



CALIFORNIA STATE SCIENCE FAIR 2017 PROJECT SUMMARY

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Project Title Removing Heavy Metals with an Affordable Home Filter: A Second Year Study	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals All over the world, heavy metal water contamination is a prominent problem; from the water crisis in Flint, Michigan to the wasteland runoff and unorthodox dumping contaminants leaching into Mumbai, India's Mithi River. Heavy metals exposure can cause severe diseases and even fatality, making it a paramount problem globally. Here In the Central Valley, the drought causing wells to run dry could lead to higher concentration of heavy metals in groundwater. The purpose of this project is to design and build an affordable layered gravity water filter and test water samples for arsenic, copper, lead, and mercury from private wells in Fresno County.</p> <p>Methods/Materials We built our filter from a cloth coffee filter, ion exchange resin (cation and anion), activated carbon pellets, ion exchange/coconut carbon mixture, kinetic degradation fluxion, tourmaline bio-ceramic balls, and additional fibers. After the filter was built, we collected four raw samples from four wells and 250 mL of each raw sample was sent to a NELAP certified laboratory for heavy metal analysis. Then we filtered the sample from each well with our filter and 250 mL of each filtrate was sent to the same lab for analysis. The concentration of heavy metals in the raw and filtered samples were compared.</p> <p>Results Copper was the highest concentration detected in all of the samples. The concentrations of copper before filtration in Sample One, Two, Three, and Four were 9.7, 54, 5.2, and 17 ug/L, respectively. After filtration, the concentration of copper was undetectable in the first three samples and 16 ug/L in the fourth sample. Arsenic was the second highest concentration detected. It was only detected in the unfiltered Sample Three with a concentration of 4.7 ug/L and after filtration it was undetectable. Lead was only detected in Sample Two with a concentration of 5.7 ug/L and after filtration it was undetectable. Mercury was not detected in any of the samples.</p> <p>Conclusions/Discussion After comparing the filtered results to the raw results, we concluded that our filter is effective in removing the heavy metals arsenic, lead, and copper. The copper from the last sample was not completely removed, most likely because copper of different isotopes were present in the water.</p>	
Summary Statement This project focuses on filtration of arsenic, copper, lead, and mercury from groundwater in Fresno County with our layered gravity filter.	
Help Received The well owners collected the water samples based on lab instruction. BSK Labs tested the water free of charge. Our parents transported us to and from the lab, and our coach provided us technical support. The ion exchange resins, the resin/carbon mixture, and fiber was provided by San Joaquin Chemicals.	