



Name: _____ Date: _____ Class: _____

Student Worksheet

Can Small Pollutants (Silver Nanoparticles) Harm Aquatic Organisms

Safety

Wear gloves at all times to prevent contamination.

Introduction

Silver has antibacterial properties. Some people ingest colloidal silver as a health supplement. (Colloidal silver is silver nanoparticles suspended in purified water.) Silver nanoparticles are used in some antibacterial socks. If you wash these socks, some nanoparticles may wash down the drain and could end up in the ocean. Could that affect a marine ecosystem?

Materials

- gloves
- 6 glass specimen vials
- 6 ~1/2 inch round labels
- distilled water
- graduated cylinder
- pipette
- bottle of colloidal silver
- a Sharpie® marker
- California Blackworms
- popsicle stick
- round toothpick
- *Elodea* plant

Question:

How can silver nanoparticles affect marine organisms?

Procedure

1. **Group member 1:** Use a graduated cylinder to measure 10 ml distilled water into each of the 2 vials. Label these vials “C” for **control**. Use the popsicle stick and toothpick to put 5 worms in one vial. Break off a piece of the aquatic plant and put it in the other vial. The plant should be completely submerged.
2. **Group member 2:** Use a graduated cylinder to measure 9.9 ml distilled water into each of the 2 vials. Add 1 drop (~.1ml) of colloidal silver to each vial. Label these vials “**low**” for **low concentration**. Use the craft stick and toothpick to put 5 worms in one vial. Break off a piece of plant and put it in the other vial. The plant should be completely submerged.

3. **Group member 3:** Use a graduated cylinder to measure 9.0 ml distilled water into each of the 2 vials. Add 10 drops (~1ml) of colloidal silver to each vial. Label these vials “**high**” for **high concentration**. Use the craft stick and toothpick to put 5 worms in one vial. Break off a piece of plant and put it in the other vial. The plant should be completely submerged.
4. Write your initial observations in the table below and on the next page.
5. Write your lab group’s number on the label of each vial.

Record Observations:

	What do the leaves look like? Can you see through them? What color are they? Are they still attached to the stem? List the color of the water, if it’s cloudy/clear, and any whether debris is present.		
<i>Elodea</i> (the marine plant)	Day 1 (initial observation)	Day 2	Day 3
Control Distilled Water			
Colloidal Silver Low Concentration 0.55 ppm			
Colloidal Silver High Concentration 5.5 ppm			

To check if the worms are alive, shake the vial lightly for 5–10 seconds, hold it up to the light, and look at it for at least 20 seconds. Please be careful not to drop the vials.

	List the number of worms alive/total number of worms used. What does the water look like? Describe the water's color, if it's cloudy/clear, and whether debris is present.		
<i>California Blackworms</i>	Day 1 (initial observation)	Day 2	Day 3
Control Distilled Water			
Colloidal Silver Low Concentration 0.55 ppm			
Colloidal Silver High Concentration 5.5 ppm			

Analyze the Results

1. Was the nano-silver toxic to the plant? Explain which concentration had the most impact.

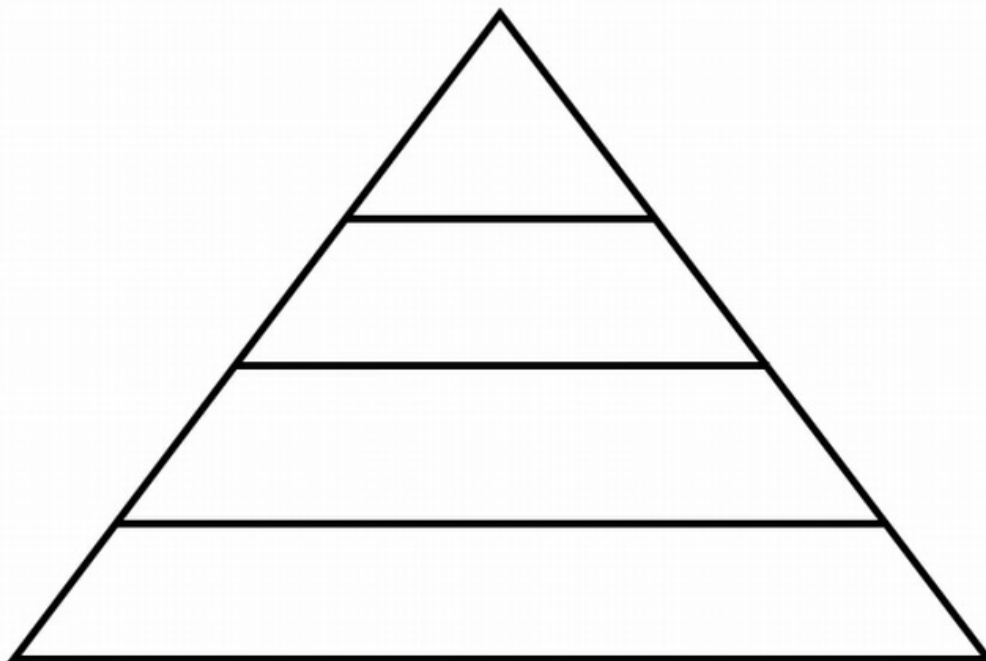
2. Was the nano-silver toxic to worms? Explain which concentration had the most impact.

Draw Conclusions

1. What organism is always at the base of a food chain or food pyramid?

2. Would *Elodea* be considered an autotroph or heterotroph? Explain your answer.

3. Complete the energy pyramid below using marine organisms. Label each level and draw a small picture of the organism. Please use *Elodea* in your pyramid.



4. Based on your energy pyramid above, what would happen if the *Elodea* were wiped out by a high concentration of colloidal silver? How might that affect the rest of the trophic levels on the food pyramid?

5. Draw a food chain that includes the California Blackworms.
6. If you were to add Blackworms to your energy pyramid and then exposed those worms to silver, how might that affect the other organisms in the pyramid? Explain your answer.

7. Do you think we should be monitoring silver nanoparticles in aquatic environments? Explain your answer.

8. Do you think the use of silver nanoparticles should be regulated? Why or why not?
