

Brine Shrimp

- 4th grade - Environments



NOTE: Getting Ready in Environments *Investigation 3* calls for a "recipe" akin to the "2-spoon" proportions noted above. Modify the proportions based on your findings.

Hatching brine shrimp. In *Environments*, brine shrimp eggs and brine shrimp juveniles are used in *Investigation 3*. In order to have enough brine shrimp for *Investigation 3*, you might wish to hatch a larger population. With luck you can raise them to maturity and keep a stable population going in your classroom for months. They start life fueled by the energy stored in the eggs, but soon they must feed or perish. After the first week of life, move the shrimp to a large container (plastic or glass—no metal) with a new water supply prepared using this formula:

- 4 liters of water
- 250 ml of Kosher salt
- 30 ml of Epsom salts
- 15 ml of baking soda

Background. Brine is a salt solution—usually a saturated salt solution. And we have all seen a shrimp or two, even if only in cocktail sauce. Brine shrimp might therefore sound like some kind of pickled seafood delicacy, but that's not the case. Brine shrimp, also called fairy shrimp and sea monkeys in some contexts, are tiny but important organisms found in salt ponds and saline lakes.

Like their distant cousins the lobster and crab, brine shrimp are aquatic crustaceans. Unlike their marine relatives, brine shrimp live only in bodies of salt water that are isolated from the ocean. They are found reliably in the Great Salt Lake in Utah and Mono Lake in California, but they can appear in unlikely temporary salt ponds after a torrential rain in the desert.

A key factor in the environment of brine shrimp is salt. They are adapted for life in a wide range of salt concentrations (as low as 25 parts of salt per 1000 parts of water to as high as 300 parts per 1000), but their optimum salt environment is around 80 parts per 1000. This is more than twice as salty as the ocean, which is about 35 parts of salt per 1000. Brine shrimp are one of the most salt-tolerant animals in the world. Conditions as salty as this result when a body of water has streams running into it, but not out. Salts carried in by natural erosion over countless years raise the salt concentration to the levels preferred by brine shrimp.

Adult brine shrimp. Brine shrimp are small unsubstantial-looking creatures of 1 cm (1/2") or so in length. They glide smoothly through the water, propelled by what appear to be two wings along their sides. Viewed under a microscope, the "wings" are revealed to be 11 pairs of appendages that undulate

and act as paddles. As brine shrimp glide along, they feed on microscopic organisms suspended in the water: algae, yeast, and bacteria.

There are both male and female brine shrimp. Following mating, the female will develop either live young or eggs in her egg sac. A female's first batch of young are born alive. After that, eggs form and are released into the water. Eggs may hatch soon thereafter, or they may lapse into a dormant state. The eggs are amazing in their ability to completely dry out and maintain their viability. Brine shrimp eggs can lie in the desert for 10 years or more, waiting for the right environment, and then spring into life to start their life cycle again.

Brine shrimp young. Just after hatching, the larval brine shrimp, called a nauplius, is no bigger than the period at the end of this sentence. This is the stage that students will look for as evidence of hatching. They will suddenly see that the tiny dark points in the water are making jerky little movements. The nauplius grows fairly rapidly when conditions are favorable (food, oxygen, and the right concentration of salt), molting its outer shell frequently. It takes 3 to 6 weeks for the shrimp to reach maturity.

Test the viability of the eggs. We strongly recommend that you test the viability of your brine shrimp eggs a week or so before you plan to do the investigation. Put 150 mL of treated or bottled water in each of two cups. Add one 5 mL spoon of salt to one cup and label it "1 spoon," and two 5 mL spoons of salt to the other cup and label it "2 spoons." Transfer 1 level minispoon of brine shrimp eggs to each cup. Put the lids on and gently swirl the cups to wet the eggs.

If all goes well, in 24 to 48 hours, at room temperature, you should see the tiny brine shrimp swimming about. You must look closely: Any movement of the water will interfere with your ability to see hatched shrimp, so leave the cup on the table and look into it from the side and down from the top (take the lid off). Eggs float, but larvae swim about. If no eggs have hatched after 72 hours, try again. If you still have no success, the viability of the eggs is suspect. Viability is certain for a year or two, so if your eggs are old, replace them. Eggs can be purchased from Delta Education or from tropical fish stores.

Feeding the brine shrimp. For food, a pinch of baker's or brewer's yeast once a week should be fine. Mark the water level on the container. As water evaporates, add more fresh water— not salt water— to keep the salt concentration the same. Put the container near a window or under a light during the day and watch the brine shrimp grow. Adult brine shrimp can be purchased from a tropical fish store. They are sold as fish food. In addition to environmental investigations involving salinity, brine shrimp are useful for light investigations; they are light seekers. Brine shrimp can be studied as part of a food chain and can be used to demonstrate life cycle. More information for long-term culturing of brine shrimp can be found at sites such as Brine Shrimp Direct.

What to do with them when the investigations are completed. After the brine shrimp have gone through their lifecycle, they can be fed to fresh water or salt water fish. *You can also return them to the district science coordinator for distribution to other schools.* (Avoid pouring the brine into your fresh water tank.) Eggs should be kept dry in their container and stored for later hatching.