Effect of Salinity Levels on Hatching of Brine Shrimp Eggs

Question: What salinity level is the best for the hatching of brine shrimp eggs?

Hypothesis: I believe 20 grams of sea salt will be the best for the hatching of brine shrimp eggs.

Materials Needed: test tubes, test tube stand, graduated cylinder, water, sea salt, triple beam balance, beaker, waxed paper, stirring rod, thermometer, brine shrimp eggs

Procedure: 1. Set 5 test tubes in a test tube stand and label with 0g., 5g., 10g., 20g., and 30g.
2. Pour tap water into the test tube labeled 0g. until it is 3/4 full.
3. Using a graduated cylinder, measure 1L of water into a beaker.
4. Using a triple beam balance, measure and add 5g. of sea salt to the water.
5. Stir the salt mixture until the salt has dissolved.
6. Pour the mixture into the appropriate test tube until it is 3/4 full.
7. Continue making salt concentrations in this way for 10g., 20g. and 30g.
8. Let stand for several hours to let settle.
9. Take temperature of each test tube to ensure that all are the same before proceeding to the next step.
10. Add just enough brine shrimp eggs to cover the top of the water in each test tube.
11. Covering the opening with a piece of waxed paper, shake each test tube to mix the contents and the eggs.
12. Repeat this shaking each day of the experiment.
13. After 48 hours examine the test tubes to determine which test tube has hatched the most eggs.

Results:

Salinity Level	Number of brine shrimp hatched Day 3	Number of brine shrimp hatched Day 4	Number of brine shrimp hatched Day 5
0 g.	0	0	0
5 g.	0	0	0
10 g.	10	0	0
20 g.	10	14	7
30 g.	2	3	1

Conclusion: I conclude that the best salinity level to hatch brine shrimp eggs is 20 g. per 1 Litre of water.

Discussion: Brine shrimp are classified as artemia in the phylum Arthropoda, class Crustacea. Artemia were first discovered in Lymington, England in 1755. Since that time they have been widely used for food for tropical fish, for research specimens due to their short life span and crude nervous system, and for entertainment when marketed as Sea Monkeys. In the Great Salt Lake area of Utah, student researchers found brine shrimp are also important as food for migratory birds and they aid in clean up of the waters by getting rid of various contaminants such as phosphorus and nitrogen.

Because brine shrimp are so desirable as a food source they are found naturally in only about 250 locations around the world, in water bodies so salty that predators and competitors for the same food cannot survive. The only companion life to the brine shrimp in these ponds are a few species of bacteria and algae, which provide food for the shrimp.

Brine shrimp have a reported life span of 50 days up to 1 year, depending on the area and conditions. They hatch from cysts in early May. After hatching, the larvae will go through 15 molts before it reaches the adult form. These begin to die by October and most will be gone by December. In the period from May to December females will give birth to either live nauplii or, if conditions are wrong for larvae survival, they will lay a number of cysts. The males are needed for cyst production as the sperm is used for the egg but usually the females can get by on their own by self fertilizing (a process called parthenogenesis). Because the males are not needed as much, the majority of brine shrimp are females.

Brine shrimp are filter feeders which means that they pull their food from the water that goes through their mouth. Their 11 sets of appendages act like a funnel to direct the water to their mouth. In the wild brine shrimp feed mainly on microalgae while in the captivity they can be fed dried microalgae, yeasts (both active and inactive), micronized rice bran, whey, wheat flour, soybean powder, fish meal, egg yolk, and homogenized liver. Research shows that frequent feedings, or better yet, a continuous drip feeding are mandatory for optimal grow out.

In researching brine shrimp I found that the optimal hatching and growing conditions are 25 degrees C, salinity of 5 parts per thousand, heavy continuous aeration, 2000 lux constant illumination for light, and water pH of 8 to 9.

It is very important to have a vigorous air supply in their water for two reasons, one is to keep the available food supply in suspension where it can be filtered out, and the other is to promote a good oxygen supply in the system. With a good oxygen supply the brine shrimp will be pale pink or yellow or even green if they are feeding on microalgae. If the oxygen levels are low and salinity is high they feed on bacteria and will be red in color. If this environment remains they will start producing resting cysts, and the colony may crash. If I did this experiment again I would need to ensure a continual air supply.

In order to maintain a minimum amount of light for hatching and growing out the adults a standard grow lite bulb for an aquarium could be used. This is another factor that I would change as there was no light source other than the classroom lights for the colony I tried to hatch.

In terms of pH, I never did test the water so perhaps this was not at the appropriate level to gain optimum results.

I also discovered that the container that the brine shrimp are in is important and that a container that is V shaped is best. This could be achieved by using a cut 2 litre plastic beverage container.

In terms of my test factor, salinity, I found that my results for hatching are consistent with the research.

With all of these factors in mind, I could have changed the brine shrimp environment in many different ways in order to get optimal grow out and a sustained adult colony. This will need to be addressed before attempting this experiment again as I discovered the cysts can remain in a dormant state for many years and not just the two year shelf life that was indicated on the container of eggs.

References:

"Artemia (Brine Shrimp) FAQ 1.1" retrieved 10 February 2007.
http://web.cecs.pdx.edu/~davidr/discus/articles/artemia.html June 13, 1995.

"Brine shrimp Wikipedia page" retrieved 10 February 2007
http://en.wikipedia.org/wiki/Brine_shrimp February 8, 2007.

"Great Salt Lake Brine Shrimp" retrieved 10 February 2007.
http://people.westminstercollege.edu/faculty/tharrison/gslfood/studentpages/brine.html 1998.

"Rhode Island Sea Grant Fact Sheet - Brine Shrimp" retrieved 10 February 2007.
http://seagrant.gso.uri.edu/factsheets/931brine.html .

Project Log

August -	had idea of doing science fair project for class
October -	thought of possible science fair projects
November 10 -	decided on topic
November 22 -	presented topic to class
November 29 -	decided on title, question, materials needed and procedure (making sure procedure was controlled)
December 2 -	made hypothesis
December 10 -	got water ready
December 11 -	added brine shrimp eggs to water
December 12 -	checked test tubes - no results
December 13 -	checked test tubes and recorded results
December 14 -	checked test tubes and recorded results
December 15 -	checked test tubes and recorded results
December 17 -	checked test tubes - everything had died
December 20 -	cleaned work area
January -	typed write up to discussion
February 10 -	worked on discussion - research and typing
February 11 -	finished typing up discussion, worked on backboard
February 12 -	presented report to class
February 12 -	finished backboard
February 13 -	presented backboard to class to discuss what I could have done to make it better