BRINE SHRIMP EXPERIMENTS

Introduction:

When environmental parameters become too severe (e.g. too high or too low temperatures or salinity, or lack of food) sensing the deteriorating environment, female brine shrimp stop producing nauplii (baby brine shrimp) and start producing resting eggs. These are eggs containing dormant embryos whose development is arrested in the gastrula stage. A special gland in the uterus of the female puts a protective layer of chitin around the egg. The eggs are then released in the water and will await optimum circumstances before hatching; in this way, the population will survive the period in which survival is impossible for the adult animals. The cysts can remain dormant for many years as long as they are kept dry. When the cysts are placed into salt water, they are re-hydrated and resume their development. Hatching and raising brine shrimp can be great fun, which makes them an excellent subject for classroom experiments or science fair projects!

San Francisco Bay Brand brine shrimp eggs are available in a 6g vial, 2.75oz jar or are available as Sally's Hatch Mix™ with enough eggs to hatch many batches of brine shrimp (Hatch Mix™ comes with 3 packets and requires one packet per batch). With some extra items like petri dishes, jars, magnifying glass and or microscopes, you can easily create a complete study.

For information on brine shrimp biology read "Brine Shrimp-what is it? Where does it come from?" For instructions on hatching brine shrimp view "How to hatch Brine Shrimp".

Materials:

To hatch and maintain brine shrimp:

• A vial of brine shrimp eggs or San Francisco Bay Brand Hatch Mix™ available from pet shops and online mail order catalogs.
• 1 gallon jar (juice jar), Hatchery™ (Item # 66190), or Shrimpery™ (Item # 66170)
• 60 watt bulb with desk lamp.

• Aquarium rock salt, baking soda and Epson Salt (skip if Hatch Mix will be used)
• Air pump & check valve (not required for Shrimpery™),
• Airline tubing
• Brewer's Yeast
• Dried Spirulina (from pet store or health food store)

For conducting experiments:

• Pipette or turkey baster
• Eye dropper
• Paper towels
• Flashlight
• Petri dish(s) with lid(s)
• Magnifying glass or Microscope
• 1 one-liter flask (a clean milk carton or pop bottle will do).

Harvest

The nauplii (baby brine shrimp) will gather at the bottom of the hatch container, transferring them to a petri dish using a pipette or turkey baster to remove some water and brine shrimp. Siphon only the orange colored nauplii from the bottom of the cone. DO NOT siphon the hatched shells, which float at the surface.

Clean-Up

After the eggs have hatched and the nauplii have been transferred to a petri dish, flask or holding container:

1) Scrub the jar, Hatchery™ or Shrimpery™ with a sponge and diluted household bleach.
2) Rinse it well!
3) Tightly seal opened egg container to prevent moist air from coming in contact with the eggs and store in your refrigerator until you are ready to hatch again.

Maintain a colony

Nauplii will live 1-3 days without food. If you want to keep them longer to conduct a more in-depth study feed your brine shrimp sparingly; in nature they eat microalgae, but will survive in captivity on brewer's yeast or dried Spirulina algae (available in pet shops and health food stores). Feed them a very tiny amount of yeast—a few "grains" of yeast or Spirulina powder –"just a pinch" is needed (every 2 days). Do not overfeed. Keep the water clean. You might need to change the water occasionally, if it gets cloudy. To change the water, shine a light at the surface and siphon water from the bottom. Keep

the water clean if you want them to survive for any length of time. Keep your colony evenly lighted. They will not grow well if kept in bright light; they will expend too much energy swimming toward the light. Don't use air stones; the bubbles are too small and can kill the little guys. Once the shrimp have had a chance to grow a bit, it is time to experiment!

Maintaining brine shrimp throughout the year is an ideal steppingstone for discussing cycling of nutrients (carbon, oxygen, nitrogen, etc.), food webs (what do brine shrimp eat and what eats them?), predator/prey relationships, taxonomy (brine shrimp aren't really shrimp), anatomy, marine biology, adaptations, etc. The possibilities are endless.

If you want to maintain a colony start with a tank of 5 gallons or larger and limit the amount of shrimp nauplii you use as a starter.

Make a Brine shrimp Observation

You can observe brine shrimp up close with a microscope or magnifying glass. Use the pipette or turkey baster to collect some nauplii or adult brine shrimp and transfer them to a petri dish. Look at them under high and low magnifications. A compound microscope allows you to see a specimen at much higher magnification; allowing you to see details like the hairlike setae on the phyllopods. Make a wet mount slide by using an eyedropper to remove some shrimp and water from the petri dish and adding 1-3 drops of shrimp and water onto a concave slide, and placing a slide coverslip over it. Keep track of your observations on the work sheet provided

- What do they look like?
- What are their swimming habits?
- Eating habits?
- What effect does light have on them (use the penlight flashlight)?
- If you can compare the adult to the larval stage, what differences do you observe?
- Use a magnifying glass for your observations and make sketches.

Environmental Factors: Change the Brine Shrimps Environment

Effect of pH and Environmental Changes

Additional materials:

- pH paper
- Small jars
- Ice
- 60-100 watt lamp.
- Sea salt solutions of different salinities

• 1 one-liter flask (a clean milk carton or pop bottle will do).
• Hydrometer (for checking salinity)

Learn about how the waters pH affects the hatch rate of brine shrimp eggs. Set up several hatches and start by testing the waters pH (use pH paper for the test). Ideal conditions are 8.0, so to raise the pH level add a little bit of baking soda. To lower the pH add a small amount of peat (about the size of a bottle cap) in a nylon bag (old pantyhose and nylon stockings work well for this)

• What affect does a pH of 8.0 have on hatching brine shrimp eggs?
• What affect does a high pH have?
• What affect does a low pH have?

You can try hatching several batches of shrimp at a time, using different hatch conditions for each batch. Set up 3-4 different hatch solutions: you might use plain freshwater and then several different solutions, each with a different salinity, pH, lighting and temperature. You can set-up a regular saltwater sample to be the control to which you can compare the results. Try hatching brine shrimp eggs with aquarium rock salt (non-Iodized) and try hatching some with table salt (Iodized).

• Before you start, hypothesize which solution will have the best results and which will have the worst.
• After 24 hours, check on the dishes. Has anything happened?
• What are the results after 48 hours?
• 72 hours?
• Were you right about which solutions would work best and worst?
• How do you think factors such as temperature (colder or warmer) or more or less light might affect the hatching success rate of the brine shrimp?

Add Pollutants

Additional materials:

• Vinegar
• Soap
• Food coloring
• Vegetable oil
• Colored chalk
• Flour

Transfer an equal number of brine shrimp and water (approximately 5 shrimp per 100 ml water) to several petri dishes or small jars (baby food jars work well) to be your test samples. Add a different solution to the water in each petri dish or jar (for liquid solu-

tions 1-3 drops in a petri dish or 6-8 drops in a small jar, for powdered substances mix in water until no longer soluble). Vegetable oil, soap, vinegar, ammonia, flour, colored chalk (crush to fine powder) or anything else that comes to mind. Observe the samples at low power magnification and record what's going on.

- How do the pollutants affect the sample?
- Is there a difference visible in twenty minutes? One hour? One day? and so on
- How might you counteract the pollutants?

Questions For General Discussion:

1. How will you measure the brine shrimps' responses?
2. What do you expect to happen? Why?
3. Will you collect qualitative or quantitative data?
4. How many shrimp will you use? Why did you choose that number?
5. What are your manipulated, responding, and controlled variables?
6. What materials did you use?
7. How would this (response) help a brine shrimp to survive?
8. Can you think of another organism that might respond similarly to this stimulus? How could you test it?
9. Predict how a brine shrimp predator would respond to the same stimulus.
10. Describe a brine shrimp's ideal habitat.
11. What were some possible sources of instrument error? of human error?
12. If you were to repeat this experiment, what changes would you make?

My Observations:

Using the space below, record findings & draw your observations of the cysts & brine shrimp.