ADVANCED PROTISTS LAB

SSS: SC.G.1.4.1, SC.F.1.4.2, SC.F.1.4.7

INTRODUCTION

The following lab should be separated into a three-part lab (pre-lab, lab, and post lab) spanning three days. Pre-lab: Teacher introduces Protists with a short lecture. Students spend about fifteen minutes looking at images of Protists and making sketches of their observations. Lab: Students are introduced to the compound microscope and procedures for preparing wet mounts of living material. Post-lab: Class forms small groups of three or four and discusses their observations and the data they collected. The discussion would be composed of four parts: Locomotion, feeding, excretion, and trichocyst discharge. For each part students will answer several questions that relate directly to their observations. In groups they will apply what they've learned to answer questions about other Protists and similar food chains. Each group then presents their results to the class. Finally, the teacher will solicit ideas from students about additional experiments that could have been conducted in the lab.

STUDENT LEARNING OBJECTIVES

1. Students will be able to recognize differences between animal-like and plant-like Protists, prepare wet mounts of live Protists, use the microscope to identify features of Protists, and collect data on physiological processes of Protists.

MATERIALS

Teaching Aids

Prepared microscope slides of *Paramecium* and *Spirogyra*

PROCEDURES

Agenda

- Quick Write: Everything you know about Protists
- Protists Lab

Lecture

Introduction (5 min): Students pull out a sheet of paper and write everything they know about Protists, which usually amounts to a few names and that they are very small. Students should become familiar with the ways in which Protists are similar to the other eukaryotes.

Lab

Exploration (10 min): Students are introduced to the proper procedure for preparing a wet mount. Each student then prepares a wet mount and uses the microscope to explore the contents.

Activity: Students will examine their samples under a microscope and draw pictures of five things they observe. Once students have completed their drawings they should number each drawing then create a table with three columns. In the first column, numbers one through five, in the

second column classify the drawing as plant-like (PL) or animal-like (AL), in the third column list one characteristic you used to classify the organism. The purpose is for students to recognize differences between living and non-living things, and plant-like and animal-like protists.

Prepared Slides (10 min): After a brief discussion about the drawings and data tables, students obtain prepared slides of *Paramecium* and *Spirogyra* and make sketches of *Paramecium* and *Spirogyra* involved in asexual or sexual reproduction, identify/label all visible structures, and make general observations.

Wet Mounts of Living Material (15 min): Students prepare wet mounts of *Paramecium* and *Spirogyra* and locate as many subcellular structures of each species as possible. Since students are already familiar with the procedures for preparing a wet mount, we can move to preparing wet mounts of live specimens for the purpose of making specific observations to compare/contrast. Students compare and contrast live specimens of *Paramecium* and *Spirogyra* to their sketches and observations of preserved specimens.

Activity: Students construct a table to compare/contrast live vs. prepared slides of *Paramecium* and *Spirogyra*. In the first column list three structures you identified from the preserved slides of *Paramecium* and *Spirogyra*, in the second column identify how these structures were different in the live specimens, such as movement, size, color, etc. For example, in the preserved slide of *Paramecium* you probably identified the contractile vacuoles, but in the live specimens the contractile vacuoles were discharging water. Later in the exercise students compile data on the physiology of Paramecium and use that data to construct figures, so this is just a simple activity in sharing data among scientist.

Compare and Contrast (10 min): Using the chalkboard students will list their compare/contrast observations for the entire class to see. Students should go back and identify all those structures they didn't see the first time.

Behavior and Physiology of *Paramecium* (15 min): Once students are familiar with the anatomy of the Paramecium, they can demonstrate their understanding of physiological processes. Students prepare wet mounts or use the ones they already have prepared to observe the locomotion, feeding, and excretory strategies of the Protist. Lastly students use acetic acid as a stimulus to get *Paramecium* to discharge trichocysts.

Activity: Students list five common human sensory responses, such as, listening to music, tasting fine wine, and smelling flowers. For each listed response, student identifies to which ones they think a *Paramecium* could respond.

Activity: Student selects one stimulus the *Paramecium* responded to and draws a signal pathway indicating how they think the signal was received and transmitted to the cilia to adjust locomotion. For example, a student might sketch a *Paramecium* with arrows indicating the signal pathway

goes from the anterior contractile vacuole to the posterior vacuole to the cilia.

Locomotion: Students can add protoslow, adjust their microscope, or use other available tools to alter the *Paramecium's* environment. For example, protoslow could be added to slow the paramecium, the light could be adjusted on the microscope from dim to very bright, or a tapping sound could be made on the microscope stage using a key or forceps. Students make observations of *Paramecium* locomotion under different external stimuli.

Feeding: Students add yeast stained in Congo red dye to a wet mount containing Paramecium and make observations.

QUESTION: Is the feeding strategy of the *Paramecium* predictive or random? What specific observation(s) led to this conclusion?

Excretion: Students add salt to slow the contractile vacuoles.

HYPOTHESIS: Student constructs a testable statement concerning the effect of salt on the action of contractile vacuoles in a *Paramecium*.
PREDICTION: Student states a specific prediction based on the hypothesis about the effects of salt.
EXPERIMENT: Student develops a simple experiment to test the hypothesis. For example, student could count the number of vacuole contractions at three different salt concentrations.

To promote discharge of *Paramecium's* trichocysts, add a drop of dilute acetic acid to slide.

QUESTION: Before applying the acetic acid: How many trichocysts do you think will discharge from the *Paramecium's* body? Do you think the discharge will be random or specifically discharged in the direction of the acid?
OBSERVATIONS: After applying the acetic acid: List in order what happened after the acetic acid was applied.

Reporting Results (10 min): Student creates a master table of all observations and builds a salinity graph from data compiled from the class experiment that measured vacuole contractions at different levels of salinity.

ASSESSMENT

Objective 1: Using the handout, students will make sketches of animal-like and plant-like Protists, identify and label features of live Protists, record data on physiological processes of Protists, and answer questions about the mechanisms controlling the physiological processes of Protists.