



CALIFORNIA STATE SCIENCE FAIR  
2017 PROJECT SUMMARY

<b>Name(s)</b> <b>Ruchika S. Dixit</b>	<b>Project Number</b> <b>J1606</b>
<b>Project Title</b> <b>How Quorum Sensing and Media Affect Bacterial Bioluminescence</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Electricity is not dependable in small villages in third world countries, making light a scarce resource. To solve this problem, I wanted to explore if bioluminescent bacteria called <i>Vibrio Fischeri</i> can be used as an alternative light source. My goal was to increase the bacteria's luminescence by experimenting on media in which it grows and bacteria's density (cells/ml).</p> <p><b>Methods/Materials</b> I ran two tests on the bacteria. In the first, the independent variable was the media. For this experiment, I made five different media and grew bacteria in each of them. The first was a control, with no extra chemicals, the second with Chitosan, third with Fatty Aldehyde, fourth with L-Cysteine, and fifth with FMNH<sub>2</sub>.</p> <p>For the second experiment, the independent variable was cell density. I grew bacteria in five different densities, using the McFarland Standards (McF) as a measure of cell density, 0.5 McF in the first, 1 McF in the second, 2 McF in the third, 3 McF in the fourth, and the most dense being 4 McF, the fifth.</p> <p>In each experiment, I took pictures of the bacteria at 24 hours, 48 hours, and 72 hours, and ran them through an image processor, called ImageJ, which can measure the amount of light in a picture.</p> <p><b>Results</b> I found that in the media experiment, Chitosan had less luminescence than the control at 24 hours, but at 48 hours, the luminescence increased notably, then dropped after 72 hours. For Fatty Aldehyde, all 3 days were lower than any other chemical, and the luminescence didn't change much over time. FMNH<sub>2</sub> and L-Cysteine appeared to be similar to the control.</p> <p>In the density experiment, every density had the highest luminescence at 24 hours, less at 48 hours, and the least luminescence at 72 hours. At 24 hours, 2 McF had the most luminescence followed by 0.5 McF and 1 McF. 3 McF and 4 McF had the least luminescence.</p> <p><b>Conclusions/Discussion</b> Both media manipulation and density variation increase bacterial luminescence. Chitosan in media and 2McF density can be used to build a prototype of an alternative light source.</p>	
<b>Summary Statement</b> By growing the bacteria in media with added chemicals or in different cell densities, can I increase the amount of light that is produced by the bioluminescent bacteria, <i>Vibrio Fischeri</i> ?	
<b>Help Received</b> I conducted the project at Schmahl Science Lab under the mentorship and supervision of Mr Carroll. I did all the work by myself.	