Microbes in Sewage

Pollution Prevention Lesson Series

Provided by:

REGIONAL WATER QUALITY CONTROL PLANT
Operated by the City of Palo Alto for the East Palo Alto Sanitary District, Los Altos, Los Altos Hills, Mountain View, Palo Alto and Stanford

GRASSROOTS ECOLOGY

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Microbes in Sewage

Objectives

- Students will learn the role of microorganisms in wastewater treatment
- Students will observe pictures and and videos of microorganisms and practice classifying them based on observable characteristics
- Students will learn what the microorganisms can and can't break down, and how our household habits can help keep our water safe and clean
- Students will distinguish between unicellular and multicellular organisms

Introduction

Read this introduction for a primer on how water flows through our environment, then meet us back here!

Water that flows down our drains and into the sanitary sewer system ends up at the water treatment plant so that the water can be cleaned up before it's released back into the environment. There are several steps in the treatment of wastewater. During the secondary treatment, microscopic organisms are cultivated and used to break down organic waste. An entire ecosystem of microscopic life lives in these wastewater basins, from bacteria to tiny shrimp, and they are hard at work cleaning our water. In this virtual lab, students will observe footage of these microbes and learn how to classify them.

Activity

Materials

- MIS virtual lab slide deck
- MIS virtual lab notebook pages (see pages 4-5)

The Microbes in Sewage slide deck is set up so that students can go through the slides at their own pace, or can follow along with a teacher. Slides will prompt students to follow along with certain questions and activities on their MIS virtual lab notebook pages.

The slides provide details about the water treatment steps, and then focus on the biological treatment step as a way of introducing students to microbes and their role in the wastewater ecosystem. Students will learn about different unicellular and multicellular organisms that live in the wastewater, and study their identifying characteristics. The students will observe these organisms using microscope footage from the treatment process, and will use observed characteristics to identify each microbe.

Additional resources

- The YouTube channel "Journey to the Microcosmos" has beautiful and amazing video clips about microscopic life.
- A high-level, background reading about microbes in wastewater treatment can be found at: https://www.iowaruralwater.org/tools_tips/toni_glymp/Bacteria-Protozoa.pdf

NGSS Alignment

Disciplinary core ideas	Science and engineering practices	Crosscutting concepts
LS1.A Structure and Function: All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular)	Analyzing and interpreting data	Patterns Scale, Proportion and Quantity

Microbes in Sewage: Virtual Lab Notebook

1. Describe what happens during the secondary (biologic) treatment step of water treatment.

2. Where does water from the treatment plant end up after the final step of treatment?

3. Why is wastewater treatment important?

4. Where does water from storm drains go, and how is it different from what happens to water that goes through our household drains?

5. Microbes working during the biologic treatment step break down **organic** waste. From what you already know, what does **organic** mean?

6. What does **organic** mean from a biological perspective?

7. Give two examples of:
    a. organic material that microbes **can** break down:

    b. non-organic material, which microbes **can't** break down

8. Choose **at least 3** mystery microbes and challenge yourself to identify them!

Microbe #	Sketch	Single celled, or multicellular? How do you know?	Observations about appearance, movement, size, etc	Identification and justification (what do you think it is, and why)

9. Why are wastewater microbes important, and what do they do for us?

10. What was one thing you learned or observed in this lesson that surprised you?