

Microbial Physiology Lab Fall 2011

This lab meets every Tues from 1:20-5:20 pm first for discussion in HS367 and then HS165. Attendance is required.

The objective of this laboratory is to teach a variety of techniques used in physiology research, while conducting discovery-based research. What is discovery-based research? If you have not had the opportunity to conduct independent research, this is your opportunity in class setting. This means we as a class will try to address multiple research questions about bacterial strains that were isolated from the Fox River. During these different experiments (week by week), you will learn about how to conduct research, become familiar with a variety of techniques used in microbiology research, and learn how to compile and analyze a variety of data sets.

This class research builds upon the beginning characterizations of these Fox River (FR) bacterial isolates that began with Fall 2010 microbial physiology students. Attached is the 2010 class poster that was presented at the American Society for Microbiology General Meeting in New Orleans by one of the student's from class.

The goal at the end of the semester would be to present the research conducted in Microbial Physiology at some type of regional/national scientific meeting, the UW research symposium, or Oshkosh celebration of scholarship. Everyone from class gets to put the poster on their resume. This is something that can help you standout as you apply for a job position, graduate school, or professional school.

With that introduction to the lab portion of microbial physiology, let's get into the specifics of the course. Over the course of 14 weeks, we will try and address both culture and molecular experiments to better understand the "ecophysiology" of the FR freshwater bacteria. You may ask why we are studying freshwater bacteria for this course instead of the classically described strains of *E. coli*, *B. subtilis*, or *P. aeruginosa*. Because this allows us to utilize a variety of techniques to "conduct primary" research experiments since we do not already have this information in the scientific literature. We will focus on learning a variety of techniques used for physiology research. After the experiments are over as a group we will analyze our data to formulate conclusions about how about these freshwater strains fits with peer published research. The first question you need to ask, what is known about closely related bacterial species from freshwater and other environments to help us plan experiments and analyze.

Your responsibilities:

- 1) Keep an extremely detailed research lab notebook. You will need a BOUND composition style notebook. Your notebook will be graded 2 times during the semester: once early in the semester (between week 3-4; giving you time to improve your observations, results, and procedure recording skills an). The second time will be after we complete the class research on the FR isolates (week 8). (50 points for each: 100 total points)

- 2) Read the lab write up and corresponding research paper for lab each week. We will discuss the lab write up, the method(s) and expected type of data that will be collected from the experiment. Each method/technique will be used to address a specific question about the "ecophysiology" of your

bacteria. YOUR WEEKLY CONTRIBUTION ADDS TO THE PARTICIPATION GRADE FOR LAB (100 points).

3) One week after collecting data from a weekly experiment and/or finishing multiple techniques to address a single question, you need to analyze the data about your bacterial strain. We will take time in lab to put together the class research data from these data analysis and discussion elements. Something to keep in mind ANY of the experiments can be RE-DONE because in research sometimes we need to confirm our results. YOUR WEEKLY CONTRIBUTION ADDS TO THE PARTICIPATION GRADE FOR LAB OF (100 points).

4) Each student will write up a single paper summarizing the results about their particular bacteria isolate include a minimum of 5 references about closely related bacteria for comparison. These papers will be formatted like international journal of systematic evolutionary microbiology (. There is an example of a paper from the journal posted on D2L. This will be a record of the data collected about your individual freshwater bacterial isolate including a discussion of how these results fit with the literature. This paper deadline is December 3, 2011. (50 points) If this is late, you will LOSE 10% of the points by each day that it is late.

5) As a class we will spend an entire lab working on the class poster. This including putting together the written text (Introduction, Methods & Materials, and Discussion) and Results (Tables and Figures). Over the course of the semester, we will weekly discuss the results, which will direct our work on this poster. Make sure that you bring a hard copy and an electronic copy (Lab 13: December 6) (25 points)

6) An independent research project spanning 4-weeks will be conducted in groups of two. These projects need to address an aspect of microbial physiology. The first aspect is determining your research question surrounding the project. This may stem from something that week have talked about in lecture or lab or even another microbiology/biology course. The next step is to find methods that will allow your group to address this research question. The first part is putting together a short research proposal detailing the question that you are trying to address (including a hypothesis about the research), a research plan for the 4 week time frame you have to conduct this independent research, a back-up plan or part of the research question that is assured to give your group some type of data, and a list of the supplies and equipment that you will need to complete this research. **The proposal is worth 25 points and is due October 8th.** This gives me the time to get them back to your groups by October 11th for discussion and revisions. Your group will be graded upon the feasibility for the research question, general planning of the experiment, and completeness for essential supplies and reagents. Over the month of November you will have the entire 4-hour lab and outside class time to work on these projects. (Entire month of November)

7) The final part of the independent projects is to give a formal research talk. The presentations will occur on December 13. 2011. These talks should be 15-20 minutes long. The talk should be broken down into an introduction into the field/topic that applies to your research topic. Next you should include your research question/ hypothesis followed by methods. The main part of the talk should focus on your results, data analysis (discussion), and conclusion about the project. The presentation will also be graded upon professionalism, speed, delivery, and ability to answer questions about the research. **This presentation is worth 100 points.**

Lab Point Breakdown:

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| 100 pts | Discussion/Weekly Presentation of Research |
| 100 pts | Lab Notebook (Will be reviewed two separate times) |
| 50 pts | Paper Summarizing Research on your Riverine Isolate |
| 25 pts | Contribution to Class Poster |
| 25 pts | Research Plan for Independent Research (submitted by the group) |
| 100 pts | Presentation of Independent Research |

Lab Schedule

Week/Date	Lab Exercise
Wk1/Sept 13	Introduction/Dilution-to-Extinction
Wk2/Sept 20	Growth Curves/Carbon Utilization/Isolation of Riverine Bacteria
Wk3/Sept 27	Genomic DNA & Plasmid DNA Isolations Continuation of Wk 2 exercise
Wk4/Oct 4	Biofilm Formation/ G+C Content Analysis Continuation of Wk 3 exercises
Wk5/Oct 11	Quorum Sensing lab/ Gene Analysis/ Plan Pigment Lab Continuation of Wk 4: Analysis of Biofilm
Wk6/Oct 18	Assessment of Pigment Protection/Clean-up of PCR products Continuation of Wk 5 exercises
Wk7/Oct 24	Scanning Electron Microscopy Demo on Biofilm sample Preparing for Independent Research/Continuation of Wk 5 exercises/ Re-do of any parts of the course
Wk8-11 Nov 1-22	Group Independent Research (If you need extra time, your group can have until Nov 29)
Wk12/ Nov 29	Bioinformatics Lab: Basic Sequence Analysis of Isolate Data
Wk13/Dec 6	Class Poster Workshop
Wk14/Dec 13	Independent Research Presentations