



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Narayan S. Subramanian	Project Number J0806
Project Title Do Extreme pH Conditions Quench Respiration in Secondary Wastewater Treatment Mixed Liquor?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of my experiment was to measure the rate of respiration in mL of carbon dioxide produced per hour in a sample of mixed liquor from the secondary wastewater treatment process at varying pH. Mixed liquor is a combination of partially treated wastewater and activated sludge. Activated sludge consists of many of the microorganisms that live in the wastewater. Mixed liquor consumes many of the dissolved and suspended solids that do not get filtered in the primary settling basins. I hypothesized that the rate of respiration of microorganisms in a sample of mixed liquor from the wastewater treatment plant will decline as the pH of the mixed liquor is adjusted to acidic(low pH) or basic (high pH) conditions. And furthermore, that the rate of respiration will be highest for the unadjusted mixed liquor(nearly neutral pH~7.4).</p> <p>Methods/Materials I conducted an experiment to measure the rate of respiration in two samples of mixed liquor at varying pH. For one sample, I measured the rate at the starting pH of 7.3 and then at pH's of 6.8, 6.3, 5.8, 5.3, and 4.8. In the other sample I measured the rate at the starting pH and then at 8.0, 8.5, 9.0, 9.5, 10.0, and 10.6. I added 1N Sulfuric Acid to decrease the pH and 1N Sodium Hydroxide to increase the pH. For each sample I placed 1.5 L of mixed liquor in a sealed chamber in the respirometer. The respirometer calculated the instantaneous rate of respiration in milliliters of carbon dioxide produced per hour (ml/hr) and I recorded it after 15 minutes.</p> <p>Results The results of my experiment clearly show that the production of Carbon Dioxide greatly decreases in extreme pH conditions. To scientifically prove my results, I entered my raw data into an excel spreadsheet and made a graph. The best-fit curve to the data points was a downward facing parabola. The r-squared value of 0.89 is close to 1 indicating that the points fit the curve well.</p> <p>Conclusions/Discussion In Conclusion, my experiment would be of great help to waste water treatment plants all around the world. Treatment of wastewater with microorganisms in activated sludge is one of the vital steps of secondary wastewater treatment. This type of experiment will be able to determine an optimum pH level for mixed liquor so the microorganisms can thrive. It would also help determine how much the treatment of the wastewater would slow down if acidic or basic wastewater entered the wastewater treatment facility.</p>	
Summary Statement My project was conducted in order to see if extreme pH conditions would quench the respiration in secondary treated mixed liquor.	
Help Received The Watsonville Water Treatment facility provided the instruments I used in my project. Mr. Mike Crane taught me how the instruments were used and supervised my experiment. My mom helped with the artistic aspects of my board.	