



CALIFORNIA STATE SCIENCE FAIR 2006 PROJECT SUMMARY

Name(s) Donald H. Livingston	Project Number J0517
Project Title Dangerous Mountain Waters	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this project is to find the level of copper in the drinking water in a house in Kirkwood. There were blue stains in the sinks that raised suspicions about there being high levels of copper. The hypothesis was that the copper level in water from the Kirkwood Meadows Public Utility District rises over time if it is left sitting in copper pipes, becoming unsafe to drink after two weeks.</p> <p>Methods/Materials The hypothesis was tested in two different ways: 1. The copper level of water in the house was tested 14 different times after sitting undisturbed in the house's pipes for different amounts of time (on-site tests). 2. Water from the house was put into copper plumbing tubes to sit for two weeks (lab tests) and was tested for copper and other water facts every other day for two weeks. An at-home copper test kit and alkalinity strips were used for all tests. All tests were repeated twice.</p> <p>Results The on-site test results show that the hypothesis was wrong. The on-site water became unsafe to drink after very short periods of time (as little as 2 hours), not just after two weeks. The copper level bounced all around based on the acidity of the water, not the length of time it spent in the house pipes. The lab test results also show that the hypothesis was wrong. Copper level in the water from KMPUD did not steadily rise over time. Instead, it shot up, dropped a bit and then zoomed back down. The water in the tubes acted differently from the water in the house pipes, probably because it sat quietly, did not get new oxygen, and was not disturbed, so maybe a protective coating could form. This could also help explain why the water's copper level dropped after one week in the tube.</p> <p>Conclusions/Discussion The conclusion is that the copper level does not rise based on time, but on the pH level of the water. The well closest to the house has very acidic water and when there are not a lot of people using water at Kirkwood, the acidic water does not get mixed up with water from other wells. After hearing about the copper levels from this project, KMPUD began testing water from a sample of houses in the neighborhood to see if they were meeting the EPA standard for copper (they were not). Based on the results of these tests, KMPUD is going to begin treating the water from the one well with sodium hydroxide, which will make the water less acidic and hopefully lower the copper level of the water.</p>	
Summary Statement This project tests the level of copper in the water in a house in Kirkwood and tries to figure out if the levels are related to the amount of time the water sits in copper pipes.	
Help Received Dad helped show me how to make the charts; Mom helped me organize and edit my writing and talk to KMPUD; my science teacher gave me the idea for adding the copper tubes tests; Michael Sharp and Peter Tobacco of KMPUD explained the Kirkwood water system to me.	