

Organismal Biology Laboratory (BIOL 1108; CRN 13232)
Special PERSIST/FYRIS Section: Biological Forensics II

Fall 2016

INSTRUCTOR: Dr. Kyle L. Johnson, Department of Biological Sciences
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OFFICE HOURS: By appointment
LAB: Mon & Wed, 2:00 – 4:50 p.m., Biology Building, room B108
TA: Miguel Beltran, B.S.
Textbook: There is no textbook. Readings will be provided in PDF format.

Prerequisites: Students must be freshmen enrolled in the UTEP PERSIST or BUILD programs (collectively called FYRIS). Completion of *UNIV 1301: Research Foundations* is required. Students must secure instructor approval before enrolling.

Course Objectives

In *Biological Forensics I & II*, a laboratory research class, students in the PERSIST and BUILD programs 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 “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, mitochondria dynamics, RNA virus genome replication, cellular apoptosis, intracellular innate immune responses, and gene and protein expression patterns.
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, measure mitochondrial membrane potential through flow-cytometry, isolation of nucleic acids and proteins, analysis of proteins by SDS-PAGE and Western blot and nucleic acids by q-PCR, and techniques in bioinformatics analysis.

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

CLASS POLICIES

Makeup Policy. 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. 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

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 distributed as follows

1. **Pre-Lab Summary Write-ups.** The student will be exposed to different scientific techniques each week. To prepare for the upcoming topics and accompanying

techniques, the student will provide a write up summarizing the topics and techniques.

2. **Group Opening Presentations.** Students will prepare an introductory (Power Point based) presentation that will highlight the concepts and techniques of the week.
3. **Group Laboratory Meetings.** Students will meet with the TA as a group. The TA will help the students interpret data, design experimental approaches, and evaluate experimental techniques. Laboratory notebooks will also be checked during this meeting.
4. **Lab Recaps.** In-class quizzes will evaluate the student's mastery of the current experimental objective.
5. **Research Wrap-Up.** One lab report will be compiled with the results of the studies to tell a complete story from beginning to end of the goal/hypothesis, methods used, results obtained, and the big-picture interpretation. This lab report will be turned in as a group. Each group will also present their work using Power Point to summarize their work.

LECTURE	DATE	OBJECTIVE	TECHNIQUES
Week 1	August 29-31	Introduction to cellular apoptosis.	Conduct in-class exercises to characterize cellular apoptosis.
Week 2	September 7	Identify the integrity of mitochondrial membrane potential.	JC-1 assay in BsrT7 cells. (Flow cytometry)
Week 3	September 12-14	The role of apoptotic signaling and mitochondrial dynamics.	Western Blot
Week 4	September 19-21	Continuation: The role of apoptotic signaling and mitochondrial dynamics.	Immunofluorescence Confocal Microscopy
Week 5	September 26-28	Knockdown of mitochondrial dynamics-related proteins using shRNA.	qPCR
Week 6	October 3-	Evaluate efficiency of shRNA	Western Blot

	5	protein knockdown.	
Week 7	October 10-12	Introduction to the RLR pathway. Induce anti-viral signaling through use of Poly(I:C) in MEFs.	qPCR; IFN- β
Week 8	October 17-19	Induce RLR pathway using Poly(I:C). Characterize MAVS and IRF3 oligomerization.	NATIVE-PAGE, Western Blot
Week 9	October 24-26	Mitochondrial membrane potential in the absence and presence of Nodamura Virus RNA1.	JC-1 Assay in MEFs
Week 10	October 31 – November 2	IFN- β induction in the presence and absence of Nodamura Virus RNA1.	qPCR and ELISA of IFN- β
Week 11	November 7-9	Expression of RLR associated proteins in the presence and absence of Nodamura Virus RNA1.	NATIVE-PAGE, Western Blot
Week 12	November 14-16	Identify NoV RdRp localization and replicase activity in absence and presence of mitochondrial dynamics proteins.	Immunofluorescence Confocal Microscopy

In summary,

Pre-Lab Writeups	120 points (12 at 10 pts each)	= 12% of total grade
Lab Opening Presentations	200 points (2 at 100 pts each)	= 20%
Lab Meetings	240 points (12 at 20 pts each)	= 24%
Lab Recaps	240 points (24 at 10 pts each)	= 24%
<u>Research Wrap-Up</u>	<u>200 points</u>	<u>= 20%</u>
Total	1000 points	100%