Health Consultation

Exposure Investigation Report

BLOOD LEVELS IN THE CANON CITY VICINITY

FREMONT COUNTY, COLORADO

EPA FACILITY ID: COD042167858

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared by:

The U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation

Abbreviations and Acronyms

ATSDR	Agency for Toxic Substances and Disease Registry
BLL	Blood lead level
CDC	Centers for Disease Control and Prevention
EI	Exposure Investigation
EPA	U.S. Environmental Protection Agency
NCEH	National Center for Environmental Health
QA/QC	Quality assurance / Quality control
µg/dL	micrograms per deciliter

Executive Summary

Based on community concerns and a request for assistance from the EPA, ATSDR investigated potential lead contamination in the Lincoln Park neighborhood, located just south of Canon City, Colorado.

Community concerns focused on the adequacy of the blood testing surveillance program in the Lincoln Park neighborhood and specifically on “at risk” children living in the area. A perceived potential for elevated childhood lead level remains in the community because of historical and current mining and milling operations, findings from previous investigations and current remedial efforts to remove lead contaminated soil from neighborhood properties. In addition, the high proportion of older housing in the area is also a risk factor for elevated BLL.

The available data indicated that the rate of elevated BLLs for Fremont County is below the state average. However, concerns about the adequacy of blood lead testing have persisted among residents and health care providers. As a result, ATSDR conducted a blood lead testing program as a public health service to the community. ATSDR provided the blood lead testing to “at risk” children at a local school. A total of 115 children at a local school were tested for blood lead. None of the children tested had elevated blood lead levels. ATSDR recommends that local and state agencies continue routine monitoring of lead levels in area children.

Background

Based on community concerns and a request for assistance from the Environmental Protection Agency (EPA), the Agency for Toxic Substances and Disease Registry (ATSDR) investigated lead contamination in the Lincoln Park neighborhood, located just south of Canon City, Colorado.

The preliminary investigation and findings about lead are described in a previous health consultation that concluded the available data were not sufficient to determine whether area children were being adequately screened for blood lead levels (BLL) [1]. The data that were available did indicate that the rate of elevated BLLs in Fremont County is below the state average [2]. However, concerns about blood lead levels have persisted among residents and health care providers.

The community questioned the adequacy of BLL testing in the Lincoln Park neighborhood, and specific interest was focused on "at risk" children living in the area. The concerns over BLLs were at least partly based on the historical and current mining and milling operations in the general area, previous investigations and remedial efforts to remove lead-contaminated soils from neighborhood properties, and the preponderance of older housing in the area which is a primary risk factor for elevated BLL [1].

Given the historical and current environmental issues, it was reasonable to address the questions with a BLL screening program in the Lincoln Park neighborhood as a public health service. As a public service to the community, ATSDR provided blood lead testing to children in the community.

Methods

Target Population

Children who attended a local school in the Lincoln Park area were recruited for the lead testing service. Children aged 6 and under were eligible to be tested for blood lead. The sampling was intentionally biased and focused on children most likely to be exposed. ATSDR conducted the blood sampling and analysis, participant interviews, and data analysis with the collaboration of local health and school officials. The specific school was chosen because a high percentage of the students are economically disadvantaged, and therefore represents a high risk population for lead exposure. Approximately 200 children attend the school and many live in the Lincoln Park area.

Blood Lead Samples

During the week of September 19th, 2005, ATSDR representatives obtained 115 blood samples of which 10 did not meet quality assurance and quality control (QA/QC) criteria and therefore were not analyzed by the lab. The 105 samples that passed QA/QC criteria were evaluated and are reported in this document.

The capillary blood samples were collected using a "finger stick" method and were analyzed for lead by the National Center for Environmental Health (NCEH) laboratory in Atlanta, Georgia. The lead content was analyzed by using a Perkin Elmer Model 5100 atomic absorption spectrophoto-meter with Zeeman effect background correction. The lower limit of detection for this method is approximately 0.6 µg/dL. Results were reported as micrograms of lead per deciliter of blood (µg/dL).

Individual test results with a written explanation of their meaning were provided to the participants. Individual test results were not made available to the public, and confidentiality was protected according to Federal and State laws. This health consultation does not reveal personal identifiers. Map points that indicate locations of student residences (Figure 1) have been randomly altered by distances of up to several blocks such that the map does not accurately identify a specific residence.

Data Management

Blood lead results were electronically transmitted from NCEH to ATSDR in spreadsheet format. No personal identifiers were included in the spreadsheet. Data quality assurance and quality control were performed by the NCEH laboratories.

Results and Discussion

Blood lead testing is a well established method of estimating lead exposure in children. However, blood lead levels provide data from one specific point in time and they cannot provide information on the source of lead exposure (e.g., food, air, dust/soil, pottery, toys, etc).

Children are especially susceptible to lead exposure and are also more likely to be exposed due to pica behavior, poor personal hygiene and more frequent contact with soil during play activities. The likelihood of lead exposure increases among children with multiple risk factors. The primary risk factors include: low socioeconomic status or poverty, immigrant status, and living in older housing [3, 4]. In addition, children aged 1-5 years on Medicaid should receive lead testing because they are at high risk for elevated blood lead levels [5]. Despite Medicaid requirements, an estimated 81% of young children enrolled in Medicaid are not screened for blood lead levels [5].

An elevated BLL in children affects their cognitive and behavioral development [6]. Elevated BLLs in children have also been associated with growth impairment, high blood pressure, hearing problems, and slowed nerve conduction [7].

A total of 105 samples met QA/QC criteria and were analyzed by the lab. Summary data on these 105 participants are reported in Table 1. Figure 1 presents the approximate residential locations of 82 children that provided addresses that could be mapped. Gender and ethnicity data for the children who participated in the lead testing service were not available. All children were between 1 and 7 years of age, only one child was age 7. The average age of participants was 3.8

years and the median age was 4 years. Most of the children were either 3 years of age (n = 25), 4 yrs of age (n = 54), or 5 years of age (n = 13).

Blood lead levels greater than or equal to 10 µg/dL are considered elevated in participants younger than 6 years of age [8]. None of the children in the lead testing service had blood lead levels that exceeded 10 ug/dL and, therefore, none of the children tested had unusual exposures to lead.

Only one child had a BLL that exceeded 6.0 ug/dL; that child had a BLL at 9.3 µg/dL. The BLLs for children aged 1- 5 years of age was very similar to all children tested (Table 1). There was no correlation between age and BLL (correlation coefficient = -0.0247) among participants. If the participant with a BLL of 9.3 µg/dL is considered an outlier and is extracted from the analysis, there still remains no correlation between age and BLL (correlation coefficient = -0.03737).

Table 1. Blood Lead Levels in Children

Statistic	1 -7 years of age	1- 5 years of age
Number of children	**105**	**100**
Mean (ug.dL)	**2.1**	**2.06**
Median (ug/dL)	**1.7**	**1.7**
Range (ug/dL)	**0 – 9.3**	**0 – 9.3**

µg/dL = micrograms per deciliter

Twenty children with addresses in the general Lincoln Park area were tested for BLL (Figure 1). The mean BLL for the Lincoln Park children was 2.11 µg/dL (standard deviation = 0.9 ug/dL). The mean BLL for the children living outside of the Lincoln Park area was 2.05 µg/dL (standard deviation = 1.4). These data indicate there is no statistical difference between the BLLs from the Lincoln Park children versus the BLLs from children living outside the general Lincoln Park area.

Comparison to U.S. General Population

The BLLs collected by the lead testing service were compared to the 95th percentile value for the civilian U.S. population, as reported in the Centers for Disease Control and Prevention's (CDC) *Third National Report on Human Exposure to Environmental Chemicals* [9]. This report provides information on BLLs in the general U.S. population; these levels are *not* levels at which health effects are likely. The CDC National Report merely states how much lead is in the blood of most people who are not *unusually* exposed to lead.

All but two of the BLLs in the lead testing service were below the 95% percentile of the U.S. population, for the years 2001 – 2002 for children between 1 - 5 yrs of age (95th percentile = 5.8 µg/dL) [9]. Those two children had BLLs of 5.9 µg/dL and 9.3 µg/dL. Since approximately 5 in 100 children tested are expected to exceed the 95th percentile, this finding suggested that, in the group children tested, fewer than the expected number of children had BLLs exceeding the 95th percentile.

In this lead testing service, children were selected from a high risk group (i. e., low socioeconomic status who may be more likely to have lead exposures) for blood lead testing. When evaluating the children as individuals, none of the children in this investigation had BLLs exceeding 10 ug/dL. When evaluating the children as a group, almost all of the children had BLLs below the 95th percentile. Collectively these findings indicate that the children tested did not show evidence of unusual exposures to lead.

It is prudent public health practice to continue efforts to identify at risk children for lead exposure; therefore, the state and local health department should continue monitoring children for elevated BLLs. In addition, children on Medicaid are at high risk for lead exposure and should receive lead testing when appropriate [5].

Reporting Results to Participants of the BLL Testing Service

In May 2006, individual test results and an explanation of their significance were provided to the participants of this investigation. Upon request, an ATSDR physician was available via telephone to discuss participants' results.

Conclusion

None of the children in this lead testing service had elevated blood lead levels. Therefore, the children tested did not have unusual exposures to lead at the time of testing.

Recommendation

Routine monitoring of lead levels of children living in the Lincoln Park neighborhood, as well as those living the surrounding area, should continue.

References

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Authors:

Ketna Mistry, M.D.
Senior Medical Officer
Division of Health Assessments and Consultations
Agency for Toxic Substances and Disease Registry

Clement Welsh, Ph.D., MPH
Senior Environmental Health Scientist
Agency for Toxic Substances and Disease Registry

Steve Dearwent, Ph.D., MPH
Epidemiologist
Division of Health Assessments and Consultations
Agency for Toxic Substances and Disease Registry

Field Assistance by:

Gail Scogin
Environmental Scientist
Division of Health Assessments and Consultations
Agency for Toxic Substances and Disease Registry

Glenn Tucker, Ph, D.
Senior Regional Representative
Division of Regional Operations
Agency for Toxic Substances and Disease Registry

Figure 1. Approximate Locations of Local Residences of the Children Participating in the Blood Lead Screening Service. The area shaded in pink illustrates the general Lincoln Park neighborhood. Single points noted on the map may represent multiple sample locations of near-neighbors.