Health Consultation

PUBLIC HEALTH EVALUATION OF SOIL DATA
FROM BENEATH AN ASPHALT DRIVEWAY
AT 1067 WINCHESTER AVENUE

HAMDEN, CONNECTICUT

JULY 30, 2001

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.

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR
or
Visit our Home Page at: http://www.atsdr.cdc.gov

HEALTH CONSULTATION

PUBLIC HEALTH EVALUATION OF SOIL DATA FROM BENEATH AN ASPHALT DRIVEWAY AT 1067 WINCHESTER AVENUE

HAMDEN, CONNECTICUT

Prepared by:

Connecticut Department of Public Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

The conclusions and recommendations in this health consultation are based on the data and information made available to the Connecticut Department of Public Health and the Agency for Toxic Substances and Disease Registry. The Connecticut Department of Public Health and the Agency for Toxic Substances and Disease Registry will review additional information when received. The review of additional data could change the conclusions and recommendations listed in this document.

BACKGROUND AND STATEMENT OF ISSUE

The Connecticut Department of Public Health (CT DPH) was asked by the US Environmental Protection Agency (EPA) to evaluate the public health significance of soil sample results collected from beneath an asphalt driveway at a residence located at 1067 Winchester Avenue, Hamden, CT. This residence is located in a neighborhood in which soil is being investigated by EPA, Connecticut Department of Environmental Protection (CT DEP) and one or more Potentially Responsible Parties to determine the nature and extent of contaminated fill material present in the area. A Health Consultation evaluating soil sample results from the entire neighborhood will be prepared at a later date.

Summary of Environmental Data from 1067 Winchester Avenue
Environmental sampling data have been collected from beneath the driveway at 1067 Winchester Avenue by both CT DEP and EPA. At the request of the resident, in January 2001, CT DEP analyzed a soil sample it collected from a depth of 1 to 4 feet below the surface of the asphalt driveway in an area in which black tarry material bubbles through the asphalt to the driveway surface, in very warm weather. CT DEP analyzed the soil sample for metals, extractable total petroleum hydrocarbons (ETPH), semivolatile organic compounds (SVOCs), pesticides and polychlorinated biphenyl compounds (PCBs).

On April 25, 2001, EPA collected soil samples from the same area beneath the driveway. EPA advanced five borings through the asphalt and collected 7 soil samples at depths ranging from just below the asphalt driveway (0 to 2 feet) to 9 feet below ground surface. Samples were analyzed for a wide range of semi-volatile organic compounds.

In the soil sample collected by CT DEP at a depth of 1 to 4 feet below ground surface, elevated ETPH was found. Lead and arsenic were also found at slightly elevated levels. No pesticides or PCBs were detected. In each of the boring samples collected by CT DEP and EPA, numerous polycyclic aromatic hydrocarbon (PAH) compounds were found at elevated levels. It should be noted that the highest levels of PAHs were present in the EPA boring collected from 0 to 2 feet below the asphalt of the driveway. Concentrations of several PAHs greatly exceed the CT DEP standards for residential soils (CT RSRs). The level of ETPHs detected in the CT DEP sample also greatly exceeded the CT RSRs.

The CT RSRs are health-based soil cleanup standards set based on assumptions that direct contact with contaminated soil occurs every day for a 30-year exposure period. The standards consider noncancer health effects as well as cancer risks from long-term exposure.

For each compound detected above the residential CT RSRs, Table 1 below presents the maximum concentration along with the residential CT RSR.

TABLE 1: Summary of Soil Data from beneath the driveway, 1067 Winchester Avenue, Hamden, CT

Contaminant	Maximum Concentration (mg/kg)	CT residential RSR (mg/kg)
ETPH	15,450	500
Lead	701	500
Arsenic	11.3	10
PAH compounds:		
Benzo(a)anthracene	84	1
Benzo(b)fluoranthene	89	1
Benzo(k)fluoranthene	76	1
Benzo(a)pyrene	91	1
Indeno(1,2,3-cd)pyrene	66	1
Dibenzo(a,h)anthracene	18	1

To express the PAH data in terms of carcinogenic potential, CT DPH used toxic equivalency factors (TEFs) developed for equating cancer potency relative to benzo(a)pyrene (ATSDR Toxicological Profile for PAHs, 1995). TEFs have been developed for each PAH compound considered to be carcinogenic. TEFs relate the cancer-causing potential of carcinogenic PAHs to benzo(a)pyrene. They are used to adjust the concentration of a PAH compound to an equivalent concentration of benzo(a)pyrene. Using TEFs, the total carcinogenic PAH concentration in the borings ranges from 4 mg/kg to 121 mg/kg. The average across all borings is 60 mg/kg. For purposes of comparison, the Agency for Toxic Substances and Disease Registry (ATSDR) has a cancer screening value for benzo(a)pyrene in soil of 0.1 mg/kg. This cancer screening value equates to an extremely low, or insignificant increased cancer risk, assuming that exposure occurs every day for 30 years.

The potential public health implications of the contaminants detected by EPA and CT DEP are discussed below.

DISCUSSION

Evaluation of public health implications to adults and children

When evaluating potential public health implications of exposure to hazardous contaminants, CT DPH considers how people might come into contact with the contaminants. In order to be exposed, one must come into direct contact with the contaminants. In this particular situation, the contaminants sampled are beneath an asphalt driveway. Direct contact with the contaminants in soil beneath the driveway is not likely to occur. Without exposure, there is no risk of adverse health impacts.

However, residents of 1067 Winchester Avenue report that a black tar-like material bubbles through the surface of the driveway during summer months when the weather is hot. The

material appears in an area approximately three feet by three feet in the center of the driveway. During early May 2001, there were several days of unseasonably warm weather so EPA and CT DPH representatives made a site visit to observe the driveway on May 1, 2001. There were a number of small bubbles visible on the driveway surface. When a bubble was touched gently with a small stick, a tar-like material was observed to ooze from the bubble. The material did not appear to be softened or melted asphalt from the driveway surface. Rather, it appeared to be material coming through the asphalt from below. Residents report that after a long stretch of very warm days, there is so much material that has bubbled through the driveway that it forms a tarry pool and they frequently place cat litter over the area to help absorb the material and minimize the extent to which it adheres to shoes and is tracked into the house.

Based on visual observations made by CT DPH during the May 1, 2001 site visit and reports by the residents, CT DPH believes that it is likely that residents of 1067 Winchester Avenue are being exposed via direct skin contact to the tar-like material accumulating on the surface of their driveway. If the material is tracked into the house on shoes, there could be direct skin contact with the material during cleaning of shoes or floors. Additionally, residents could come into skin contact with the material if they try to clean it from the driveway or while they collect and dispose of cat litter that has absorbed the tarry material. There is also the possibility that if the tar material gets on the hands, there could be some oral exposure if hands are put in the mouth before washing. There are currently no children residing at the home. However, if young children were present, they may have a greater likelihood of exposure because of the increased hand-to-mouth activity that children engage in.

It is possible that the contamination present in soil beneath the driveway is the source of the tarry material bubbling through the driveway; especially considering that the highest levels of contaminants were found in the boring sample taken from 0-2 feet below the asphalt. Therefore, to evaluate potential health impacts, CT DPH has assumed that the material people are being exposed to on the driveway surface has similar levels of contaminants as was found in the soil beneath the driveway. For purposes of evaluating potential health effects, CT DPH has chosen to focus on PAHs and not lead, arsenic and ETPH (the other contaminants detected above CT RSRs). The reason for this is that lead and arsenic were detected at concentrations only slightly above the health-based CT RSRs, and ETPH is comprised of petroleum hydrocarbons, of which PAHs are a part.

There is a good deal of information in the toxicological literature regarding health effects from skin contact with PAHs. Skin exposure to mixtures of PAHs have been shown to cause various skin disorders in animals and humans. There is evidence in animals that benzo(a)pyrene applied to the skin causes immune effects and altered epidermal cell growth. In animals, a number of PAHs have been shown to induce skin tumors following application to the skin. Such skin tumor effects are suggestive in humans (ATSDR Toxicological Profile for PAHs, 1995). Regarding oral exposure to PAHs, studies in animals indicate that some PAHs caused tumors when the animals were fed the PAHs for long periods of time. Also, mice fed high levels of benzo(a)pyrene during pregnancy had difficulty reproducing and so did their offspring.

However, we have no information to suggest these effects occur in people (ATSDR Toxicological Profile for PAHs, 1995).

As shown in Table 1, benzo(a)pyrene is present in soil beneath the driveway at a level that exceeds CT RSRs by almost 100 times. Other PAHs are present at levels that greatly exceed CT RSRs. As stated previously, the RSRs assume that exposure occurs 365 days per year. Exposure to the tar-like material would not occur that often because the material is only present on the driveway surface for 2 or 3 months of the year. Nevertheless, the PAHs detected by EPA and CT DEP are roughly 100 times greater than the RSRs so even with less frequent exposure over the long-term, they could potentially present a health concern.

It is important to consider the sum of all carcinogenic PAHs. As mentioned previously, carcinogenic PAHs (expressed as benzo(a)pyrene equivalents using TEFs) in the soil borings range from 4 mg/kg to 121 mg/kg and the average across all borings is 60 mg/kg. Using the ATSDR cancer screening value as a guide, long-term exposure to carcinogenic PAHs at the average concentration of 60 mg/kg would be associated with a low increased cancer risk. Long-term exposure at the highest concentration would be associated with a moderate increased cancer risk.

CONCLUSIONS

Based on visual observations of the driveway at 1067 Winchester Avenue and information from the residents at that property, CT DPH believes that there is a potential for exposure to occur via direct skin contact and incidental ingestion to the tarry material accumulating on the surface of the driveway. A quantitative evaluation of potential health impacts is not possible because of a lack of data on the tar-like material and difficulties quantifying how much exposure is occurring to the material. However, if one assumes that the soil sampled by EPA and CT DEP beneath the driveway is the source of the tarry material bubbling through the driveway surface, then the tarry material represents a concentrated source of contamination that is accessible for oral and dermal exposure and could potentially present a health concern.

ATSDR has a categorization scheme whereby the level of public health hazard at a site is assigned to one of five conclusion categories. ATSDR conclusion categories are included as Attachment A to this report. CT DPH has concluded that if soils beneath the driveway are the source of the black tar-like material coming through the driveway surface, then the tar-like material presents a "public health hazard."

RECOMMENDATIONS

Based on the conclusion presented above, CT DPH believes that the most prudent course of action from a public health perspective would be for the source of contaminants beneath the driveway to be mitigated. CT DPH recommends that action be taken in the near term (i.e., within the next several months) to mitigate the source of contaminants beneath the driveway. If such action is not possible, CT DPH recommends that at a minimum, a sample of the tar-like material that accumulates on the driveway surface be collected and analyzed. This would help CT DPH to better evaluate potential exposures to the accessible material.

CERTIFICATION

The Health Consultation for Soil Data at 1067 Winchester Avenue in Hamden Connecticut was prepared by the Connecticut Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

for G.U.

Technical Project Office, SPS,SSAB,DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Health Consultation and concurs with its findings.

for RG

Chief, SSAB,DHAC,ATSDR

PREPARER OF HEALTH CONSULTATION

Margaret L. Harvey, MPH
Epidemiologist
Environmental Epidemiology and Occupational Health
Connecticut Department of Public Health

ATSDR Regional Representative:

William Sweet
EPA/New England

ATSDR Technical Project Officer:

Greg V. Ulirsch
Superfund Site Assessment Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

ATTACHMENT A: ATSDR Public Health Hazard Categories

Category	Definition	Criteria
A. Urgent public health hazard	This category is used for sites that pose an urgent public health hazard as the result of short-term exposures to hazardous substances.	evidence exists that exposures have occurred, are occurring, or are likely to occur in the future AND estimated exposures are to a substance(s) at concentrations in the environment that, upon short-term exposures, can cause adverse health effects to any segment of the receptor population AND/OR community-specific health outcome data indicate that the site has had an adverse impact on human health that requires rapid intervention AND/OR physical hazards at the site pose an imminent risk of physical injury
B. Public health hazard	This category is used for sites that pose a public health hazard as the result of long-term exposures to hazardous substances.	evidence exists that exposures have occurred, are occurring, or are likely to occur in the future AND estimated exposures are to a substance(s) at concentrations in the environment that, upon long-term exposures, can cause adverse health effects to any segment of the receptor population AND/OR community-specific health outcome data indicate that the site has had an adverse impact on human health that requires intervention
C. Indeterminate public health hazard	This category is used for sites with incomplete information.	limited available data do not indicate that humans are being or have been exposed to levels of contamination that would be expected to cause adverse health effects; data or information are not available for all environmental media to which humans may be exposed AND there are insufficient or no community-specific health outcome data to indicate that the site has had an adverse impact on human health
D. No apparent public health hazard	This category is used for sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health hazard.	exposures do not exceed an ATSDR chronic MRL or other comparable value AND data are available for all environmental media to which humans are being exposed AND there are no community-specific health outcome data to indicate that the site has had an adverse impact on human health
E. No public health hazard	This category is used for sites that do not pose a public health hazard.	no evidence of current or past human exposure to contaminated media AND future exposures to contaminated media are not likely to occur AND there are no community-specific health outcome data to indicate that the site has had an adverse impact on human health