



CALIFORNIA STATE SCIENCE FAIR

2015 PROJECT SUMMARY

Name(s) Rohan Bhushan	Project Number S1501
Project Title Gravitactic Effects of Copper Pollution on Glucose Metabolism in <i>Euglena gracilis</i>	
<div>Objectives/Goals<p><i>Euglena gracilis</i> is a very important part of the marine environment, providing food for many organisms in a similar way phytoplankton does. The organism also has many additional dietary uses and nutritional value for humans. Copper pollution in the Monterey Bay and other local water sources threaten this flagellate in ways that have not been appropriately studied, especially upon the organisms# ability to heterotrophically utilize glucose as a food source. In this project the effect of copper induced gravitactic disturbance on glucose metabolism was observed. I hypothesized that gravitactic agitation would lead to a decrease in glucose metabolism, resulting in reduced biomass and cell size.</p></div>	
<div>Abstract<p><i>E. gracilis</i> was incubated in two batches CB (Copper Bath) and NC (Neutral Control), in media containing glucose (TMglu), no organic carbon source (TMnoc), glucose and copper (TMglc), and copper (TMcop). CB tests included a primary copper wash. Glucose concentrations were found using a glucose testing kit. A compound microscope was used to record and observe cells in samples. Cell count was found using an automated image analyzer to count the number of cells in a 160x photo, then this number was substituted into a formula I developed. Cell size was found using the same program. Upset Gravitaxis was verified by overlaying two photos of 1 second intervals, then observing the degree in change of orientation off of the preceding path.</p></div>	
<div>Methods/Materials<p><i>E. gracilis</i> was incubated in two batches CB (Copper Bath) and NC (Neutral Control), in media containing glucose (TMglu), no organic carbon source (TMnoc), glucose and copper (TMglc), and copper (TMcop). CB tests included a primary copper wash. Glucose concentrations were found using a glucose testing kit. A compound microscope was used to record and observe cells in samples. Cell count was found using an automated image analyzer to count the number of cells in a 160x photo, then this number was substituted into a formula I developed. Cell size was found using the same program. Upset Gravitaxis was verified by overlaying two photos of 1 second intervals, then observing the degree in change of orientation off of the preceding path.</p></div>	
<div>Results<p>Glucose metabolism was adversely affected by the addition of copper with an initial decrease in TMglc. TMnoc was found to have a median biomass in comparison to other samples. The results show that copper is impairing <i>Euglena</i>#s ability to metabolize glucose, but once the <i>Euglena</i> is allowed to recover, metabolism is significantly higher than the normal rate. Gravitactic inhibition of photosynthesis was also observed, due to the low cell counts and sizes in TMcop tests.</p></div>	
<div>Conclusions/Discussion<p>From the results I could conclude that metabolic rates were negatively impacted by upset gravitaxis caused by copper. In the future, methods for the extraction of paramylon would be developed. Copper pollution will continue to threaten the viability of this organism as a food source for marine organisms, but if there is a need to culture the <i>Euglena</i> for human dietary needs, the <i>Euglena</i> will be able to recover from copper impaired metabolism.</p></div>	
Summary Statement <p>I investigated how upset gravitaxis, caused by copper pollution, is affecting glucose metabolic rates in the flagellate <i>Euglena gracilis</i>.</p>	
Help Received <p>Received advice and help from Dr. James Barry and Dr. Shannon Johnson at the Monterey Bay Aquarium Research Institute and Dr. Shannon Johnson at UCSC.</p>	