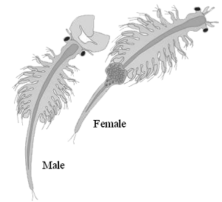
Name ____ Date __________________

Effects of Various Salinities on the Hatching Viability of Brine Shrimp

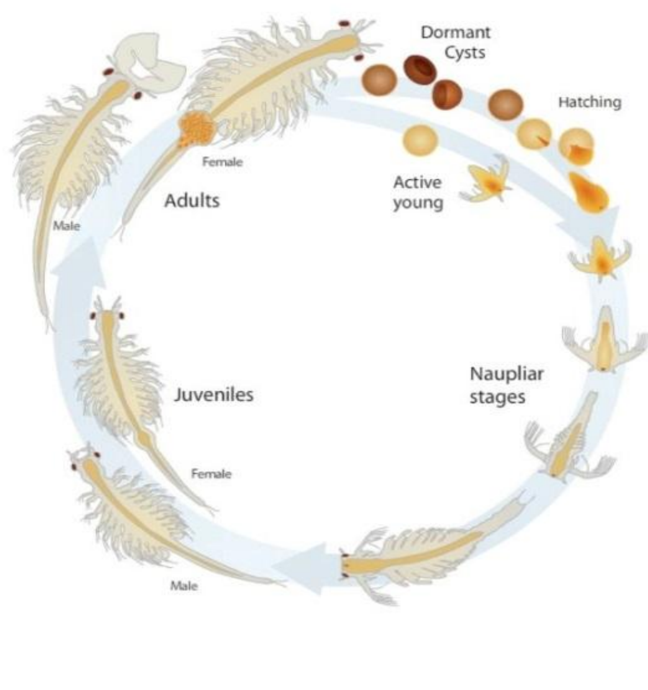


Background Information:

Brine shrimp (*Artemia sp.*) are small crustaceans, like lobsters, crabs, and crayfish**.** A hard exoskeleton supports their bodies and protects them from injury. Brine shrimp are found throughout the world and are adapted to live in harsh, changing environments such as tidal marshes and salt lakes where salinity levels can often reach three times as much as ocean salinity. Brine shrimp are very small and do not have a lot of protective adaptations from predators, so their only form of defense is to live in environments that predators cannot tolerate.

Under ideal conditions, female brine shrimp produce eggs that hatch quickly into live young. However, when conditions become less conducive, the shrimp instead produce **cysts**—encased embryos that cease development until conditions are again favorable. When this happens, this stage is called diapause. The brine shrimp used in this activity are stored in this dormant stage. Once the cysts are incubated in saltwater, the embryos quickly resume their development and hatch.

After the cyst breaks open, the brine shrimp remains attached to the shell, surrounded by a hatching membrane. This stage is known as the umbrella stage. The hatching membrane remains attached to the cyst for a number of hours until the young brine shrimp, known as a nauplius, emerges. During the first larval stage, the nauplius subsists on yolk reserves until it molts (loses its exoskeleton). During the second stage, the nauplius begins to feed on algae. The nauplius progresses through approximately 15 molts before reaching adulthood in 2 to 3 weeks.



Problem/Question:

In what salinity do Brine Shrimp hatch best?

Hypothesis

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Testing Hypothesis - Experiment

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Materials

Brine shrimp eggs (cysts)

4 petri dishes with lids

Paintbrush

4 small pieces of double-sided tape

Graduated cylinder

Wax Marker

Solutions of Saltwater: 0%, 3.5%, 15%, 25%

4 microscope slides

Pipets

Dissecting microscope or magnifying glass

Procedure

Day 1:

1. Using a wax marker, label the lids and bottom of 4 petri dishes: 0%, 3.5%, 15%, 25%
2. Use a graduated cylinder to measure 30 mL of 0% salt solution and pour it into the petri dish labeled 0%. Rinse out the graduated cylinder.
3. Like Step 2, use a graduated cylinder to measure 30 mL of 3.5%, 15%, and 25% salt solutions and pour them into the appropriate petri dishes. Remember to rinse out the graduated cylinder between solutions.
4. Measure and cut ½" of double-sided tape and stick to a microscope slide. Repeat for the remaining 3 microscope slides.
5. Making sure not to mess up the tape, use a wax marker to label the slides as 0%, 3.5%, 15%, and 25%.

6. Lightly touch the paintbrush to the side of the container of brine shrimp cysts. Your goal is to collect only approximately 20 eggs on the brush. You do not want to cover the tip of the brush in eggs. (Reminder: You will have to count each and every egg!)
7. Dab the paintbrush onto the tape on the microscope slide. Repeat for the remaining 3 microscope slides.
8. Examine the first slide under the microscope and count the number of eggs on the slide and record in Table 1 under 0% Day 1.
9. If you have more than 50 cysts, you will need to start over with that slide.
10. Place this slide into the petri dish labeled 0% Salt Solution. Be sure to put it Tape Side Up.
11. Repeat Steps 7 and 8 for the remaining slides until you have prepared 4 microscope slides of eggs, recorded the numbers in Table 1, and placed each slide in its appropriate salt solution.
12. Set the four petri dishes on a piece of paper and write your group's name on the paper.
13. Allow the dishes to sit at room temperature under the light bank for 48 hours.

Day 3: (48 Hours Later)

1. Examine each petri dish with a dissecting microscope.
2. Count the number of un-hatched eggs and subtract the number from the beginning number of eggs in container. Record this number in Table 1 under "48 hours".
3. In the Hatching Viability Column of Table 1, calculate and record the Hatching Viability Percentages after 48 hours. To do this, use this formula:

$$\text{Hatching Viability Percentage} = \frac{\text{Number swimming brine shrimp at 48 hours}}{\text{Total number of eggs initially placed in petri dish}} \times 100$$

Table 1: Hatching Viability of Brine Shrimp in Varying Levels of Salinity

% Salt Solution	Day 1: # Cysts in Container	Day 3: # Hatched Brine Shrimp	Hatching Viability Percentage
0%			
3.5%			
15%			
25%			

Graphing Results:

Plot the Hatching Viability Percentages from Table 1. Title the graph and label the axes after identifying the independent and dependent variables.

What type of graph would best show this data? ____

What is the independent variable? ____

What is the dependent variable? ____

Plot the independent variable on the x-axis, and the dependent variable on the y-axis.

Analysis and Conclusion:

1. In which salinity did you observe the highest hatching viability?

2. Did your lab results support your hypothesis? (Provide evidence from your lab results to support your answer)

3. Ocean water typically has a salinity of 3.5%. Would brine shrimp hatch in the ocean?

4. Based on your answer to question #3, why do you think brine shrimp are not found in the ocean?

5. An adaptation is a trait that an organism has that helps it survive better. How does a high tolerance to salinity help the brine shrimp survive better?