Memorandum

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Date May 16, 1994

From Senior Toxicologist, TSS, ERCB, DHAC (E57)

Subject Health Consultation: Tar Creek Superfund Site (6012)
Ottawa County, Oklahoma

To Jennifer Lyke
ATSDR Regional Representative
US EPA Region 6
Through: Director, DHAC, ATSDR (E32)
Acting Chief, ERCB, DHAC (E57)

BACKGROUND AND STATEMENT OF ISSUES

This health consultation was initiated by the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate blood lead data gathered by the Indian Health Service (IHS) for the area surrounding the Tar Creek Superfund site. ATSDR assessed the public health implications of the blood lead data and other available environmental contamination information. As part of our review, ATSDR staff conducted a site visit on April 26, 1994, and discussed public health concerns with representatives of the IHS, U.S. Environmental Protection Agency - Region 6, Oklahoma Department of Environmental Quality, tribal governments, and private citizens.

The Tar Creek Superfund site is located in the northeastern corner of Ottawa County, Oklahoma. The area was extensively mined for lead and zinc beginning at the turn of the century and continuing until the early 1960s. Ore milling operations produced large quantities of tailings that were deposited on the surface in "chat" piles. Chat is a gravel-like material that ranges in size from 3/8 inch to fine-grained material. In addition to the chat piles, at least 16 major floatation ponds (sedimentation ponds) were located in the area [1]. Floatation pond sediments are fine-grained sediments that originated in the gravity separation process and were disposed of in settling basins.

After mining operations ceased, the underground mine shafts filled with water. Discharges of acid mine water from these shafts have severely affected the water quality in Tar Creek and other surface streams in the area.

Chat and floatation pond sediment are known to contain lead, but no data on the lead concentration of tailings from the Tar Creek Site were available for review. However, mine wastes from the Baxter Springs and Treece Subsites, located across

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the state line in Kansas, are similar to mine wastes at the Tar Creek Site. Chat from Baxter Springs and Treece contained the following maximum concentrations of metals: cadmium - 89 ppm, lead - 1,600 ppm, and zinc - 13,000 ppm [1]. Sediment from the floatation ponds in the same area contained the following maximum concentrations of metals: cadmium - 540 ppm, lead - 13,000 ppm, and zinc - 52,000 ppm.

The Tar Creek site is underlain by the Boone aquifer. This aquifer is contaminated with high concentrations of zinc, iron, and other inorganic chemicals related to past mining activity. The residents rely on public water systems for their potable water supply. Twenty-one wells in the deeper Roubidoux aquifer provide water for the public water system. Recent testing by the Oklahoma Department of Environmental Quality indicated that the wells are currently in compliance with all primary drinking water standards. However, five of the wells failed the secondary drinking water standard for iron, and one of the wells also failed the secondary standard for sulfate [1]. Further tests will be conducted to determine if this contamination is due to contamination of the Roubidoux aquifer or infiltration of water from the Boone aquifer through the well casing.

IHS has tabulated blood lead data for about 190 residents who live in the area. The data reviewed were from tests conducted between February 1992 and May 1993. Most of the tests were conducted on children, although a few teenagers and adult women were also included. Both venipuncture and finger sticks were used to collect blood samples. When a blood lead level $\geq$ 10 µg/dL was detected, a follow-up venipuncture test was conducted within three months. The distribution of lead concentrations determined in this study are presented in Table 1. As indicated, a substantial portion of the children had blood lead levels $\geq$ 10 µg/dL. Children with elevated blood lead levels were identified in several towns including Wyandotte, Miami, Quapaw, and Commerce, and no discernable pattern of geographic distribution was noted.

DISCUSSION

As indicated in Table 1, a substantial portion (35%) of the children had blood lead levels $\geq$ 10 µg/dL. The sources of lead exposure for children with elevated blood levels have not been identified. Possible exposure sources that warrant further investigation are listed below.

Lead Paint: Many of the homes in the area were built prior to 1978 when lead-based paints were banned. Older homes with flaking or chalking paint are of particular concern because of the increased potential for ingestion by teething infants or children who display pica behavior.

Potable Water: Water samples collected from the well heads of public water supply wells did not contain lead or other metals at levels of health concern. However, lead can leach from lead solder or lead pipes into the water supply for a house. Water that stands in pipes overnight or water from hot water supply lines can have particularly high lead contamination.

Chat Piles: Children who live or play near chat piles may ingest or inhale lead-contaminated dust. The floatation ponds pose an even greater threat since (1) the lead concentration in sediment from the floatation ponds can be 5 times the concentration of lead in tailings from the chat piles, and (2) the particles in the sedimentation ponds are finer than the particles in the chat piles, hence more easily ingested or inhaled.

During ATSDR's site visit, it was noted that chat piles were located in close proximity to baseball fields, picnic grounds, and other public areas. Chat piles have reportedly been used by children for sledding and other play activities, and they are also used by riders of off-road vehicles. Houses have been built on former chat piles or in close proximity to existing chat piles. Chat is also used widely in the area for road bed construction and for private driveways.

During ATSDR's site visit, many salvage yards were noted in the area. Car batteries, radiators, and other lead-containing materials may be a source of lead exposure--either through direct contact or by secondary contact when workers at the facility carry contaminated dust home. In individual homes, hobbies (e.g.; stained glass windows, soldering) and the use of lead-glazed pottery or leaded glassware are potential sources of lead exposure.

Children and developing fetuses are the most sensitive segment of the population to lead toxicity [2]. The developing nervous system of a fetus or young child is particularly sensitive to the neurotoxic effects of lead. Adverse neurological effects in children have been associated with blood lead levels as low as 10 $\mu g/dl$ [2]. Therefore, it is important to protect children and women of child-bearing age from exposure to lead contamination.

CONCLUSIONS

Based on the information reviewed, ATSDR concludes the following:

1. A significant portion of children that were surveyed by the Indian Health Service had blood lead concentrations in excess of acceptable levels.

2. The sources of lead exposure in children with elevated lead levels have not been identified. Potential sources of exposure that warrant investigation include lead paint, tap water, and dust and tailings from chat piles and floatation ponds.

RECOMMENDATIONS

1. Conduct appropriate follow-up activities for children with blood lead levels $\geq$ 10 µg/dL in accordance with recommendations from the Centers for Disease Control [3]. Source identification should include investigation of possible lead contamination of tap water and paint.

2. Conduct blood lead screening in children and pregnant women to identify other residents with excessive lead exposures.

3. Analyze environmental media for potential contamination with lead and other metals. These analyses should include dust in ambient air and tailings from chat piles and floatation ponds in areas accessible to the public.

4. ATSDR is considering conducting additional biological and environmental tests to identify exposed populations and sources of exposure.

If further clarification is necessary or if additional data become available, please contact this office at 404-639-6360.

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REFERENCES

(1) U.S. Environmental Protection Agency - Region 6; Five Year Review: Tar Creek Superfund Site; April 1994.

(2) Agency for Toxic Substances and Disease Registry, Toxicological Profile for Lead; April 1993; TP-92/12.

(3) Centers for Disease Control; Preventing Lead Poisoning in Young Children; October 1991.

Table 1: Blood Lead Concentrations in Indian Health Service Patients; Ottawa County, Oklahoma (1)

Blood Concentration (µg/dL)	Number of Patients	Percentage
≤ 9	123	65.1
10 - 14	51	27.0
15 - 19	11	5.8
20 - 44	4	2.1

(1) Data provided by Donald Ackerman, Indian Health Service, Miami, Oklahoma.