



**CALIFORNIA STATE SCIENCE FAIR  
2015 PROJECT SUMMARY**

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<b>Project Title</b> <b>Effects of Calcium and Vitamin K on Microtubule Depolymerization in Chlamydomonas reinhardtii</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objective of this project was to determine if calcium and vitamin K in the forms of menaquinone and phylloquinone had an effect on microtubule depolymerization as expressed through the flagellar motility of Chlamydomonas reinhardtii. <b>Methods/Materials</b> After culturing Chlamydomonas reinhardtii and preparing solutions of calcium, menaquinone, and phylloquinone in a consistent range of molarities, 1 milliliter samples of the Chlamydomonas were treated with 40 microliters of each of the treatment solutions. Ten images were captured over 20 seconds in order to compare the rate of movement of individual cells in the treatments. Solutions of combined treatments were prepared and tested using the same protocol as in the dose response. Each of these treatments were repeated 4 times to ensure the viability of the results. <b>Results</b> The only individual solutions which rejected the null hypothesis to suggest statistically significant movement of the cells (as compared to the control with no treatment) was Calcium at 500 micromolar after 30 minutes and 100, 250, and 500 micromolar after 60 minutes, all with p values of below 0.05. A t-test conducted to test for a statistical significance between the 30 and 60 minute analyses failed to reject the null hypothesis with a p value of 0.5. Two t-tests were conducted to tell whether there was a statistical difference between the calcium and the treatment, at both 30 and 60 minutes. The results failed to reject the null hypothesis at 60 minutes (p=0.06), but rejected the null hypothesis at 30 minutes (p=0.03). <b>Conclusions/Discussion</b> Calcium is the only treatment which, individually, has an effect on microtubule depolymerization. The movement of the cells treated with calcium was significantly less, likely due to that fact that calcium increases depolymerization meaning the microtubules shrink and therefore the flagella are shorter and cannot propel the cell as quickly. All of the calcium treatments were significantly different than the control after 60 minutes, but only the 500 micromolar calcium was significant after 30 minutes. This suggests that calcium takes more than 30 minutes to be absorbed by the cells. Menaquinone when combined with calcium sped up the effects of microtubule depolymerization. The results supported my hypothesis because calcium had the most effect on microtubule depolymerization which increased when calcium was combined with menaquinone.	
<b>Summary Statement</b> This project tests how calcium, menaquinone, and phylloquinone affect microtubule depolymerization as expressed through the flagellar motility of Chlamydomonas reinhardtii.	
<b>Help Received</b> Professor Merchant, Crysten Blaby, and Sean Gallaher of UCLA supplied Chlamydomonas reinhardtii and provided tips for culturing them.	