



**CALIFORNIA STATE SCIENCE FAIR  
2008 PROJECT SUMMARY**

<b>Name(s)</b> <b>Timothy D. Chen</b>	<b>Project Number</b> <b>S0906</b>
<b>Project Title</b> <b>The Effectiveness of Water Purification Systems on Decreasing Ion Concentration and the Level of Microorganisms</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The purpose of my project was to determine the efficiency of carbon, ceramic, reverse osmosis, and ultraviolet purification systems of water. Their performances were determined by their effectiveness of filtering ions and bacteria. <b>Methods/Materials</b> Filtration: Tap water control, ultraviolet, carbon, and reverse osmosis, were repeated four times, 30 mL of tap water poured into one cup unless stated otherwise. The Hanna Instruments TDS meter was used to measure the total dissolved solids, in parts per million, of the trial. Ceramic had 1 Liter of tap water was poured and tested. Micro-organisms Growth Agar Plates: Repeated 24 times for each system to be plated onto 5 agar plates. Water was plated by syringe onto plate. Aerobic Agar Films: Repeated 19 times for each system to be plated onto 4 agar films. Water was plated by syringe onto film. Incubating the Agar: The agar & agar films were incubated and removed after 36 hours. <b>Results</b> Reverse osmosis filtration system removed 199 ppm, 93.77%, of the water's ions. Ceramic processed water filtered out -186 ppm, -87.69% of the hydrated ions. The ceramic filtered plates had an average of 157 colonies per sq centimeter an average deviation of 32.2 colonies per sq centimeter. There was bacterial overgrowth in the trials shown-there were too many colonies to count. Ultraviolet Radiation filtered out an average of 2 ppm. Carbon Filtration filtered out an average of 22 ppm. For the bacterial growth in the agar plates and films: reverse osmosis, ultraviolet, and carbon had no growth in the agar plates or films. <b>Conclusions/Discussion</b> Osmosis was the most effective purification system, because of the semi-permeable membrane's indiscriminate filtration. Carbon's lackluster performance was probably a result of an obstructed, overused carbon filter. Ultraviolet's lack of filtration was expected; radiation does not filter. Ceramic must have added its own TDS by fragments of ceramics or silicon shells and added its own bacteria-despite the nano-silver impediment.	
<b>Summary Statement</b> Which Purification System best filters water available to urban America.	
<b>Help Received</b> Mother assisted in procuring experiment's materials, Dr. Cheng lent the incubator.	