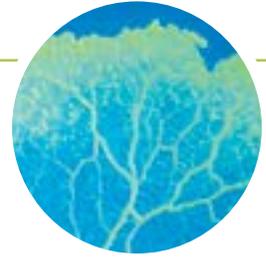


Decomposition by *Physarum polycephalum*

A Carolina Essentials™ Activity

Student Worksheet



Overview

Decomposition of plant and animal material is essential for all healthy ecosystems. Both matter and energy are cycled through physical and chemical decomposition. Decomposers break down complex biochemicals and facilitate the return of essential nutrients and elemental building blocks to the ecosystem.

The slime mold *Physarum polycephalum* is a decomposer most commonly found in cool, humid, dark places such as leaf litter and other organic debris found in forests. *Physarum* is most often observed in its diploid, **plasmodial** form, as a single large cell containing multiple diploid nuclei that replicate their DNA and divide synchronously. A single plasmodium can contain more than a million nuclei. In the laboratory, plasmodia have been grown to a diameter of more than 30 centimeters.

Physarum feeds on small particles of organic material, particularly dead leaf material, bacteria, fungi, and other microorganisms, through the process of **phagocytosis**. The organism can be observed flowing or **streaming** as it searches for and ingests food. It also produces enzymes to break down materials that are then absorbed by **pinocytosis**.

As it forages, *Physarum* in plasmodial form flows slowly. The part of the organism at the forefront of foraging has a fan-like shape. As the organism searches for and takes in food, the cell contents stream back and forth at approximately 60 second intervals through a network of vein-like tubes. A single vein can be up to 1 millimeter in diameter, and streaming can be easily observed using a stereomicroscope. Absorbed material gets distributed throughout the cell using this mechanism. The network of tubes is reorganized as the organism moves in search of food.

Decomposers like *Physarum* play a critical role in every ecosystem, breaking down organic molecules, transferring energy, and cycling matter through the food web.

Essential Question

What role do decomposers play in an ecosystem?

Activity Objectives

1. Observe the phenomenon of periodic streaming in *Physarum polycephalum*.
2. Explain why *Physarum polycephalum* is considered a decomposer.
3. Explain *Physarum*'s role in the terrestrial carbon cycle.

Activity Procedures

1. Write your name or group number on the bottom of the petri dish. Set your microscope up to view the petri dish containing the plasmodial form of *Physarum polycephalum*. Light the plate from the underside.
2. Begin with the 10× lens and observe the entire plasmodium. Sketch and describe what you observe.
3. Locate an area of plasmodium in which streaming is taking place. Switch to the 40× lens and observe this area for 3 to 4 minutes. Sketch and describe what you observe. Using a china marker, outline the plasmodium area on the petri dish top.
4. After observing the *Physarum*, place 3 to 4 oat flakes in different locations in the petri dish and seal the dish with tape.
5. Weigh the petri dish and contents.
6. After 24 hours, examine the *Physarum* again. Outline the plasmodium area again.
7. Weigh the petri dish after 24 hours of growth.

SAFETY REQUIREMENTS



Use safety goggles, gloves, and apron. Wash hands with soap and water when finished.

MATERIALS

Petri dish with plasmodial *Physarum polycephalum*
Oat flakes
Transparent tape
Stereomicroscope or light microscope with 10× and 40× lenses
Digital balance
China marker

Continued on the next page.

Data and Observations

Observation	Sketch	Description
Day 1 10x		
Day 1 40x		
Day 2 40x		

Day	Weight (g)
1	
2	

Continued on the next page.

