Letter Health Consultation

AURORA ENERGY COAL POWER PLANT SITE

FAIRBANKS, ALASKA

EPA FACILITY ID: AKN001002940

Prepared by
Alaska Department of Health and Social Services

JUNE 19, 2014

Prepared Under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
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.

You May Contact ATSDR TOLL FREE at
1-800-CDC-INFO
or
Visit our Home Page at: http://www.atsdr.cdc.gov

LETTER HEALTH CONSULTATION

AURORA ENERGY COAL POWER PLANT SITE

FAIRBANKS, ALASKA

EPA FACILITY ID: AKN001002940

Prepared By:

Alaska Department of Health and Social Services
Division of Public Health, Section of Epidemiology
Environmental Public Health Program
Under a cooperative agreement with the
Agency for Toxic Substances and Disease Registry

THE STATE of ALASKA
GOVERNOR SEAN PARNELL

Department of Health and Social Services

DIVISION OF PUBLIC HEALTH
Section of Epidemiology

3601 C Street, Suite 540
Anchorage, Alaska 99503
Main: 907.269.8000
Fax: 907.562.7802

January 23, 2014

Tamara Cardona, Ph.D.
Alaska Department of Environmental Conservation
Contaminated Sites Program
610 University Ave.
Fairbanks, AK 99709
E-mail: tamara.cardona@alaska.gov

Re: Residential lead exposures in homes near Aurora Energy Power Plant

Dear Dr. Cardona:

Thank you for contacting the Environmental Public Health Program (EPHP) in the Section of Epidemiology regarding concerns about lead concentrations in the soil of some homes near the Aurora Energy Coal Power Plant site (also known as the Chena Power Plant) in Fairbanks and possible health implications to the residents. We examined the lead contaminant data for soil that was sampled from each residence and described our health assessment below.

Background

In September 2013, the U.S. Environmental Protection Agency (EPA) completed a Site Inspection of the Aurora Energy Coal Power Plant in response to a community member's petition to the EPA regarding health and environmental concerns about a black dust she believed to be coal ash in a residential neighborhood approximately 1,300 feet (1/4 mile or 396 meters) south of the power plant (EPA, 2013a). As part of the Site Inspection, the EPA collected three surface soil samples from each of eight homes in a neighborhood located near the plant and tested them for target analyte list (TAL) metals (EPA, 2013b) and hexavalent chromium. In two of the residences, one of the three soil samples collected for each residence exceeded the Alaska Department of Environmental Conservation (DEC) Method 2 Soil Cleanup Levels for lead in residential soil (400 mg/kg). DEC is concerned that the residents of these homes may be exposed to potentially harmful amounts of lead from their soil. Harmful health effects of lead exposure include intellectual and behavioral deficits in children, and cardiovascular, central nervous, renal, reproductive, and hematologic system damage in adults (ATSDR, 2007).

On September 9, 2013, DEC sought EPHP's evaluation of potential exposure and health risks associated with lead in soil at the aforementioned residences. The source of lead in the soil samples is unknown.

Exposure Pathways

Children may incidentally ingest soil when playing or spending time in the area of contaminated soil. Adult residents, workers, visitors, and trespassers may ingest soil if they engage in activities that disturb the soil. In addition, both children and adults may absorb certain chemicals from soil that comes in contact with skin or breathe in dust from the soil while engaged in the aforementioned activities. Using soil contaminant data, potential exposure risks can be estimated for these homes.

Exposure and Health Evaluation

To evaluate the potential exposure to lead at the eight residences, we calculated lead exposure doses using the EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children (Version 1.1, Build 11, EPA, 2007). The model calculates lead exposures for children aged six months to seven years. The model takes into account outdoor soil lead levels, lead concentration in surrounding air, dust and water; time spent outdoors for each age group and the amount of lead ingested both through soil and dust and through diet. The default values used in the model are national averages and hence some variables such as time spent outdoors and soil intake levels are not necessarily representative of locations like Fairbanks where there is snow on the ground for six months of the year. Therefore, the model output may be overly conservative for a site in Fairbanks. The four main components of the IEUBK model are: (1) an exposure model that relates environmental lead concentrations to age-related intake of lead into the gastrointestinal (GI) tract, (2) an absorption model that relates lead intake into the GI tract and lead uptake into the blood, (3) a biokinetic model that relates lead uptake in the blood to the concentrations of lead in several organ and tissue compartments and (4) a model for uncertainty in exposure and for population variability in absorption and biokinetics. The model calculates long-term lead exposure and does not account for daily or seasonal variations in exposure that may occur. Fetuses and young children are the most sensitive populations to exposures from toxins in the environment and hence calculations were only done for children. These calculations are protective of other populations such as adults.

We used the default parameters for the model except for soil lead concentrations, where we used site-specific data for each residence. The data were provided by the EPA and are shown in Table 1. Surface soil samples were collected from 0 to 3 inches below the ground surface using dedicated stainless steel spoons. The collected material was homogenized thoroughly in dedicated stainless steel bowls and placed into certified clean pre-labeled containers. We used the average lead concentration of the three samples taken at each residence for the outdoor soil lead concentration for each home (EPA, 2013a). A more extensive soil sampling strategy from the residences would have provided a better picture of soil lead concentration distributions at these residences. However, our assessment can only rely on available data.

Results for theoretical blood lead levels (BLLs) for children that may live in each residence can be found in Table 2. The IEUBK model output predicted geometric mean BLLs that were all less than 5 micrograms lead per deciliter blood (µg/dL) in all of the homes where soil was evaluated near the Aurora Energy Power Plant. The Centers for Disease Control and Prevention (CDC) has established a reference BLL of 5 µg/dL in both children and pregnant women (fetus). This level was primarily set to identify children with BLLs higher than most other children under 6 years of age in the U.S. Exposure to lead from the soil of homes evaluated near the Aurora Energy Power

Plant is not expected to result in geometric mean BLLs that exceed the CDC reference level for lead in children. However, even low levels of lead in blood have been shown to affect IQ, ability to pay attention, and academic achievement and hence, the CDC recommends preventing children's exposure to lead (CDC, 2012).

In addition to predicting the geometric mean BLL, the model also predicts the percentage of children that might exceed 5 µg/dL at a given soil lead concentration. At residence #7, the model indicated that 26% of children aged 6 months to 7 years exposed to lead at the level found in the soil at that residence could have a BLL over the 5 µg/dL reference level. At residence #6, the model indicated that same percentage to be 12.5%. The predicted probabilities of exceedance for the other six residences were all quite low, under 1% (Table 2). These calculations do not necessarily mean that a child will have a BLL that exceeds 5 µg/dL if they live at one of these residences. Since all models have uncertainties in their assumptions, there are likely uncertainties in our calculations. For example, the model assumes that the concentration of lead in indoor dust will be 70% of the concentration of lead in the outdoor soil. In reality, the lead concentration in indoor dust may be higher or lower. Also, a more rigorous soil sampling strategy may have produced average soil lead concentrations that were different from those available. Considering that our BLL calculations for residences #6 and #7 indicate that a child who may live there may be exposed to lead that results in a BLL above 5 µg/dL, it is important to follow the recommendations outlined below.

Conclusions

1. The EPHP concludes that exposure to *measured* lead in soil and other environmental sources from living at residences #6 and #7 near the Aurora Energy Power Plant may harm people's health. This is a public health hazard. This is because there is a probability that more than 5% of children who may live there could have BLLs ≥ 5 µg/dL.
2. The EPHP concludes that exposure to *measured* lead in soil and other environmental sources from living at residences #1 ,#2, #3, #4, #5, #8, or the background site residences near the Aurora Energy Power Plant is not expected to result in adverse health effects. This is because fewer than 5% of children who may live at these residences could have BLLs ≥ 5 µg/dL.

Recommendations

1. EPHP recommends that residents of the homes sampled participate in the risk assessment exposure evaluation mentioned above.
2. EPHP strongly recommends that occupants of the eight residences sampled, particularly those with the soil lead concentrations exceeding DEC's soil cleanup level (*i.e.,* residences #6 and #7), have their blood levels tested. EPHP can facilitate the testing by working with Public Health Nursing in Fairbanks.

Public Health Action Plan

Actions Undertaken

1. EPHP collected demographic information from residences #6 and #7 and determined that no children live at these residences.

2. EPHP conducted a lead risk assessment exposure questionnaire with the occupants of the residences having the soil lead concentrations exceeding DEC's soil cleanup level and determined one potential lead exposure source in residence #7 (the occupant reloads and melts his own bullets).
3. EPHP arranged for occupants of residences #6 and #7 to have their blood tested for lead, free of charge. While occupants of residence #6 gave blood for testing, the occupants of residence #7 declined, citing government interference in their health. EPHP recommended that the residents in #7 seek blood lead testing on their own to determine their lead exposure.
4. EPHP verbally informed occupants of residences #6 and #7 about lead exposures from environmental, recreational, and occupational sources.

Actions Underway

1. EPHP is providing health education materials to the occupants of residences #6 and #7

Please feel free to contact us with any questions that you may have.

Sincerely,

Stacey Cooper, M.S.
Health Assessor
Environmental Public Health Program
(907) 269-8016
stacey.cooper@alaska.gov

Ali Hamade, PhD, DABT
Manager
Environmental Public Health Program
(907) 269-8086
ali.hamade@alaska.gov

References

Agency for Toxic Substances and Disease Registry (ATSDR), 2007. Toxicological profile for Lead. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Centers for Disease Control and Prevention (CDC). 2012. Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention. Report of the Advisory Committee on Childhood Lead Poisoning Prevention of the Centers for Disease Control and Prevention. http://www.cdc.gov/nceh/lead/acclpp/final_document_010412.pdf

EPA, 2013a. Site Inspection, Aurora Energy Coal Power Plant, Fairbanks, Alaska.

EPA, 2013b. Mid-Atlantic Brownfields & Land Revitalization. Target Analyte Metals (Heavy Metals) and Cyanide. http://www.epa.gov/reg3hwmd/bf-lr/regional/analytical/metals.htm

EPA, 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK), Windows®.

Acknowledgements: We thank Ms. Nim Ha (Alaska Section of Epidemiology), Mr. Todd Blessing (Alaska Department of Environmental Conservation), and Dr. David Mellard (ATSDR) for their thoughtful reviews of this consultation.

Appendix

Table 1. Surface soil lead results for sampled residences near the Aurora Energy Power Plant – 2013.

	Lead (mg/kg)			
	Sample #1	**Sample #2**	**Sample #3**	**Average**
Residence #1	36.5	23.8	61.8	40.7
Residence #2	61.4	101	62.4	74.9
Residence #3	9.2	8.2	35.3	17.6
Residence #4	62	60.5	53.8	58.8
Residence #5	43.7	44.1	74.1	54.0
Residence #6	65.1	557	38.7	220.3
Residence #7	43.6	105	785	311.2
Residence #8	9.9	37.2	15.6	20.9
Background Residence #1	19.1	NA	NA	NA
Background Residence #2	14	NA	NA	NA

Lead data source: EPA, 2013a. Site Inspection, Aurora Energy Coal Power Plant, Fairbanks, Alaska.

mg/kg = milligrams lead per kilogram soil

NA – Not Available

Table 2. Predicted blood lead levels (BLLs) by age of children who may live in sampled residences near the Aurora Energy Power Plant.

	Residence #1	Residence #2	Residence #3	Residence #4	Residence #5	Residence #6	Residence #7	Residence #8
Age (years)	**BLL (µg/dL)**	**BLL (µg/dL)**	**BLL (µg/dL)**	**BLL (µg/dL)**	**BLL (µg/dL)**	**BLL (µg/dL)**	**BLL (µg/dL)**	**BLL (µg/dL)**
.5-1	1.4	1.7	1.1	1.6	1.5	3.2	4.1	1.1
1-2	1.5	1.9	1.2	1.7	1.6	3.7	4.7	1.2
2-3	1.4	1.8	1.1	1.6	1.5	3.4	4.4	1.1
3-4	1.3	1.7	1	1.5	1.4	3.3	4.2	1.1
4-5	1.1	1.4	0.9	1.3	1.3	2.7	3.4	1
5-6	1	1.3	0.9	1.2	1.1	2.3	2.9	0.9
6-7	1	1.2	0.8	1.1	1	2	2.6	0.8
Geometric Mean BLL for ages 0.5 to 7	1.2	1.6	1.0	1.4	1.3	2.9	3.7	1.0
Predicted % of children with BLL above 5 µg/dL	0.14	0.67	0.032	0.35	0.28	12.5	26.3	0.041

BLL – Blood Lead Level

µg/dL = micrograms lead per deciliter blood

EPA's IEUBK Model was used for the above calculations. We used the default model parameters except for outdoor soil lead concentration where we used site specific values. The CDC's reference level for blood lead in children is 5 µg/dL. Blood lead levels <5 µg/dL are not considered a public health hazard. Blood Lead Levels shown in the table reflect the geometric means of exposure possibilities generated by the IEUBK model.

REPORT PREPARATION

This Health Consultation for the Residential Soil Lead Aurora Energy Power Plant site was prepared by the Environmental Public Health Program within the Alaska Division of Public Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented.

Author(s)

Stacey Cooper, M.S.
Health Assessor
Environmental Public Health Program

Ali Hamade, PhD, DABT
Manager
Environmental Public Health Program

State Reviewer(s)

Nim Ha, MPH
Health Educator
Environmental Public Health Program

ATSDR Reviewers

Division of Community Health Investigations:
Audra Henry, M.S., Technical Project Officer
Kai Elgethun, PhD, MPH, Western Branch Associate Director for Science
Tina Forrester, PhD, Acting Division Director