**113 Lab Learning Objectives**

**Week 10: synthetic lab #9**

Learning Objectives for Promoter Discovery

*Skills*

* Write effective lab report in the form of a scientific paper.

*Cognitive*

* Employ a scientific approach to answering biological questions and test hypotheses.
* Analyze experimental data and reach logical conclusions.
* Generate overall conclusions of the multi-week laboratory module to identify new promoters that could be useful in synthetic biology research.

**Week 10: Information and Natural Selection lab #5**

Learning Objectives for Environmental Information and Natural Selection

*Skills*

* Extract potentially toxic materials from plant tissues.

*Cognitive*

* Employ a scientific approach to answer biological questions and test hypotheses.
* Analyze experimental data and reach logical conclusions.
* Construct explanation linking genetic taste capacity to natural selection and evolution.
* Hypothesize sources of environmental information that indicate toxicity of plant tissues.
* Design an experiment to use model organisms to extrapolate potential toxicity of a compound or mixture.

**Week 10: Information and Evolution Lab #3**

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 10**

Before you come to lab:

1) Read about [Goldilocks evolution](http://www.bio.davidson.edu/113/weekly_Labs/Goldilocks_evolution.pdf)

2) Bring plant tissue for extraction of potential toxins. You need to bring this with you for lab. If you forget, you will be sent away to go get it.

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

A) Can evolution with random mutations result in identical outcomes multiple times?

B) What was the main point of the “Goldilocks” evolution story?

C) Why are we collecting plant materials this week? To which previous lab is this connected?

D) Why would a plant produce bitter compounds?

**Week 10**

In Lab

**Information: Design and Build a New Promoter (an 8 week project)**

1) submit written lab report, make sure it was pledged by everyone in your group

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

2) Analyze your results from the last evolution experiment and perform your next round of directed evolution. You want to collect and test a mixed population of bacteria that may be developing antibiotic resistance. Where will you find these cells on your three plates from last week? You will have six plates to use this week.

**Information and Evolution: Genetics of Perceiving Danger Module (a 5 week project)**

3) Your lab group needs to bring in two plant tissues. You can bring leaves and berries from a single plant, or leaves from two different species, *etc*. If you can, find a plant that looks like it has some damage due to herbivore predation. Then bring leaves that are damaged vs. not damaged. You can see if plants produce toxins in response to predation. Your goal is to find two tissues – one that you think will be toxic and one that you don’t think will be toxic. Be prepared to explain why you chose your two plant tissues.

4) Grind and extract potential toxins from your plant tissue samples. Be sure to label each vial correctly and with your lab group name. We will let them evaporate until next week to get rid of the methanol solvent.

**Plant Toxin (?) Extraction**

Collect two plant tissues, one you think might be toxic (A) and one you think won’t be (B).

Get 22 vials

Label them A1 – A11 and B1 – B11.

Grind up your two tissues using very few grains of sand and no water.

Weigh 0.4 grams of each paste and put into test tubes labeled A or B. Don’t mix samples A and B up at this step.

Add 4 mL of methanol to each tube and let the extraction proceed for 5 minutes.

|  |  |
| --- | --- |
| **Vial Numbers** | **Volume of Extract** |
| 1 | zero |
| 2 & 3 | 250 µL of pure methanol, no extract |
| 4-11 | 250 µL extract |

Leave the caps off and let this dry for one week. We will use these next week. Leave them in a color-coded box already labeled either am or pm.