Hatch-A-Cyst

Things to consider and/or discuss

1. Abiotic factors brine shrimp are likely to encounter in environments such as Great Salt Lake

Extreme Salinity	Boats	Heat
UV Exposure	Cold	Light
Fluctuations in pH	Brine Shrimp Fishermen	
Oxygen Levels	Pollution (from runoff and wastewater treatment)	

2. Determining which abiotic factor you will test

- Ideally each testable abiotic factor identified above will be tested by at least one lab group.
- You may wish to assign this, or let students choose their own with minimal overlap.

3. Creating a hypothesis: If your students have prior knowledge of brine shrimp and their ideal environment, you may wish to have them create a hypothesis that is more specific to the abiotic factor they are testing.

4. Setting up their experiment:

- Think about testing a gradient of your abiotic factor
- Ensure that the factors listed above remain constant
- Be sure to count cysts before they are hatched
- Set up your experiment so it is easy to count hatched nauplii
- Is time a factor?

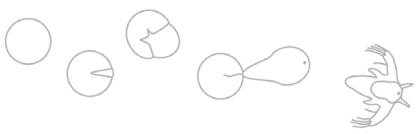
5. What data to record:

- What will you record at the beginning of the experiment?
- What will you record at the end of the experiment?

6. Recording data: Prompt them to include data for the control group as well.

7. Conclusion: Prompt students to explain this as they would to a friend (rather than restating their hypothesis). Ex: "Brine Shrimp hatch in temperatures ranging from 25° C - 32° C". Pool the conclusions from all lab groups to determine the best environment for hatching brine shrimp.

Tip



As cysts hatch they swell with water and crack as the embryos inside begin to grow. When the nauplii first emerge they are still wrapped in hatching membranes. Fully hatched nauplii are pale yellow and swim with jerky movements. In ideal conditions, cysts hatch in 1 - 2 days.

Abiotic Factor	What to Use	Background
Salinity	Create several concentrations of salt solution by dissolving different amounts of Instant Ocean™ or non-iodized salt in tap or deionized water. Calculate percent salinity in grams per 100 mL.	Brine shrimp cysts will hatch in salinities ranging from 3%-20%.The optimal salinity for hatching is around 9%, however, the algae that brine shrimp eat need a salinity of about 13%. Conditions in the Great Salt Lake support this difference: when spring runoff decreases the salinity of the lake temporarily, the brine shrimp hatch rate increases. As salinity levels decrease, algal growth increases.
Light	Use aluminum foil, fabrics of different opacity or different locations around the room to vary the amount of light brine shrimp cysts receive.	Newly hatched nauplii are attracted to light and will swim toward it.
UV Exposure	A UV light box can provide direct exposure. If you don't have access to a UV light box, the "sterilize" function on many goggle cabinets uses UV light.	At 4,200 feet in elevation, brine shrimp of the Great Salt Lake receive ultraviolet light levels that are about 15% higher than at sea level.
pH	Household chemicals such as bleach, vinegar, lemon juice and baking soda can be used to alter the pH of the water in which you hatch your brine shrimp.	Bleach solution decapsulates brine shrimp cysts. Decapsulated embryos will sink to the bottom of the hatching container. Hatcheries sometimes use bleach solution to separate the empty cysts from those that contain embryos.
Temperature	An incubator, heat lamp, refrigerator and freezer can be used to alter the temperature where brine shrimp hatch.	Dehydrated cysts will tolerate extreme heat and freezing temperatures with embryos intact. They will hatch in temperatures ranging from 25o C - 32o C.
Oxygen Levels	Sealing containers and using a small aquarium pump and flexible tubing are two ways to change the level of oxygen for hatching cysts.	Cysts will not hatch in extremely anoxic conditions.
Pollution	Examples include yard care chemicals, insect repellents, insecticides, auto care chemicals and ethanol.	Urge students to think about common household pollutants that might run off into Great Salt Lake and the impact the surrounding areas might have on the lake's ecology.

Funding for this module was provided in part by Westminster College and by a grant awarded under the Workforce Innovation in Regional Economic Development (WIRED) Initiative as implemented by the U.S. Employment and Training Administration.