ATSDR Record of Activity

UID #: rlw0 Date: 01 / 24 / 2007 Time: 10:00 am x pm

Site Name: Old Athens Turnpike City: Princeton Cnty: Mercer State: WVA

CERCLIS #: WVN000305682 Cost Recovery #: 3AE9 Region: III

Site Status (1) _ NPL _ Non-NPL _ RCRA _ Non-Site specific _ Federal
(2) _ Emergency Response _ Remedial _ Other

Activities

_ Incoming Call _ Public Meeting* _ Health Consult* _ Site Visit*
_ Outgoing Call _ Other Meeting _ Health Referral _ Info Provided
_ Conference Call _ Data Review X Written Response _ Training
_ Incoming Mail _ Other

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1-EPA	2-USCG	3-OTHER FED	4-STATE ENV	5-STATE HLT
6-COUNTY HLTH	7-CITY HLTH	8-HOSPITAL	9-LAW ENFORCE	10-FIRE DEPT
11-POISON CTR	12-PRIV CITZ	13-OTHER	14-UNKNOWN	15-DOD
16-DOE	17-NOAA	18-OTHR STATE	19-OTHR COUNTY	20-OTHR CITY
21-INTL	22-CITZ GROUP	23-ELECT. OFF	24-PRIV. CO	25-NEWS MEDIA
26-ARMY	27-NAVY	28-AIR FORCE	29-DEF LOG AGCY	30-NRC
31-ATSDR				

Program Areas

_ Health Assessment _ Health Studies _ Tox Info-profile _ Worker Hlth
_ Petition Assessment _ Health Survelinc _ Tox Info-Nonprofil _ Admin
_ Emergency Response _ Disease Regstry _ Subst-Spec Resch _ Other

_ Health Consultation _ Exposr Regstry _ Health Education

BACKGROUND AND STATEMENT OF ISSUES: US Environmental Protection Agency (EPA) Region III requested the Agency for Toxic Substances and Disease Registry (ATSDR) review the results of lead contaminated surface soil samples obtained from an area adjacent to a residential area in Princeton, WVA, and comment on the health implications associated with human exposure.

The Old Athens Turnpike Site is located in downtown Princeton, WV. Previous industrial waste disposal activity on the property has already been documented as the source of lead contamination of the soil in this residential area [1]. A salvage company operated on the property from the 1920s to 1990 [1].

In December 2003, a Site Inspector who conducted a Compliance Schedule Evaluation of the site under the West Virginia Hazardous Waste Management Act collected two composite surface soil samples from the contaminated areas [1]. Composite sample number 1 was collected from an area covering about 15 feet by 9 feet and the second surface soil sample was obtained from a composite of 6 spots of the dump site [1]. The laboratory results of sample number 1 revealed lead at 3,380 parts per million (ppm), and the results of soil sample number 2 showed lead at 151,000 ppm [1]. These samples were selected for laboratory lead analysis based on field screening results of greater than 400 ppm [1]. Also, a small area revealed lead using XRF reading at 7,000 ppm [1]. Battery casings were detected on the surface soil in those areas where the samples were collected with visible battery fragments. The surface soil samples were submitted to Research Environmental and Industrial Consultants, Incorporation for analysis. Earlier, in January 2000, 5 surface soil samples were obtained from these areas and revealed the presence of battery casings containing lead ranging from 1,060 ppm to 48,300 ppm. The site Inspection Report indicated that there was evidence that children frequented the area, because toys have been found on the site during every site visit [1].

DISCUSSION

Lead levels in surface soil samples obtained from areas adjacent to the residential area in Princeton, WV pose a public health threat to children and adults. Human exposure to lead at this site may occur via inhalation of windborne dust when children play in the area. Moreover, children and adults may be exposed by inadvertent ingestion, or dermal exposure of lead contaminated battery casings, or lead contaminated soils.

No groundwater sampling results were provided for review. Therefore, currently, it cannot be determined if vertical migration of site-related lead is affecting an underlying aquifer used for nearby drinking water wells.

Bioavailability of lead has become an issue in quantifying exposure of sensitive populations, and where necessary establishing clean-up levels for contaminated soil. Long-term exposure to low levels of lead has been shown to be associated with behavioral abnormalities, learning deficits, and impaired cognitive functions, and has also been implicated in the pathogenesis of hypertension both in humans and animals model systems [2]. It is well known that lead exposures cause adverse health effects on heme biosynthesis. This effect occurs as a result of lead inhibition of certain enzyme activity such as aminolevulinic acid dehydratase (ALAD) [3]. Reductions in ALAD production in adults have been demonstrated at an oral dose of 0.02 milligrams/kilogram/day (mg/kg/d) for 3 days and at air levels as low as 3.2 micrograms/cubic meter($\mu g/m^3$) for 3 or 4 months.

Exposure to lead may cause serious adverse health effects, particularly in young children. Young children and fetuses are especially sensitive to the toxic effects of lead exposures. Factors influencing this susceptibility include (1) immaturity of the blood brain barrier which allows entrance of contaminants into the developing central nervous system; (2) hand-to-mouth activity and pica (ingestion of at least one gram of soil) behavior which leads to consumption of contaminated media; (3) nutritional status of the child; (4) low body weight; (5) passive diffusion of contaminants across the placenta to the developing fetus. Because of these factors, children are more at risk of developing adverse health effects than adolescents and adults from lead exposure.

Blood lead levels at 10 micrograms/deciliter (µg/dl) or greater have been linked to adverse developmental effects in fetuses, hearing impairment, stunting of growth, and reductions in intelligence quotients in children [4]. Blood lead levels are increased on average about 5 µg/dl for every 1,000 ppm of lead in soil or dust, and may increase 3 to 5 times higher than the mean response depending on play habits and mouthing behavior [5,6].

A lead study conducted to investigate the seasonal changes in blood lead levels in children indicates that some of the seasonal variation in blood lead levels in children is probably due to increased exposure to lead in dust and soil. Moreover, the study showed that the outdoor activity patterns indicate that children are likely to contact high lead levels from street dust, or soil during longer outdoor play periods in the summer [4].

US EPA use 400 ppm and 1,000 ppm as screening tools for lead for residential and industrial soils, respectively. No minimal risk level has been developed for lead, because the threshold for its most sensitive effects (i.e., neurotoxicity) has not yet been defined. Furthermore, US EPA has not developed a Reference Dose for lead [4].

At this residential area in Princeton, WV, in January 2000, lead was detected in surface soil samples at 1,060 ppm, 29,000 ppm, 43,200 ppm, 44,200 ppm, and at 48,300 ppm. The December 2003, sampling results showed the maximum level of lead detected at 151,000 ppm [1].

An absorbed dose of lead at 0.05 mg/kg/d for 5 days per week for 200 days has been shown to cause adverse neurological effects in monkeys. In characterizing the surface soil at this site, ATSDR assumed that 2days/week for 3 months a child weighing 15 kg ingests 200 mg of soil/day that contains an average level of lead at 30,000 ppm. With these assumptions, the estimated exposure dose of lead would be approximately 0.1 mg/kg/d.

CONCLUSIONS

Lead levels in surface soil collected from areas adjacent to the residences in Princeton, WV are highly variable, and pose a public health hazard to children and adults. The results of these surface soil samples revealed lead at levels that exceed US EPA's lead screening level for residential sites of 400 ppm as well as industrial sites of 1,000 ppm. Furthermore, inhalation and inadvertent oral exposures of lead contaminated soils and dusts may increase blood lead levels in people who regularly play or traverse these areas. Therefore, the surface soil and battery casings containing lead near these residences pose a public health hazard to children and adults who use these areas on regular basis.

RECOMMENDATIONS

1. Prevent human exposures to site-related lead contaminated soils, dusts, and battery casings near the residences.
2. Consider conducting surface soil sampling in other areas near these residences to assess the horizontal extent of lead contaminated soil.
3. Determine if drinking water in the area is supplied by private residential wells. If so, sample nearby drinking water supplies.

Signature: Robert L. Williams Date: 1-09-2007

cc:

REFERENCES

1. Site Inspection Report for Old Athens Turnpike Site, January 7, 2004, Compliance Schedule and Evaluation Sampling, inspected and prepared by Penny Harris.

2. Region-Specific Alterations in Dopamine and Serotonin Metabolism in Brains of Rats Exposed to Low Levels of Lead, Subbarao V. Kala and Arun L. Jadhav, Neurotoxicology 16 (2): 297-308, 1995.

3. Toxicological Profile for Lead, ATSDR, 1999.

4. Abstract: Seasonal Influences on Childhood Lead Exposure, Lih-Ming, George G Rhoads, Paul J. Lioy, Environmental Health Perspectives Volume 108, Number 2, February 2000.

5. Standards for soil lead limitations in the United States, Chaney, R.L. and Mielke, H.W., Trace Substances in Environmental Health 20:355-377, 1986.

6. Establishing a health based standard for lead in residential soils, Reagan, P.L. and Silbergeld, E.K., Trace Substances in Environmental Health 23:119-238, 1990.