
Effects of Upcountry Maui Water Additives on Health

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Abstract

Since 2001 Upcountry Maui residents have been concerned that water additives may be linked to health problems in their community. A study using phone surveys was conducted to assess this issue. Most people suffered skin rashes, while others experienced eye irritations or respiratory problems. The surveys suggested that these symptoms might have been attributable to the water additives.

Introduction

The surface water that supplies parts of Upcountry Maui (including Kula, Pukalani, & Makawao) was presumed to be corrosive and leaching lead from lead solder and brass fittings found in several older homes. The Department of Water Supply (DWS) tried to flush the lines and attempted to adjust the pH level, but still had elevated levels of lead in many Upcountry homes. The Federal Safe Drinking Water Act¹ & the Environmental Protection Agency² mandate local water utilities to ensure that water from a customer's tap does not exceed 15 parts per billion of lead. Although the water in the distribution system of concern in Upcountry Maui met this standard, the water coming from the tap of many Upcountry Maui homes did not. Because of these mandates the Calgon product C-9 (zinc orthophosphate) was added to the water supply on June 1, 2001 in an attempt to control the corrosion.³ C-9 is intended to help by creating a protective film in the water pipes, preventing the leaching of the lead. Unfortunately, ninety-eight people subsequently reported health problems to DWS. The use of C-9 was stopped April 10, 2003 and phosphoric acid was added instead.

Methods

A study using two phone surveys was conducted to assess this issue. The first portion focused on developing a research tool and characterizing the signs and symptoms believed to be associated with the Upcountry water additives. For the second portion random phone numbers from the Upcountry area and a control group were called to assess whether there was an appreciable difference between the two groups, which would suggest that the water additives (C-9 and phosphoric acid) might have caused the health problems.

For the first survey, the ninety-eight Upcountry homes with complaints about symptoms from the additives were contacted and asked specific questions about their symptoms. Phone calls were made from 6/22/03 - 6/30/03 in the afternoon & evening times. The survey was designed to ensure anonymity, collect demographics, and record the reported symptoms in detail. To minimize interviewer bias for both the first and second surveys, a primary interviewer collected the demographic information for each participant. The participant was then transferred to a second interviewer. Before this transfer each participant was instructed not to tell the second interviewer where he or she lived. The second interviewer assessed the medical complaints when the participant indicated that symptoms were present. Information was collected for all household members, both symptomatic and asymptomatic.

For the second survey 200 random phone numbers from the Upcountry area (Kula, Pukalani, Makawao towns) and 200 random numbers from the Downtown area (Kahului, Wailuku towns) were called. Phone calls were made from 7/2/03 - 7/16/03 again in the afternoon & evening times. Participants were asked if they had experienced symptoms similar to those reported in the first survey during the past 2 years, the time period when C-9 and phosphoric acid were being used to treat the water. The Downtown area was used as a control group because the area has a different water supply with no C-9 or phosphoric acid treatment. The team used a modified version of the original survey for the randomized, blinded, control group telephone survey. Interviewers were again blinded to the location of participants by using the two-interviewer method.

Results

Twenty-four households were willing to participate in the first survey. Information was collected on sixty-two individuals residing in the twenty-four households. Every household had at least one symptomatic individual. In total there were thirty-two symptomatic individuals. From this first survey it was determined that the primary complaints were skin rashes, eye irritations, and respiratory problems. Twenty-seven

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individuals reported a skin rash, thirteen reported eye irritations, and four reported respiratory problems. Twenty-two individuals reported having only one symptom, while eight reported two symptoms, and two reported all three symptoms. Residents strongly believed that their symptoms were related to use of water treated with C-9 or phosphoric acid.

The results of the second randomized, blinded survey with a control group indicated that a statistically significant ($p=0.02$) number of Upcountry residents experienced similar symptoms over the past two years compared to Downtown residents. Thirty-six homes in the Upcountry group were contacted and information was gathered on ninety-seven individuals. Fourteen of the ninety-seven reported symptoms; ten of them reported getting a skin rash. In the Downtown group, thirty homes were contacted and information was gathered on seventy-seven individuals. Only three reported symptoms, one reporting a skin rash.

Discussion

The surveys suggest that these symptoms may have been adverse reactions to the water additives, but more research would be needed to confirm this. A causal relationship cannot necessarily be inferred, however, the way in which the health problems manifested suggested that water use was a factor. In both surveys most symptomatic individuals Upcountry reported symptoms after showering or associated their symptoms with some sort of water exposure, such as watering the lawn. Some also noted that if they showered Downtown or went on vacation that their symptoms would resolve, but would return once Upcountry water use was resumed. However, the three symptomatic individuals from the Downtown group did not attribute their symptoms to water use, instead citing other causes, such as grass allergies when mowing the lawn causing eye irritation. The finding of symptomatic individuals in the Downtown group may simply account for the background rate of skin rashes, eye irritations, and respiratory problems present in the population for that given time. Again, while these results are suggestive that there is an association between treated water & reports of symptoms, further studies would be needed to show a true correlation.

There are several limitations to our study. The sample size was small and there may have been an unintentional selection bias due to the times the calls were made. Also, those with unlisted phone numbers were not included in the study, adding to the bias. Additionally, reported symptoms could have been due to confounding factors, such as allergies or illness, different soap use, or different ages or ethnic groups contacted. However, despite the limitations a statistically significant difference was still shown between the Upcountry group and the control group, suggesting

that the water additive could be the factor contributing to the symptoms residents reported. Future studies may include a randomized, double blind, controlled crossover study with participants bathing in treated or untreated water. This may give more solid evidence about whether the water additives truly play a role in producing the symptoms of the residents.

References

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