**113 Lab Learning Objectives**

**Week 11: Information and Natural Selection lab #6**

Learning Objectives for Environmental Information and Natural Selection

*Skills*

* Design well controlled experiment to test toxicity of plant extract.

*Cognitive*

* Employ a scientific approach to answer biological questions and test hypotheses.
* Analyze experimental data and reach logical conclusions.
* Construct a generalizable explanation linking genetically defined taste capacity to natural selection and evolution.
* Identify possible sources of environmental information that communicates the level of toxicity for plant tissues.
* Design an experiment to use model organisms to extrapolate potential toxicity of a compound or mixture.

**Week 11: Information and Evolution Lab #4**

Learning Objectives for Bacterial Evolution

*Skills*

* Pipet accurately.
* Work with bacterial cells using sterile technique.
* Make dilutions of stock solutions.

*Cognitive*

* Employ a scientific approach to answering biological questions and test hypotheses.
* Describe the big idea of evolution based on lab experiences.
* Explain how antibiotic resistant bacteria can appear quickly in the population.
* Design directed evolution process to select antibiotic resistant bacteria.

**Bio113 Week 11**

Before you come to lab

1) Find out how antibiotic resistance works for the antibiotic you have chosen. What mutations have been documented, or what new genes do cells acquire to become resistant?

2) Answer each of these four questions in two sentences or less.

A) When you are performing your directed evolution experiment, do the cells only mutate their   
 DNA in beneficial ways to survive? What is the genetic source of resistance?

B) How will you know when the cells become antibiotic resistant?

C) What is the connection between brine shrimp toxicity testing and PTC tasting in mammals?

D) Is it possible for two different species to co-evolve? How might this be related to TAS2R38   
 and the brine shrimp toxicity testing?

**Week 11**

In Lab

**Evolution: Directed Evolution of Antibiotic Resistance in Bacteria (a 6 week project)**

3) Analyze your results from the last evolution experiment and perform your next round of directed evolution. If possible, pick colonies from your plate that are within the “zone of inhibition”. Otherwise, just take the inner ring like last week. You may want to pool your control cells from your previous six plates, or not. At this point in Bio113, you should be able to shape your experimental design based on the questions you want to answer. You have 6 plates to work with this week.

**Information and Evolution: Genetics of Perceiving Danger Module (an 8 week project)**

4) We have outlined a well controlled toxicity experiment that will provide you with statistical power to draw meaningful conclusions. You will discuss this as a group in lab, but you should be prepared to discuss the design with the entire lab.

5) Conduct the brine shrimp toxicity test. Note that 1 to 2 people from each group will need to come in Friday afternoon to count the live and dead shrimp. By Monday, it will be too late to collect these data.

**Brine Shrimp Bioassay for Plant Toxins**

A) Use an unnumbered vial and fill it with 5 mL of sea water. You will use this vial in step #4 with sea water as a “ruler” for filling all vials to a final volume of 5 mL.

B) Put 1 mL of sea water into all 22 of your numbered vials. You can do this using the squirt bottle and estimate the volume.

C) Use the squirt bottle to make the final volume 5 mL using your unnumbered “ruler” vial to estimate 5 mL.

D) Add 10 live brine shrimp to all 22 of your numbered vials. Be sure to not include any dead ones and do not exceed 5 mL total volume.

E) Leave the caps off and place the vials back into your box to keep them from spilling.

F) **Friday**, at least one person from each group needs to come to lab and count the live and dead/missing brine shrimp in all 22 vials. Record the number of live shrimp for each individual vial (don’t pool your data).

Counting shrimp works well if two people from each group work together. The lab will be available 8 am – 5 pm Friday but you may have to knock or ask the someone in the biology office to help you open the door. Record your numbers and save them for lab next week. Don’t count dead ones and account for any missing shrimp. You know you started with 10 in each vial.