



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Thomas Cumbelich	Project Number S0503
Project Title Supermilk: A Plant-Based Milk Alternative	
<p style="text-align: center;">Abstract</p> <p>Objectives To create a combination of plant-based milk that together is equal or similar to the levels of protein and calcium in multiple types of cow's milk.</p> <p>Methods I ordered and personally used the Bio-Rad Bradford Protein Assay Kit for protein quantitation, and the Vernier Calcium Ion-Selective Electrode to determine calcium concentration. I purchased, blended and strained almonds, pistachios and sesame seeds in two different batches. A standard curve was set after I mixed the protein standards from a 2 mg/mL Bovine Serum Albumin Standard with Phosphate Buffered Saline, for standards of 2, 1.5, 1, 0.75, 0.5, 0.25, 0.125 mg/mL. I tested for protein using the Spectrov Plus spectrophotometer at 594.8 nm, and 1x Bradford Reagent, and then recorded the absorbance of each cuvette filled with phosphate buffered saline and the milk samples. Then, using the electrode, I measured calcium concentration and recorded the value. I repeated this process with the second batch, and then recorded the same process, once more, with green peas and spinach.</p> <p>Results The average protein levels from four Clover Sonoma cow milks is 9.25 g/cup and the average calcium is 0.33 g/cup. My overall best milk of pistachio and almond blend that was measured twice, only had an average of 2.505 g/cup of protein and 0.024 g/cup of calcium. The pistachio almond milk achieved 32.5% of the protein level and 8.7% of the calcium level needed to reach the average cow milk levels. My highest calcium recording was 0.069 from green pea spinach milk, but because I only ran that one time, the results are not reliable.</p> <p>Conclusions Though my results were a far reach from my hopeful expectations, I still created a plant-based milk alternative that is viable for someone with a lactose intolerance or dairy allergy. Also, this is a decent product as it surpassed two commercial almond milk brands in protein concentration.</p>	
Summary Statement I did not achieve levels of protein and calcium similar to those in multiple types of cow's milks with a plant-based alternative, however, I still improved upon shelf products.	
Help Received My teacher helped me create the protein standards for the standard curve. A statistical coach helped me plan my project and then organize my results.	