Health Consultation

FEDERAL CREOSOTE SITE

MANVILLE, SOMERSET COUNTY, NEW JERSEY

CERCLIS NO. NJ0001900281

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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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HEALTH CONSULTATION

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Prepared by:

Exposure Investigation and Consultation Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Background and Statement of Issues

The Agency for Toxic Substances and Disease Registry (ATSDR) was requested by the Region II U.S. Environmental Protection Agency (EPA) to provide a health consultation addressing environmental contamination at the former Federal Creosote site in Manville, New Jersey. The purpose of the consult is to determine if surface soil concentrations of contaminants resulting from creosote waste pose a threat to public health [1].

The Federal Creosote site is a 35-acre site that once housed a wood treating plant that operated until 1957. Railroad ties were treated with creosote at the site, and the waste was disposed of in two lagoons on site. A residential community consisting of 137 homes was constructed over the former wood treating facility beginning in the mid-1960s [2].

The creosote waste was not adequately addressed when the facility was closed, and pure creosote product is present below the surface at several locations throughout the community. Sampling identified polycyclic aromatic hydrocarbons (PAHs), a constituent of creosote, in the subsurface soils at concentrations in the low percent range. In addition, sampling detected PAHs on the surface as high as 758 milligrams per kilogram (mg/kg) on one residential property.

In response to a previous request from EPA, ATSDR provided a health consultation assessing the public health impact from initial soil sampling results. ATSDR concluded in the consultation that direct contact with the creosote contamination below the surface at some locations posed a potential health hazard. The initial sampling effort did not include enough samples from the surface soil where human contact is likely to occur. Therefore, ATSDR recommended additional sampling of the surface soil so this pathway could be assessed.

This health consultation will address the results of the latest sampling event conducted by EPA in the Spring of 1998. The goal of this sampling is to characterize the extent of contamination in the surface soil. The groundwater pathway will not be discussed in this document. EPA is currently assessing the impact of the site on nearby municipal wells.

Surface soil samples were collected from 133 properties in the subdivision. Approximately 10 to 12 samples were collected from each yard and analyzed for PAHs and metals [3]. The PAHs were converted to benzo[a]pyrene (BaP) equivalents to determine relative carcinogenic potency. In addition, 95% upper confidence

level estimates (UCL) were calculated for PAHs and other contaminants of concern [3]. The UCL concentrations for BaP equivalents in the surface soil of individual properties ranged from 0.03 mg/kg to 43 mg/kg [3].

Lead was detected in the surface soil on one property at an UCL concentration of 2,749 mg/kg (arithmetic mean 537 mg/kg). Another property had an UCL concentration of 611 mg/kg (arithmetic mean 243 mg/kg). The remaining properties had lead UCL concentrations $\leq$ 180 mg/kg.

UCL concentrations of arsenic ranged from 12 to 16 mg/kg on 7 properties. The remaining properties had arsenic UCL concentrations less than 12 mg/kg [3].

Discussion

ATSDR evaluated the latest surface soil sampling data collected in the Spring of 1998 from each of the 133 residential properties. This analysis included the evaluation of PAHs, arsenic, and lead concentrations in the soil.

PAH evaluation

The sampling conducted at this site in the Spring of 1998 confirm earlier findings that showed PAHs, a constituent of creosote, at elevated levels in the surface soil (0-to-6 inches). In general, PAH contamination was identified in the area of the former waste lagoons, canals, and drip areas.

PAHs are a group of chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances [4]. PAHs can be man-made or occur naturally [4]. There is no known use for most of these chemicals except for research purposes. A few of the PAHs are used in medicines and to make dyes, plastics, and pesticides. They are found throughout the environment in the air, water, and soil [4]. There are more than 100 different PAH compounds [4].

As pure chemicals, PAHs generally exist as colorless, white, or pale yellow-green solids. Most PAHs do not occur alone in the environment (including those found at hazardous waste sites), rather they are found as mixtures of two or more PAHs [4]. They can occur in the air either attached to dust particles, or in soil or sediment as solids. They can also be found in substances such as crude oil, coal, coal tar pitch and road and roofing tar [4]. As is the case with this site, PAHs are also present in creosote.

Since PAHs bind tightly to soils and exhibit very low volatility, exposure to PAHs in the soil at this site is most likely to occur through incidental ingestion of soil or dust, or to a lesser extent, through dermal absorption. The total doses that may be associated with ingestion or contact with moderately contaminated soils are much lower than the levels that may occur in a normal diet (e.g. PAHs detected in cooked meats). As a general rule, environmental levels of PAHs would not be expected to constitute a significant human health hazard for the following reasons:

1) Absorbed PAHs are for the most part readily metabolized and eliminated from your body. With the exception of some allergic reactions, the acute toxicity of PAHs is relatively low. Few adverse health effects clearly attributable to PAHs have been found in humans.

2) Inhalation of complex PAH mixtures (e.g. cigarette smoke, roofing tar or coal tar pitch volatiles, and coke oven emissions) may cause cancer in humans, but the doses required are typically high and of long duration. There are no studies that provide evidence of a direct association between oral or dermal exposure to PAHs and cancer in humans. Therefore, any attribution of risk to humans exposed via these routes must be, and are, based solely on animal experiments.

3) Due to the relative scarcity of relevant non-cancer effects in animals, toxicity equivalents for PAHs are based on cancer effects in laboratory animals treated with high doses by skin painting or oral gavage. However, the unusual treatment protocol in the skin painting experiments and the most commonly affected organ (forestomach)in the gavage experiments render these studies to be of little relevance to cancer risk in humans. People are not shaved, painted, and repeatedly treated with promoting agents neither do humans possess an organ analogous to the forestomach of rodents.

4) To date, no adverse cancer or non-cancer effects have been seen in animals chronically exposed to BaP doses of 1 mg/kg/day or less [4]. To receive a dose numerically equivalent to 1 mg/kg/day, a 10-kg child would have to consume 5,000 mg of soil daily containing 2,000 mg/kg BaP. By comparison, the highest UCL concentration of PAHs detected in the soil at this site is 43 mg/kg BaP equivalents. A 10 kg child daily consuming 5,000 mg of soil containing 43 mg/kg BaP would ingest 0.005 X 43/10 = 0.0215 mg/kg/day. In reality, however, that child's average lifetime exposure (which is the relative concern for cancer effects) will be substantially less than 0.0215 mg/kg/day since: (1) average daily soil ingestion rates over a lifetime will be much lower

than 5,000 mg of soil (soil exposure default values in the 100-to-200 mg/day are typically used). (2) a child will not ingest soil exclusively from the maximally-contaminated hot spot every day.

Arsenic evaluation:

Inorganic arsenic is a naturally occurring element in the earth's crust, and can be found at varying concentrations in the soil [5]. Arsenic exposure has been linked to injury in a number of different body tissues or systems. The known adverse health effects of arsenic are associated with prolonged exposure to relatively high levels in the air (i.e. occupational atmospheres) or heavily-contaminated drinking water [5]. However, exposure to arsenic at this site is likely to occur through the incidental ingestion and/or inhalation of arsenic-containing soils. Whether these arsenic levels pose a health threat is dependant on the concentration in the soil and the likelihood of exposure.

To aid in the process of evaluating contaminants, ATSDR has developed Environmental Media Evaluation Guides (EMEGs). EMEGs are concentrations in various media (e.g. soil, air, and water), to be used by ATSDR health assessors and other responders to identify contaminants that may be of concern at hazardous waste sites. A soil EMEG is a concentration in soil that is likely not to pose an appreciable risk of adverse non-cancer health effects over a specified duration of exposure. The ATSDR chronic (long-term) EMEG for arsenic in soil is 20 mg/kg for soil. The highest UCL soil concentrations on this site were less than the EMEG, and ranged from 12.1 to 16 mg/kg on seven properties.

The New Jersey Department of Environmental Protection (NJDEP) has also established a comparison value for arsenic levels in residential soil. The NJDEP value is the same as the ATSDR soil EMEG (20 mg/kg). Considering no properties have arsenic levels exceeding the ATSDR and NJDEP values, long-term exposure to the soil at this site is unlikely to pose a health threat.

Lead evaluation:

Elevated levels of lead in soil can pose a public health threat, particularly to children in the 0-to-6 year old age group. Children at this age are more likely to ingest lager amounts of soil relative to body weight, and have developing nervous systems that are susceptible to the deleterious effects of lead [6]. In most residential settings, concern about exposures to lead-contaminated soil begins at concentrations of $\geq$500 mg/kg. At this site, one property had an average soil lead (arithmetic mean) of

537 mg/kg, with a 95% UCL concentration of 2,749 mg/kg. However, a full review of the data showed that only one sample exceeded 400 mg/kg; sample #032 4,780 mg/kg.

Follow-up soil sampling at this property was conducted by EPA to determine the extent of the lead contamination. The elevated lead detected in the original sampling was determined to be an anomaly, and lead was not present in the soil at levels that warranted concern.

ATSDR Child Health Initiative

ATSDR's Child Health Initiative recognizes that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination of environmental media. As part of the ATSDR initiative, ATSDR health consultations must indicate whether any site-related exposures are of particular concern for children. While assessing exposure at this site, ATSDR used a conservative approach that accounted for the increased sensitivity of children.

Conclusions

Based on the information provided, and assuming the present site conditions and usage, ATSDR concludes the following:

1. The surface soil concentrations of PAHs do not pose a public health hazard.

2. The lead levels detected in surface soils at the site do not pose a public health hazard.

3. The arsenic levels detected in surface soils at this site do not pose a public health hazard.

Recommendations

None.

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References

1. Verbal request from EPA Region II to ATSDR in June 1998.

2. March 27, 1997 Letter from NJDEP to Richard Caspe, U.S. EPA Region II.

3. Preliminary Human Health Risk Assessment, Federal Creosote Site, Manville, N.J. CDM Federal Programs Corporation., June 1998.

4. ATSDR Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHs), Update, U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, August 1995.

5. ATSDR Toxicological Profile for Arsenic, Update, U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, February 1999.

6. Toxicological Profile for Lead, Update, U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, April 1993.