



CALIFORNIA STATE SCIENCE FAIR

2015 PROJECT SUMMARY

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Project Title Water You Filtering?	
Abstract Objectives/Goals Aquarists perform bothersome and time-consuming biweekly 20% water changes to remove nitrates, keeping their fish tanks clean and healthy. Unfortunately, colonies of beneficial nitrifying bacteria are removed in the process. I have always wondered if there was a type of filter medium I could use to filter my water that would remove nitrates but not nitrifying bacteria, eliminating the need for water changes. The objective of this experiment was to determine which type of filter media most effectively removes nitrates from cycled aquarium water while preserving nitrifying bacteria. The main goal was to eventually develop an aquarium filter that removes nitrates but not nitrifying bacteria, therefore saving water. Methods/Materials After the original water sample was tested for nitrates three times using an API Nitrate Liquid test kit, the water was run through each different type of filter and tested for nitrates three times. A drop of the filtered water sample with the least nitrates and a drop of the original water sample were Gram stained and tested for the presence of nitrifying bacteria by observation using oil-immersion microscopy. Results The original water sample contained 5 ppm of nitrate. The BRITA filter removed 2.5 ppm of nitrates, the ZeroWater filter removed all measurable nitrates, and the paper coffee filter and diatomaceous earth filter removed no nitrates. Colonies of Gram negative nitrifying bacteria were present in both the original and ZeroWater filter water samples. Conclusions/Discussion The ZeroWater filter most effectively removed nitrates from cycled aquarium water while preserving nitrifying bacteria. The results from this experiment could be very useful to aquarists, as filtering aquarium water with ZeroWater filters or eventually a customized nitrate filter eliminates the need to conduct time-consuming biweekly 20% water changes. The results from this investigation also support water conservation, as aquarium water can now be filtered rather than dumped and replaced. With more than 20 million fish tanks in the U.S., water conservation estimates exceed 750 million gallons per year. Two main questions arose when performing the experiment: how the results would be affected if the original water sample had a much higher level of nitrates (e.g. 40 ppm) and if there could have been a more accurate way to measure nitrates, possibly with a digital or photometric nitrate detector.	
Summary Statement This experiment tested 4 types of filter media to determine which most effectively removed nitrates from cycled aquarium water while preserving nitrifying bacteria, with the intent to improve overall aquarium health and conserve water.	
Help Received I received help from my father, who assisted me in the Gram staining process and helped me contact his friend who lent me his microscope and camera attachment.	