



**CALIFORNIA STATE SCIENCE FAIR  
2014 PROJECT SUMMARY**

<b>Name(s)</b> Matthew M. Hase-Liu	<b>Project Number</b>  34796
<b>Project Title</b> <b>The Effectiveness of the Natural Polymers Chitosan, Polyglutamic Acid and Moringa Oleifera Seeds in Water Purification</b>	
<b>Objectives/Goals</b> We are seeing ever-increasing threats of contamination of fresh water, from industrial wastes, to nuclear power plant accidents, to pharmaceutical drug contamination of municipal drinking water. Activated Carbon and Zeolite are widely employed as purification agents, but are not effective for all contaminants. In this study, I looked for natural purification agents that were abundant in nature, highly effective, and required minimal processing. <b>Abstract</b> <b>Methods/Materials</b> In this study, I compared the natural polymers Chitosan, Polyglutamic Acid, and Moringa Oleifera Seeds with the commonly used Activated Carbon and Zeolite on reduction in water turbidity and concentration of the 4 types of common contaminants. Chitosan is derived from Chitin. Polyglutamic Acid is extracted from fermented soy beans, and Moringa Oleifera Seeds are obtained from Moringa Trees in Africa. I measured their effects on turbidity of a standardized mud suspension using a nephelometer and reduction in equilibrium concentration of the 4 types of common contaminants (transition metal cations, complex anions, simple halogen anions, and organic compounds) using a Spectronic 21D Spectrophotometer. I also monitored pH with a pH meter and AC conductivity with a TDS meter. Afterwards, I analyzed instrumentation errors and performed statistical analysis. <b>Results</b> Chitosan is an excellent purification agent against all 4 types of common contaminants. Polyglutamic Acid is excellent for reducing turbidity and all the chemicals except complex anions. Moringa Oleifera Seeds are good for reducing turbidity and all the chemicals except transition cations. <b>Conclusions/Discussion</b> Overall, I found Chitosan as the best purification agent in this study, performing even better than the commonly used Activated Carbon. In addition, all of the natural polymers outperformed Zeolite. As a current application, I propose making a multi-stage filter, consisting of Polyglutamic Acid to first reduce the turbidity, then Chitosan and Moringa Oleifera Seeds to filter out the remaining contaminants.	
<b>Summary Statement</b> The natural polymers Chitosan, Polyglutamic Acid, and Moringa Oleifera Seeds are effective water purification agents.	
<b>Help Received</b> Mrs. Alonzo provided advice on emphasizing important points (such as controls) needed in the project.	