



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Joel Herman; Alec Zhang</b>	<b>Project Number</b> <b>S1509</b>
<b>Project Title</b> <b>The Effect of UV Wavelength on the Mutation Rate of Escherichia coli</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose is to compare the mutagenic effects of UV-B and UV-C light at equivalent intensities on Escherichia coli.</p> <p><b>Methods/Materials</b> A bacterial tryptophan reverse mutation assay was used to measure the mutagenicity of UV-B and UV-C radiation. E. coli WP2, which require tryptophan for growth due to a point mutation, were inoculated into minimal growth media and exposed to equal intensities of UV-B or UV-C light for various times. Growth of E. coli WP2 on minimal media requires reversion of the point mutation, therefore, the number of colonies is a measure of the mutagenicity of the UV-B or UV-C exposure.</p> <p><b>Results</b> With no exposure to UV light, an average of 12 colonies was observed after 48 hours incubation on minimal media, which represents the background rate for reversion of the tryptophan mutation. With UV-C the maximum number of colonies (mean = 436, standard deviation = 31), was observed with 15 seconds exposure at 45 mWatts/cm<sup>2</sup>. With UV-B exposure at the same intensity, the maximum number of colonies (mean = 359, standard deviation = 62) was observed at 3:00 minutes.</p> <p><b>Conclusions/Discussion</b> The maximum mutagenic effects of UV-B and UV-C irradiation on E. coli were not significantly different, but the maximum number of mutations with UV-C was obtained at a much lower exposure. This study was done to investigate the potential for mutations in bacteria that survive UV-C decontamination systems, such as those used to disinfect water, due to receiving a sub-lethal exposure, and to determine if UV-B might have lower potential for mutations in bacteria that survive decontamination. Our results suggest that UV-B and UV-C do not differ in their mutagenic potential in bacteria that survive UV decontamination.</p>	
<b>Summary Statement</b> We used a reverse mutation assay to compare the mutagenic effects of UV-B and UV-C radiation in E. coli, to determine if UV-B has lower potential for causing mutations in bacteria that survive UV decontamination.	
<b>Help Received</b> One of our fathers (Mr. Herman) obtained permission for us to conduct our experiments in a microbiology laboratory at his company, supervised our laboratory work and taught us basic bacteriological techniques. My parents and biology teacher helped us proof-read and edit our poster and binder.	