ANSCI 385 – Biotechnology Laboratory

Instructors Dominique Alfandari (alfandar@vasci.umass.edu)
Kathleen Arcaro (karcaro@vasci.umass.edu)

Times Twice per week; 3-hour lecture and lab class

Place ISB 368

Course Description Students will receive practical experience in basic and advanced cell and molecular biology techniques used in biotechnology and research laboratories. The course will be divided in two modules. The first module, mammalian cell culture, will utilize two breast cancer cell lines to examine the role of DNA methylation in gene expression and ultimately disease. The second module will train students in the use of fluorescent microscopy to visualize organelles in living cells, in methods of protein purification and analysis, and in the use of luciferase reporter assays to measure transcriptional activity.

Learning Objectives In addition to providing students with modern biological laboratory skills, this course is designed to encourage students to think critically in the analysis of experimental results. Throughout the semester students will work in teams and will practice critical reasoning by trouble-shooting problems as they arise. Oral communication skills will be practiced by presenting progress reports and team presentations. Students also will practice careful note-taking and organization of laboratory reports.

Credits 4

Prerequisites ANIMLSCI 200 and ANIMLSCI 311 or equivalent

Grading Grades will be based on lab reports (40% of grade), team presentations (10% of grade), lab notebooks (10% of grade), and in-class exams (40% of grade). The rubric for grading the progress reports and team presentations includes the clarity of the introduction of the problem, elucidation of the hypothesis tested, understanding of the methods, application of appropriate statistical tests to the results, and clear conclusions.

Required Reading Lab manuals and handouts as provided by professors
Relevant, recent primary literature available on-line

Bibliography Molecular Biology of the Cell, 6th Edition
Alberts B, Johnson A, Lewis J, Morgan D, Raff M, Roberts K and Walter, P. 2014 Taylor & Francis Group

Class	Topic
Module 1: Mammalian Cell Culture: Sterile Technique, DNA Methylation and Gene Expression	
1	Basics of sterile technique; begin maintaining two breast cancer cell lines that will be used throughout the module
2	Cell culture: counting and seeding; introduction to DNA methylation in cancer
3	Cell culture: seeding; DNA extraction; Primer design for methylated DNA
4	Cell culture: proliferation/toxicity assay; Continue primer design for methylated DNA
5	Cell culture: proliferation/toxicity assay and seeding; RNA extraction and primer design
6	Cell culture: analysis of proliferation assay; RT-PCR
7	Cell culture: treatment with AZA
8	Cell culture: phase-contrast photo-microscopy, use of scale bars, images for reports, Pyrosequencing
9	Cell culture: maintenance; Pyrosequencing
10	Cell culture: freezing cells; Analysis of DNA methylation and expression data
11	In-class lab skills and written examination
12	Team presentations
13	Team presentations
Module 2: *In Vivo* Fluorescent Microscopy, Protein Purification and Transcriptional Activity	
14	*In Vivo* Fluorescent Microscopy-Principle (GFP/RFP/Live-Act)
15	*In Vivo* Fluorescent Microscopy (Photo-activation and photo-conversion)
16	*In Vivo* Fluorescent Microscopy (Software, Time lapse)
17	Protein Purification and Analysis (Extraction and basic detection techniques ELISA, Western blot)
18	Protein Purification and Analysis (Affinity purification and immunoprecipitation)
19	Protein Purification and Analysis (Introduction to mass spectrometry)
20	Protein Purification and Analysis
21	Luciferase Assays to Measure Transcriptional Activity (Principle and comparison with other techniques)
22	Luciferase Assays to Measure Transcriptional Activity (Applications)
23	Luciferase Assays to Measure Transcriptional Activity (Analysis, normalization, controls)
24	In-class lab skills and written examination
25	Team presentations
26	Team presentations

Attendance Policy

Absentee policy and extenuating circumstances (illness, death in the family, etc.) for which students must miss a class meeting

While attendance is crucial to participation in the Honors Seminar Series and therefore a significant factor in calculating your final grade in this course, extenuating circumstances may require you to miss a class meeting. Whether an absence is "excused" or counted in calculating participation grades is largely at the discretion of the instructor. Any student absent—whether the absence is "excused" or not—should contact the instructor as soon as possible to discuss assignments missed, class discussion, etc.

Student athletes, members of the band, and on occasion, students who are members of other groups will be allowed to miss class for games and other special events and make up work will be assigned. (See http://www.umass.edu/umhome/events/religious.php for University attendance policies and religious holidays.)

Accommodation Statement

The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

Academic Honesty Statement

Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent (http://www.umass.edu/dean_students/codeofconduct/acadhonesty/).

Plagiarism Policy

Documenting the Writing, Speaking, and Thinking of Others

In all your writing, and in oral presentations too, it is essential that you acknowledge the ideas of others upon whom your own thinking depends, including ideas obtained from such non-written sources as lectures, interviews, class discussions, and even casual conversations with colleagues and friends. Give credit for ideas that are not your own as well as for passages of text that you summarize, paraphrase, or quote.

If material possessions are the property of our community at large, thoughts and ideas—expressed in speech or writing—constitute the "intellectual property" of our academic community. To take another's words or ideas and present them as your own is to commit plagiarism, an act of academic theft, and the punishments can be severe (cf. *University of Massachusetts Amherst Academic Regulations*, "Academic Honesty").