The Effects of Copper Sulfate on the Hatching of Brine Shrimp
Samantha Lawing (Lab Partner: Unknown Scientist) 9/4-8/09

Problem
The Great Salt Lake’s Farmington Bay has experienced a decrease in the population of brine shrimp. Upon further investigation of the brine shrimp population, it is discovered that the brine shrimp cyst are present in the environment, but not hatching. Research was conducted to determine what changes to the Farmington Bay environment may have caused the reduced hatching of cyst. A new toxin in the environment could be copper sulfate. The proposed question is, does the concentration of copper sulfate effect the number of brine shrimp cyst that hatch?

Hypothesis
If the concentration of copper sulfate is greater than 0.05%, then less than 50% of the brine shrimp cyst will hatch.

Procedure
Establish six cultures for brine shrimp using a standard culturing protocol. Label each of the cultures with the treatment that it will receive (see Figure 1). The control culture will not have copper sulfate added. The experimental groups will have 0.25mL of a copper sulfate solution (0.01%, 0.025 %, 0.05%, 0.075%, and 0.1%) applied. Once the cultures are established, add 100 cysts to each culture. Leave the cultures in an incubator set at room temperature for 24 hours. Count the number of hatched cyst after the 24 hour period. Record data in data table and dispose of copper sulfate solutions and cultures by EPA protocol.

Figure 1. Experimental setup of brine shrimp culture
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Data

Table 1. Data collected after 24 hours.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Control</th>
<th>CuSO₄</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.01%</td>
<td>0.025%</td>
</tr>
<tr>
<td>Number of hatched cyst</td>
<td>87</td>
<td>81</td>
</tr>
</tbody>
</table>

Data Analysis

![Graph showing hatched cysts](image)

Figure 2. This graph shows the number of hatched brine shrimp in the cultures. 0.00% is the control.

The data shows a decrease in the number of brine shrimp hatched as the copper sulfate concentration increases. The control culture had 87 of 100 cyst hatch. The 0.01% copper sulfate culture had 81 of 100 cyst hatched. The 0.025% copper sulfate culture had 74 of 100 cyst hatched. The 0.05% copper sulfate culture had 67 of 100 cyst hatched. The 0.075% copper sulfate culture had 43 of 100 cyst hatched. The 0.1% copper sulfate culture had 28 of 100 cyst hatched.

Conclusion

I reject my hypothesis, if the concentration of copper sulfate is greater than 0.05%, then less than 50% of the brine shrimp cyst will hatch. The data shows that the number of hatching cyst was not below 50% in the 0.05% copper sulfate culture. The number of hatching cyst did not reach 50% in the 0.075% copper sulfate culture. Based on the data from this experiment, the tough coating of the cyst must not dissolve in concentrations greater than 0.05% due the unfavorable conditions in the environment. One function of the
cyst is to protect the embryo from unfavorable conditions; therefore concentration greater than 0.05% must be toxic to developing nymphs (larva). More testing must be done to assert the validity of these results.

In order to establish the validity of this experiment, it should be repeated with multiple cultures of each copper sulfate concentration. If the results from the second trial with multiple cultures, reflects the data found in this experiment, I would next hypothesize that if the unhatched cysts in the “toxic” cultures were placed in a copper sulfate free environment, then 80% of the cyst would then hatch in the twenty four hour time period.