

Lead Concentration Levels in the Drinking Water from Parks in Oakland and Piedmont, California

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Introduction

Lead is a common metal that can be detrimental to health if ingested. Lead can contaminate the environment which we are living in subtly in several ways. It can seep into drinking water via lead piping, or it can be emitted into the atmosphere from various pollutants such as from the exhausts of automobiles and factories. Most lead pipes have been replaced, but many pipes are connected with solder containing lead, and when corrosion occurs in the pipe, lead is released into the drinking water. Paint in old toys even contains lead. When entering a child's body, lead can damage the nervous system, stunt growth, cause learning and hearing problems, and cause headaches. In adults, lead causes joint pain, high blood pressure, nerve disorders, reproductive problems, and memory problems.

Due to the detrimental effects of lead on people, the Environmental Protection Agency (EPA) has set the limit to the maximum concentration of lead in water to fifteen parts per billion. In areas such as parks and public spaces, where people spend leisure time, if the concentration of lead is equal to or greater than this limit in water fountains, these fountains now pose a threat to the health and safety of the society. Hence, to determine how safe the water in the public parks is, several fountains in Oakland's public parks were tested. With the hundreds of visitors each day drinking from the water fountains in these green spaces, if there were to be a contamination of lead, then hundreds of thousands of people would be subject to detrimental health defects.

Methods

From July to November 2008, water samples were collected and tested for lead from 5 parks in Oakland and Piedmont, Ca. Parks were chosen due to their proximity to summer program location and because of high usage at some of the sites. Two to four samples were taken from drinking fountains around the parks. Four of our five sites included water fountains next to a playground. One liter of water was drawn from each fountain with no purging time. Twenty six samples were collected in total on different days from the five sites. All were collected after 10 am. Ten drops of nitric acid were added to preserve the acid until it would be tested in the lab. Samples were tested at the Lawrence Hall of Science in Berkeley, Ca. The EBAYS Team conducted experiments the HACH DR/4000 Procedure that uses a spectrophotometer to read traces of lead. Results were given in micrograms/liter which convert to ppb.

Area of Study



Figure 1: Locations of 5 Oakland parks where water samples were collected.

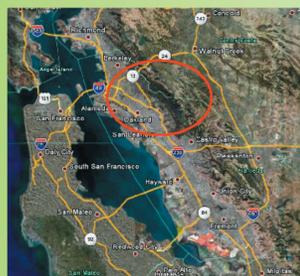


Figure 2: Map of Bay Area where sample collection took place.



Figure 4: Various fountains at Lake Merritt, Dracena Park, San Antonio Park, and Mosswood Park.

Results

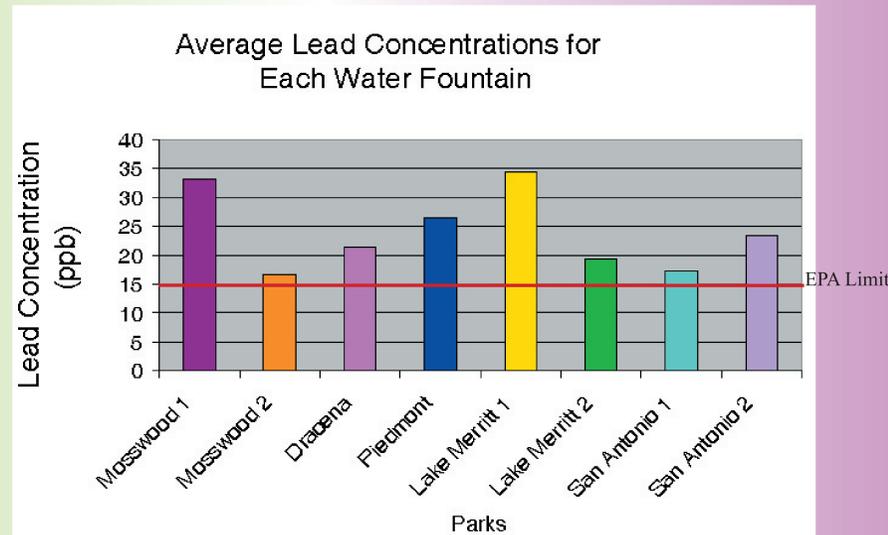


Figure 3: Bar graph of average lead concentration for each park displays that all averages are above the EPA standard limit of 15ppb.

Water Fountains	Standard Deviation
Mosswood 1	19.1065
Mosswood 2	7.525957
Dracena	6.53296
Piedmont	14.40871
Lake Merritt 1	14.43685
Lake Merritt 2	6.594521
San Antonio 1	3.100961
San Antonio 2	8.724761

Table 1: Chart containing the standard deviation of each water fountain to demonstrate how different the concentrations were between fountains.

Discussion

Twenty three of the twenty six samples tested had a lead concentration over the EPA standard of 15 ppb. These results could indicate that all parks in Oakland contain high amounts of lead. The quality of drinking water does not differ greatly between Piedmont and Oakland. Water contamination is happening differently and perhaps from different point sources in each fountain as the high standard deviation among the data points indicates. A possible explanation to the discrepancy is the amount of corrosion in the different sets of pipes leading to each of the fountains.

The high standard deviation of our results indicates that the contamination is not necessarily occurring in the EBMUD plant. In a previous EBAYS study, eleven out of thirteen public schools tested for lead contained at least one fountain with a concentration of lead over the EPA limit. The contamination probably occurs somewhere in the piping system leading to the fountains or schools. Testing water samples from businesses and houses surrounding the parks could help pinpoint the location of contamination.

High concentration of lead poses a threat to the health of anyone who visits public parks. To warn people of the contaminated water, the parks should post signs indicating that health hazard. People could also try running the water for fifteen seconds before drinking it to avoid contamination since studies show that purging the water lessens lead contamination.

Representatives of Oakland Public Works were contacted to get information regarding pipe maintenance. The information shared with them led them to pay for their own study of the three parks in Oakland. All of their results, however, were below the EPA limit.

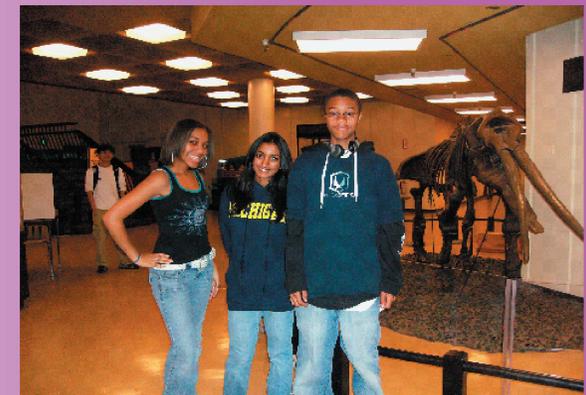


Fig. 4: Student Researchers Tamara Lawrence, Supraja Swamy, Damari Lawrence after a hard day of work in the lab at Lawrence Hall of Science.

Conclusion

- All of our sites contain average lead concentrations above the EPA standard of 15ppb.
- There was little difference in lead contamination between the parks.
- Further testing of more samples is required since supplemental study by Oakland Public Parks demonstrated contradicting results that show water poses slight health risks.

Works Cited

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