

BIOL 312L-04: Molecular Biology Lab
Fall 2016 Syllabus
Tuesday 5:30-8:30
SSMB 141

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Course Description and Objectives:

In this course we will use a cultured cell system (PC12 cells) to study the effects of some drugs in gene expression (Part I). Each pair of students will be assigned a different drug treatment. This will be a semester long project that builds upon the experiments from the previous weeks. Through literature searching, data-mining, and various molecular techniques (primer design, RNA and DNA extraction, RNA and DNA quantification, reverse transcription, PCR, Real Time RT-PCR, restriction enzyme digests), students will be required to work together to formulate and test a hypothesis on how a gene may be regulated by drug treatment. In Part II we will be focusing on using and understanding the impact of molecular biology on everyday life.

Learning Outcomes:

Students will

- demonstrate the ability to use and explain modern molecular biology techniques.
- demonstrate an understanding of developing hypotheses and designing experiments.
- communicate, analyze, and discuss experimental results.
- demonstrate the ability to evaluate and apply information presented in scientific journals.

Co-requisite(s) or Prerequisite(s): BIOL 312, MATH 250 or equivalent course in statistics or permission of instructor.

****Dates and Course content on this syllabus are subject to change****

Due to the research based nature of this lab, we will need to be flexible with our dates and requirements.

Grading: Based on a total of **120 points** by the following system:

Attendance: 5 points

Participation and scientific thinking (in-class and homework): 25 points

Midterm Exam: 20 points

Notebook Entries and part II reports: 40 points

Final Report part 1: 30 points

Final Grading Scale:

A (93.5-100), A- (90-93.49), B+ (88.5-89.9), B (83.5-88.49), B- (80-83.49), C+ (78.5-79.9), C (73.5-78.49), C- (70-73.49), D+ (68.5-69.9), D (63.5-68.49), D- (60-63.49), F (<60)

Attendance: Since this is a lab class, attendance is critical and required. **You will be required to sign-in at the beginning of every lab period.** Unexcused absences will result in lower attendance and participation grades. **Missing three or more labs due to unexcused absences**

will result in a WA (withdrawal due to excessive absences). Excused absences (emergency or known in advance) must be officially documented. Please remember you are working as a team, so absences will result in a deduction of participation points. There are no make-up exams. Assignments are due during the scheduled lab period. **Late assignments will receive a 25% deduction of points for each day they are late.**

Participation: Grading of participation will be assessed based on the following criteria. Your presence and positive attitude in class is a major factor in participation. Participation will also be assessed based on but not limited to:

- Coming to class prepared
- Working well with others (science is collaboration)
- Willingness to help (i.e. make reagents and clean up after lab)
- Asking questions (everyone needs to participate in lab discussions)

Textbook: There is not a required paper textbook for the lab. Lecture and lab materials (including protocols), assignments, and links to research articles will be posted to the Biol 312 lab course page on Oaks.

Supplies: REQUIRED

- One very fine point permanent marker (e.g. ultra-fine point Sharpie)
- One bound notebook (e.g. composition book)
- Lab coat
- Safety Goggles (with side shields)

Lab Safety: *IMPORTANT! One of the projects of this course will involve handling of rat normal cell line: The PC12 cells (for more information please visit: https://www.atcc.org/en/Products/Cells_and_Microorganisms/By_Tissue/Other_Tissues/Adrenal_Gland/CRL-1721.aspx#generalinformation)*. We will take extra precautions and assume the cells have infectious potential. We will follow strict safety practices that if followed appropriately will put students at little to no risk of infection. We will go over in great detail all of the safety precautions associated with this lab. You will be required to take additional online safety training through CITI. If students have a medical issues or general concerns about the safety of the lab exercises, they are encouraged to talk with the instructor in advance about accommodations that may be made during the class

Lab Notebook: In this lab you will be treated like a real scientist, therefore you are required to keep a lab notebook like a real scientist. Each student's lab notebook should be individual work, legible and organized. It should be written so that other people can follow your work exactly to achieve the same result(s). Lab reports will be collected on a weekly basis. It is expected that students will write about 2 to 5 pages for each week's lab in the following format:

Title and Date:

Provide a descriptive title of the week's lab and date the work.

Purpose:

Briefly describe the purpose of the lab. (Min.: 2-3 sentences). You may also explain the significance of the procedure or the type of application that can be used with the procedure.

Materials and Methods:

Specific information on materials used other than regular reagents.

- Example of information to be recorded: Specific activity, Company/Lot #, Concentration, Nucleotide sequence, type of DNA plasmid, DNA probes sequence, enzymes, label, etc.

- Procedure: Handouts will be provided. These handouts should be put into or the procedure written into your notebook. In some cases there will be some modification or changes in the procedure. This should be recorded to show the changes. Information on volume, concentration and time should be added when needed.

Results:

Your results should be labeled and have enough information so that an outside reader can understand your results. The results should also be referenced appropriately (Fig. 1, ... or Table 1, ...) so that you can discuss the results in the discussion section.

Discussion:

Summarize your result(s). Explain the outcome of the procedure. Was there anything you could have done to better your result(s)?

Homework and In-class Assignments: The lab exercises will involve working within a group. However, despite being encouraged to solve problems as a team, your homework and in-class assignments MUST show individual thought.

Midterm Exam: The midterm will be a short in-class written and bench work exam. The purpose of this exam will be to assess laboratory skills (pipetting, lab math, safety, etc..).

Final Lab Report: At the end of the semester, you turn in a final lab report during finals week. We will go over in more detail the requirements for this report the first week of November. Each individual is required to write their own lab report. YOU MAY NOT WORK TOGETHER. THIS IS AN INDEPENDENT REPORT.

Religious Holidays, Student Athletes, and Students with Disabilities: Students with special requirements are asked to please notify the instructors of your needs so arrangements can be made.

Cheating and Plagiarism: The Honor Code of the College of Charleston specifically forbids cheating, attempted cheating, and plagiarism. A student found guilty of these offenses will receive a failing grade for the course. Additional penalties may include expulsion or suspension from the College at the discretion of the Honor Board. See the College of Charleston Student Handbook for definitions of these offenses.

Schedule:

Date	Laboratory Exercise	Assignments/Deadlines
Aug 29	Last day to Drop/Add	
Aug 30	Introduction, Lab Safety, Lab Notebooks why molecular biology?	
Sept 6	Pipetting, Lab Math, database search and Using PubMed	Set the Notebook
Part I: Gene Expression in Rat brain like cells		
Sept 13	Discuss PCR, design primers, design an Experiments (+ and – controls)	Assignment 1 (Using pubmed, search a gene) due (online + copy on your notebook)
Sept 20	RNA Extraction	All Citi modules must be completed Hypothesis statement due <i>Hypothesis notebook entry due</i> <i>Design the experiment</i>
Sept 27	RNA Quality: gel electrophoresis and spectrophotometry	Primers due <i>Primer notebook entry due</i>
Oct 4	Reverse Transcription	<i>RNA extraction and RNA quality notebook entry due</i>
Oct 11	Midterm Exam Real time qPCR	<i>Reverse transcription notebook entry due</i>
Oct 18	Analyze Real Time qPCR results; Discuss Final lab report	
Part II: Impact of molecular biology on everyday life		
Oct 25	DNA Bioinformatics: sequencing, Using bioinformatics databases, compare and extrapolate database information and identify the gene product	<i>RT-qPCR data analysis notebook entry due (online + copy on your notebook)</i>
Oct 27	Last day to withdraw with a "W"	
Nov 1	Diagnosis of a genetic disease: In search of the cholesterol gene	<i>DNA Bioinformatics report is due (online + copy on your notebook)</i>
Nov 15	How is the criminal? DNA Fingerprinting Using Restriction Enzymes	<i>Diagnosis of a genetic disease report is Due (online + copy on your notebook)</i>
Nov 22	Water Quality Testing III: Isolation of Bacterial DNA from Contaminated Water, Multiplex PCR Amplification of Water Contaminants	<i>DNA fingerprinting report is due (online + copy on your notebook)</i>
Nov 29	Water Quality Testing III: Separation of PCR Products by Electrophoresis, Staining of the gel	
Dec 6	No class Final Report part 1 due	<i>Water quality testing report is due (online + copy on your notebook)</i> Dropbox will be setup on OAKS Due by noon.

SAFETY POLICY AND PROCEDURES

The School of Sciences and Mathematics of the College of Charleston understands that the safety of our students, staff and faculty is of paramount importance. Engendering a safety culture is an important part of our mission in teaching and doing science. Each department, course of instruction, or research lab may require higher standards or procedures. The policies and procedures set forth below are understood to be minimum requirements across our departments.

In this document, the term "laboratory" is meant for a work space/facility where chemicals, biological agents, or equipment is used for research and/or instruction.

No one (student, staff, faculty, or visitor) will be allowed in a laboratory (teaching or research) to perform experiments or where experiments may be in progress unless these regulations are followed.

Students dismissed from a teaching lab due to violations of the safety procedures will not be allowed to re-enter the laboratory until authorized to do so by their supervisor (instructor) and, in the case of research laboratories, by the department chair or designee. Any course work missed because of a violation of these guidelines cannot be made up at another time (or by an extension of the lab period) and will be treated as an unexcused absence.

1. You are responsible for knowing the biological, chemical, electrical, ergonomic, mechanical, and physical hazards associated with the equipment and materials that are being utilized in the laboratory. Listen to all instructions and ask questions about that which you do not understand.
2. Know the location of safety equipment: telephones, emergency shower, eyewash, fire extinguisher, fire alarm pull.
3. Know the appropriate emergency response procedures. If there is an injury or emergency, call 953-5611.
4. Do not work alone in the laboratory if you are working with hazardous materials or equipment.
5. Use hazardous chemicals, equipment, and biological agents only as directed and for their intended purpose.
6. Do not engage in horseplay, pranks or other acts of mischief while in lab.
7. Drinking, eating, and application of cosmetics is forbidden in laboratories where chemicals or biohazards are present. Smoking is forbidden in all College buildings.
8. Appropriate personal protective equipment shall be worn. The dress code for laboratory work when using chemicals, biological or physical hazards, or when instructed to do so by the laboratory supervisor is as follows:
 - a) Wear safety glasses or goggles at all times.
 - b) No exposed skin on arms, legs or torso.
 - c) Wear lab coats or other approved protective garments.
 - d) Wear gloves or other personal protective equipment (PPE) as directed by the instructor or mandated by prudent practices based on the chemicals being handled. If in doubt, wear appropriate gloves. Latex is not permitted. Avoid cross-contamination.
 - e) Remove PPE (gloves and lab coat) when exiting the laboratory.
 - f) Wash your hands, even if gloves were used, before leaving a lab where you did any lab work.

- g) Closed toe shoes are required. The heel and top of foot must be covered. High heeled shoes, sandals, and perforated shoes are not permitted.
- h) Confine long hair and loose clothing.
9. Inspect equipment or apparatus for damage before adding chemical reagents or biological samples or energizing electrical equipment. Do not use damaged equipment.
10. Never remove chemicals, biological samples, or laboratory equipment from a lab without proper authorization.
11. Presume that all chemicals and biological samples used in the laboratory are hazardous for you and the environment, unless instructed otherwise.
12. Never leave an experiment unattended unless proper safety precautions are in place.
13. Read all labels on chemicals twice before using them in the lab. Read all instructions twice for the operation of any equipment or machinery.
14. Properly and safely dispose of all waste materials.
15. Treat sharps and broken glassware containers carefully.
- a) Broken glass should be disposed of in properly marked safety containers. All sharps (needles, razor blades, etc.) used for any purpose must be disposed of in specially labeled SHARPS containers.
- b) Do not place contaminated glass in the broken glassware container. Consult your supervisor. c) Waste chemicals and contaminated PPE should be discarded as directed.
16. When using a reagent, replace the lid immediately. Never return unused reagents to stock bottles. Take only the amount needed for your experiment.
17. All chemicals and biological samples/media are to be disposed of in appropriately labeled containers. Specific instructions for each material will be provided. Pay attention to waste container labels before adding the material to be discarded.
18. Use good personal hygiene. Keep your hands and face clean. Wash hands thoroughly with soap and water after handling any chemical or biological agent.
19. Keep the work area clean and uncluttered with chemicals and equipment. Clean up the work area on completion of an operation or an experiment. Before leaving the laboratory, you are responsible for making sure your lab area is clean and organized.
20. Never store a chemical or biological specimen in an unlabeled container.
20. Always have your College of Charleston identification and insurance information with you when working in a laboratory. MedicAlert identification must be worn if you have any potential life-threatening chemical sensitivities or medical conditions.
21. Report any accident or injury, however minor, to your teaching assistant, instructor, or lab supervisor immediately. An accident report form must be completed and forwarded to the department chair, dean, and to the Director of Environmental Health and Safety.

If you have questions/concerns about safety in the lab please first consult your instructor. If these are not answered, please see the department chair. Finally, you may consult the director of Environmental Health and Safety, Randy Beaver at 3-6802 or beaverr@cofc.edu

Adopted: March 7, 2012

CougarAlert

The College of Charleston has an agreement with the Blackboard Connect Inc. [formerly The NTI Group, Inc. (NTI)] to use its Connect-ED communication software to provide an emergency notification system that is capable of reaching students, faculty, staff and parents within minutes of a campus crisis. This system is called **CougarAlert**.

Information for Students

The CougarAlert emergency notification system will contact up to six phone numbers for the student. Students may include family member numbers in their address and phone number information.

All students should log onto [MyCharleston](#) to review their address and telephone information and update as needed.

To access the address and telephone information, follow these steps:

1. Log on to [MyCharleston](#)
2. Click on the Academic Services tab
3. Click on the Banner Self-Service link in the third column
4. Click on the Personal Information link
5. Click on the Update Address and Phones and Cougar Alert link

The CougarAlert system will pull the phone number in the following order – cell phone with text messaging option, cell phone without text messaging option, residence hall room phone number, mailing phone number, home phone number, parent phone number and parent 2 phone number.

If you do not have one of these numbers in your student record, the system will select the next number on the list. To avoid issues related to timely communication of emergency messages to the proper places, every student must update his or her contact information in [MyCharleston](#) with current accurate information.

CougarAlert Display Information

When you receive an emergency message from the College of Charleston's CougarAlert System, the return e-mail address will be displayed as cougaralert@cofc.edu, and Caller ID will be displayed as 843.725.7246 (this is the College's Emergency Information Hotline).

Testing and Implementation

Testing will be conducted each semester to verify all systems are operating properly. The campus community will be notified via e-mail and web page postings when testing of the system will be conducted.

Blackboard Connect Software

[Blackboard Connect](#) is an emergency communication software that sends notification before, during and after an emergency. With this new system, the College will be able to communicate in many modes, including voice messages to home, work and cell phones; text messages to cell phones, PDAs and other devices; written messages to e-mail accounts; and messages to teletypewriters and telecommunication devices (TTY/TDD) for the hearing impaired. In combination with our existing communications methods and emergency response plans, this new notification system will significantly enhance the College of Charleston's ability to maintain a learning environment in which students are safe, secure and comfortable.

In an emergency, communications to the campus will be issued in the following priority order:

1. Message to the [Blackboard Connect](#) Emergency Notification System (phone and e-mail).
 2. Recorded message to the College's Emergency Information Hotline, 843.725.7246.
 3. Update to the Website.
 4. Printed update sheets to be distributed and posted on campus (if necessary).
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The CougarAlert system will only be used to notify you in the event of a campus crisis or emergency.