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April 22, 2016

Re: Dieldrin in Crawl Space Dirt at Private Residence

The Arizona Department of Health Services (ADHS) received your request to evaluate the potential health risks associated with dieldrin and permethrin levels in your crawl space. The following summarizes our assessment results.

Background

ADHS received your request on Friday, March 18, 2016 to review the Analytical Report. In our phone conversation, we discussed that you live in a neighborhood that has been determined to have termite issues. However, since you have not had termite issues in your home, you have raised concerns that a termiticide may have been previously sprayed in your home before you began living there. On March 18, 2016, you submitted an Analytical Report from Environmental Micro Analysis, Inc. for us to review.

Available Environmental Data

You submitted soil samples from the crawl space to Environmental Micro Analysis, Inc. on March 2, 2016. A pyrethroid screen was conducted on March 7, 2016, which tested the levels of 72 different chemicals. 70 of these chemicals were determined to be in concentrations below their respective detection limit and health-based comparison values, and are not expected to pose any health risk. 2 chemicals were determined to be in concentrations above their detection limit. These 2 chemicals are discussed in the table below:

Chemical	Concentration (ppm[1])
Dieldrin	0.88
Permethrin	62.4

[1] ppm = parts per million

Exposure Pathway Analysis

Identifying exposure pathways is important in a health consultation because adverse health impacts can only happen if people are exposed to contaminants. The presence of a contaminant in the environment does not necessarily mean that people are actually coming into contact with that contaminant. Exposure pathways have been divided into three categories: completed, potential, and eliminated.

There are five elements considered in the evaluation of exposure pathways:

1) A source of contamination
2) A medium such as soil or groundwater through which the contaminant is transported
3) A point of exposure where people can contact the contaminant
4) A route of exposure by which the contaminant enters or contacts the body
5) A receptor population

Completed pathways exist when all five elements are present and indicate that exposure to a contaminant has occurred in the past and/or is occurring presently. In a potential exposure pathway, one or more elements of the pathway cannot be identified, but it is possible that the element might be present or might have been present. In eliminated pathways, at least one of the five elements is or was missing, and will never be present. Completed and potential pathways, however, may be eliminated when they are unlikely to be significant.

The primary exposure pathway of concern for soil and dust is through incidental ingestion. The chemicals may settle in household dust and be ingested by residents. The chemicals containing dust particles may also be pulled from the crawl space beneath the house through the ventilation system, which could lead to inhalation of the dust particles by residents. However, in both children and adults, the dose of a soil contaminant that results from oral ingestion is likely to exceed the dose resulting from dust inhalation (ATSDR Guidance Manual 2005).

Termiticide can also be evaporated from the contaminated soil into the crawl space and then enter the indoor air through the cracks and ventilation system. Since indoor air sample results were not provided, ADHS is unable to analyze any potential health effects that may occur through this inhalation exposure pathway.

Exposure Pathway Elements					Time Frame	Type of Exposure Pathway
Source	Medium	Point of Exposure	Route of Exposure	Estimated Exposed Population		
Termiticide	Crawl Space dirt	Residence	Incidental Ingestion, Inhalation	Residents	Past	Completed
					Current	Completed
					Future	Potential

Description of Health-based Comparison Values

Health-based comparison values (CVs) are screening tools used to evaluate environmental data relevant to exposure pathways. The comparison values are quite conservative, and usually include uncertainty factors that account for the most sensitive populations. Adverse health effects are not expected to occur if an exposure concentration/dose is below a CV. However, an exposure concentration/dose at or above the CV does not mean adverse effects will occur. Rather, it means that there is a need to conduct a site-specific exposure scenario evaluation. The health risk for an individual depends on individual human factors (e.g. personal habits, occupation, and/or overall health), and site-specific environmental exposure factors (e.g. duration and amount of exposure). Therefore, CVs should not be used to predict the occurrence of adverse health effects without looking at site-specific conditions. CVs are only used to help determine if the contaminant needs to be evaluated in more detail.

The analytical results for soil samples were compared to the following CVs: chronic Environmental Media Evaluation Guide (chronic EMEG), Cancer Risk Evaluation Guide

(CREG), and Reference Dose Media Evaluation Guide (RMEG) developed by the Agency for Toxic Substances and Disease Registry (ATSDR). EMEGs are estimated contaminant concentrations that are not expected to result in adverse noncarcinogenic health effects based on ATSDR evaluation. CREGs are estimated contaminant concentrations that would be expected to cause no more than one additional cancer in a million persons exposed during their lifetime. RMEGs represent the concentration in water or soil at which daily human exposure is unlikely to result in adverse noncarcinogenic effects. In general, ADHS assumes that children are more susceptible to chemical exposures than adults. Since children reside in the home, the child EMEG and RMEG are used as the comparison values.

Chemical	Concentration (ppm)	Comparison Value (ppm)	Source of CV	Is it a Contaminant of Concern?
Dieldrin	0.88	2.5; 0.044	Child chronic EMEG; CREG	Yes
Permethrin	62.4	2500	Child RMEG	No

Dieldrin is selected for further evaluation because its current concentrations are above one of the health-based comparison values (CREG).

Public Health Implications: *This section will provide general toxicological information and site-specific exposure evaluation.*

Overview: From the 1950s until 1970, dieldrin was widely used as a pesticide for crops such as corn and cotton. Due to concerns about damage to the environment and potential risks to human health, EPA banned all uses of dieldrin in 1974, except to control termites. In 1987, EPA banned all uses of dieldrin (ATSDR 2002). Exposure to dieldrin has been linked to health problems such as Parkinson's disease, breast cancer, and immune, reproductive, and nervous system damage. Dieldrin is also an endocrine disruptor, which means that it can interfere with the human hormone system. It can also adversely affect testicular descent in the male fetus if the pregnant mother is exposed to it.

Non-Cancerous Health Effects

The dieldrin concentration of 0.88 ppm is below the child chronic EMEG of 2.5 ppm for dieldrin. Therefore, ADHS does not expect to see non-cancerous adverse health effects via the ingestion pathway.

Cancerous Health Effects

Cancer risks are explained in terms of the likelihood that an additional case of cancer will occur in a population. For example, one additional cancer case in 1,000,000 exposed individuals indicates that there is a very low cancer risk. EPA has established a target risk range of between 1 additional cancer risk in 1,000,000 exposed individuals to 1 excess cancer risk in 10,000 exposed individuals (10^{-6} to 10^{-4}) for hazardous sites.

EPA has calculated an oral cancer slope factor of 1.6×10^{1} per mg/kg/day for dieldrin. (EPA 1988) The calculations of estimated excess lifetime cancer risk for, a 20 month old child, a 3.5 year old child, and an adult are shown below:

Person	Dose (mg/kg/d)	Excess Lifetime Cancer Risk
Child (20 month)	3.51×10^{-7}	5.62×10^{-6}
Child (3.5 year)	4.85×10^{-7}	7.76×10^{-6}
Adult	4.52×10^{-7}	7.23×10^{-6}

The estimated excess lifetime cancer risk in both children and adults is within EPA's target risk range of 10^{-6} to 10^{-4}. Therefore, ADHS does not expect to see cancerous adverse health effects among the exposed population via the ingestion pathway.

Conclusion

ADHS does not expect to see any noncancerous or cancerous health effects due to the exposure to the contaminated soil through the incidental ingestion pathway at your residence. Some of the dieldrin or permethrin may evaporate from soil into air, and then enter the indoor air through the ventilation system. We cannot determine the potential health effects that may occur through the pathway of inhalation of indoor air at your residence. If air quality sample data is collected and submitted, the inhalation pathway can then be analyzed.

If you have any questions, please contact Kaleb Tsang by e-mail at Kaleb.Tsang@azdhs.gov or call (602) 364-3847.

REPORT PREPARATION

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References:

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