**Conclusion**

Five experiments were run in which 4 closed systems simulated different environments. Data was collected on the change in carbon dioxide levels due to the productivity of phytoplankton (or lack thereof). The data from each of these five experiments matched the other 4 sets, showing there were no outliers or abnormalities in the data. A statistical analysis of the data showed strong support that oil has an adverse effect on phytoplankton. The first test run was the ANOVA (one-way analysis of variance) test on all 4 groups. It was used to determine if the data from each of the 4 environments was part of the same population. If that had been true, that would have suggested that the oil was not affecting the phytoplankton. However, that was not the case; the test suggested that the oil was affecting the phytoplankton.

The second and third tests were comparisons of mean, used to show similarities or differences between 2 sets of data. The second test was a comparison of two means of groups C and D. Again, it showed that the data collected from groups C and D are not part of the same population, and suggest the oil is killing off the phytoplankton colonies in group D. A third test was run - comparing two means - on groups B and D. As noted in the statistical analysis, there was a significant difference. However, from looking at the data (or Chart 8) you see that the difference is small relative to the difference between bottles C and D. The results of the third test indicated that the used motor oil added to bottle D either had no immediate effects on the phytoplankton, or a small percentage of the phytoplankton survived. Both these tests support Chart 8, which shows the huge differences between the four groups.

In the research done prior to the experimentation, I found a document put out by the Environment Technology Center. This document cited research done on the effects of used motor oil on Daphnia magna and Artemia; as well as water-solubility of motor oil and the toxic metals contained in it. They found the water-solubility of used motor oil to be 12.83 mg/L - roughly 10 times as much as new oil - which could explain the brown hue the water in bottles B and D took on after 2 weeks. Many other sources stated that oil tends to emulsify and form a lighter brown, sticky compound that floats on the surface of the water.

Recommendations

There is not much I would recommend changing, however I can think of many ways to continue work on this project. The plankton was very easy to find online and was shipped within a few days. Any equipment should be ordered early because sometimes it is on back order. Here are a few ideas of how to continue my project:

* Varying the concentration of oil
* Using a microscope to see if the oil has any effect on the parts of the phytoplankton, such as the chlorophyll
* Testing different oils, such as crude oil if it can be found

[[Project Creek Watch](http://www.pleasanton.k12.ca.us/amador/Creek/index.html)][[Mr. Thiel](http://www.pleasanton.k12.ca.us/amador/faculty/science/thiel.html)][[1998 Projects](http://www.pleasanton.k12.ca.us/amador/Creek/AP98/AP98.html)][[1999 Projects](http://www.pleasanton.k12.ca.us/amador/Creek/AP99/AP99.html)][[2000 Projects](http://www.pleasanton.k12.ca.us/amador/Creek/AP2000/AP2000.html)][[2001 Projects](http://www.pleasanton.k12.ca.us/amador/Creek/AP2001/AP2001.html)]