing your thoughts; finding the right words to express yourselves; deciding on the best way to revise your drafts; learning how to correct grammatical errors; and properly documenting your sources (this information comes from the UWC website).

CLASS POLICIES

DROP POLICY. To receive an automatic "W", students must drop or withdraw from this class by the **November 3** drop date, as indicated in the academic schedule. There are no exceptions to this deadline.

ATTENDANCE POLICY. As noted below, attendance and participation form an essential part of your grade. Missed quizzes may be made up for reasonable absences including illness, death in the family, or University-sponsored activities such as athletic competitions, attendance of scientific conferences, and military service commitments. However, a signed note from a medical professional or other official must be provided within TWO weeks of the missed assignment to receive credit. Students who cannot provide written documentation will receive a score of 0 for the missed activity.

COURTESY. As a courtesy to your classmates, please give your full attention to all speakers and limit your in-class discussions to topics related to virology and virus-host interactions. Cell-phones and pagers must be turned off or set to silent mode for the duration of the class sessions. Tablet, laptop, and notebook computers are permitted ONLY if used for class-related activities. Please be on time for class – it disturbs the class when you arrive late.

ACADEMIC DISHONESTY. It is the official policy of the University of Texas at El Paso that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. Scholastic dishonesty includes, but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Please see the Office of Student Conduct and Conflict Resolution (OSCCR) website at <http://sa.utep.edu/osccr/> for details.

DISABILITIES. If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, by email to cass@utep.edu, or go to Union Building East, Room 106. For additional information, please visit the CASS website at <http://www.utep.edu/CASS>. *CASS' Staff are the only individuals who can validate and if need be, authorize accommodations for students with disabilities.*

MILITARY STATEMENT. If you are a military student with the potential of being called to military service and/or training during the course of the semester, please contact me within the first two weeks of class to arrange in advance for makeup quizzes, etc.

GRADING SYSTEM

Your grade will be based on a comprehensive assessment of your skills and their development throughout the course of the semester. Grading is NOT based on a curve. Instead, we will use a straight % scale: A (90-100), B (80-89), C (70-79), D (60- 69), F (below 60). You will each EARN a grade that reflects the effort you put into the course and the knowledge you have gained. The final grade will be determined from the following criteria:

1. **ATTENDANCE** (individual). This is a research course and your attendance at each class meeting is required. Any absences are likely to adversely affect your grade. If you plan to miss a lab, please notify the TA by email (mabeltran@utep.edu) beforehand. Attendance will be monitored

2. **QUIZZES** (individual; 200 points possible). Two quizzes (10 points possible for each) will be given each week, starting in the second week of class. A pre-lab quiz will address your research group's focus on the experimental setup for the current week, from the perspective of your selected protein/pathway of interest. A post-lab quiz will cover your group's results obtained each week and the conclusions you will draw from them. The pre-lab quizzes will be available on the course Blackboard site on Friday at 8:30 a.m. and due on the following Monday at 8:30 a.m. The post-lab quizzes will be available on Wednesday at 8:30 a.m. and due by Friday at 8:30 a.m.

3. **BACKGROUND RESEARCH REPORT** (individual; 200 points possible). The purpose of this Background Research Report is to familiarize you with the advanced scientific concepts you will be introduced to, throughout the semester. While this is a laboratory component course, you will be immersed in independent research. In any scientific laboratory, you must first gather and understand the most updated literature in your research topic. In molecular biology, the most trusted and updated pieces of scientific literature are manuscripts from peer-reviewed scientific journals. You will be responsible in attaining reliable and current journal articles relevant to your topic.

4. **DATA INTERPRETATION EXAM** (individual; 100 points possible). Interpreting experimental data is at the forefront of scientific investigations. Understanding the experimental approach, controls, expected results, and drawing conclusions from within the experimental limitations are as critical to laboratory science as selecting the proper experiments. The potential significant impact of your experimental results will require you to be trained in drawing experimental conclusions specific to each assay. Altogether, this will help you solve your scientific problems and evaluate your hypotheses. Students' understanding of these crucial elements will be tested in a Data Interpretation Exam given during the fifth week of the semester via the Respondus Lockdown Browser. You will be allowed the use of a sheet of paper with a writing utensil. All other items must be off of your desk/work area. Students will have one hour to complete the Data Interpretation Exam.

5. **LAB REPORTS** (group; 300 points possible). Each group will collaborate to generate the three major lab reports (100 points each). These reports will be comprised of the results of the studies and your interpretation of the data. Each report will tell a complete story from beginning to end of the goal/hypothesis, methods used, results obtained, and big-picture interpretation. Each report will address only ONE scientific question, although it may be comprised of the results from different assays. The questions focus on the following topics in regard to the group's choice of protein of interest and its interaction with the NoV RdRp: lab report 1, Protein Expression and Interaction; lab report 2, Protein Localization; lab report 3, Mechanistic Perturbation of Mitochondrial Function.

6. **GROUP PRESENTATION** (individual; 100 points possible). Each group will receive 30 minutes for their presentation. While this is a group presentation, members will be graded by their individual performance and overall contributions to this project. Excluding the results section, ensure to reduce the use of text. Cited images and other diagrams should be heavily relied on within these sections. The ability to rely on visuals helps improve your presentation skills and provides aids for your audience to better understand the material. Ensure that all

figures, graphs, tables, and other supporting data presentations in your Results section are properly titled and labeled. All presented data should be clear and visible for the audience.

In summary, the grades will be calculated as follows:

Attendance	100 points (10 weeks; 5 pts/day)	= 10% of total grade
Quizzes	200 points (2/week; 10 pts/each)	= 20%
Background Research Report	200 points	= 20%
Data Interpretation Exam	100 points	= 10%
Lab Reports	300 points (3 x 100 pts/each)	= 30%
Group Presentation	100 points	= 10%
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Total	1000 points	100%

Tentative laboratory schedule (due dates are indicated by bold type)

Week	Dates	Experimental Objective	Supplemental Topic
1	9/5, 9/7	Theoretical scientific problems and preparing solutions	Lab safety and the scientific method
2	9/12, 9/14	Protein extraction (protein quantification) and SDS-PAGE gel electrophoresis	Experimental design (developing an experiment)
3	9/19, 9/21	Transfection of MEF cells with plasmid N1HA and Western blot	Experimental controls; Background research report due 9/21
4	9/26, 9/28	Protein overexpression in presence or absence of RdRp and Western blot	Labeling and recording of data
5	10/3, 10/5	Immunoprecipitation of RdRp and Western blot	Interpretation of experimental results; data interpretation exam due 10/5
6	10/10, 10/12	Immunoprecipitation of protein of interest and Western blot	Viruses
7	10/17, 10/19	Localization of endogenous target protein by confocal microscopy	Intracellular virus/host interactions; lab report 1 due 10/17
8	10/24, 10/26	Localization of target protein after experimental manipulation	Mitochondrial dynamics
9	10/31, 11/2	Mitochondrial distribution in presence of endogenous target protein	Continuation of mitochondrial dynamics; lab report 2 due 10/31
10	11/7, 11/9	Mitochondrial distribution after experimental manipulation	Discrepancies of experimental results
11	11/14, 11/16	Visualizing viral RNA by confocal microscopy	Creating a presentation; lab report 3 due 11/14
12	11/21	Group presentation workshop	
	11/23	Thanksgiving holiday – University closed	
13	11/28	Discuss group presentation; final draft of presentations due on BlackBoard at 9 a.m.	
	11/30	Group presentations	