Health Consultation

RESIDENTIAL PESTICIDE CONTAMINATION

REMEDIATION AND FOLLOW-UP

7125 ANDERSON ROAD

ALEXANDER, SALINE COUNTY, ARKANSAS 72202

EPA FACILITY ID: ARR000011106

Prepared by
Arkansas Department of Health

FEBRUARY 12, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners 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 or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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SUMMARY

INTRODUCTION

In the area surrounding the residential pesticide contamination, ADH's/ATSDR's top priority is to ensure that the community has the best information possible to safeguard its health and prevent residents from coming in contact with harmful toxic substances.

CONCLUSION

ADH/ATSDR concludes that that until further notice from our offices, residents should not: 1) drink the water at all, and/or 2) make skin contact with the water for greater than five minutes per day, since the high level(s) of DDT currently found in the water could harm people's health. Well water at this rental property is a public health hazard until DDT concentrations are determined to be much lower.

BASIS FOR DECISION

Theoretical risk values based on the DDT concentration of 54.9 parts per billion (ppb) found in the kitchen tap line from the well water at the rental property exceeded standard health screening values. Water containing this high concentration of DDT has the potential to put certain individuals at risk of adverse health effects if exposure is prolonged.

NEXT STEPS

ADH/ATSDR recommends that the residents renting the house should temporarily discontinue the use of well water for drinking and cooking purposes, and also limit bathing or showering time to five minutes or less until concentrations of DDT from the well water are shown to be lower. Using alternative water sources, such as bottled water for drinking or cooking is advised. For additional future steps to be taken, see the complete "Recommendations" section at the end of this document.

FOR MORE INFORMATION

If you have concerns about your health, you should contact your health care provider. You can also call ADH at 1-501-661-2893 and ask for information on the "Residential Pesticide Contamination" remediated site.

Statement of Issues

This health consultation is a follow-up to the 2007 "Residential Pesticide Contamination" health consultation, which first addressed the commercial-grade pesticide contamination found near a residential well used for drinking water [1]. The 2007 health consultation can be accessed at: http://www.atsdr.cdc.gov/hac/pha/HCPHA.asp?State=AR . After some clean-up actions were taken regarding this site, water samples from the rental property were again collected and tested in 2009, by the Arkansas Department of Environmental Quality (ADEQ). ADEQ submitted the water sample data to offices at the Arkansas Department of Health (ADH) for public health evaluation. ADH, in a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), has prepared this health consultation to review the data from these recent water samples.

Background and History

In a meeting held on October 9, 2009, as a follow-up to a prior review of this property in 2007, ADEQ purposed an additional review of the most current well water data from this site. At the time of the previous health consultation (2007), levels of the pesticide DDT (or dichlorodiphenyltrichloroethane) were found to be 0.34 parts per billion (ppb) in the well water, and it was concluded that concentrations at this low level in the well water would not harm people's health. However, at that time it was recommended that residual pesticide, which was elevated in the surface soil, be removed from the property, so that potential soil contact could not harm people's health and the pesticide source could be eliminated.

Several attempts by ADEQ to have the owner of the rental property clean-up the residual pesticide-contaminated surface soil and debris have failed. Therefore, final remediation work completed this year at this site was conducted through the aid of ADEQ, and well water samples were taken for confirmation after completion of the project. Water samples were tested for detectable levels of DDT and DDD (or dichlorodiphenyldichloroethane); however, only DDT was found to be at concentrations above health screening levels. The highest concentration of DDT in the water sample was found to be 9.2 ppb after remediation work done at this property in August 2009 [2]. Since the DDT concentration was found to be higher after site-clean up, further evaluation of this site was needed. A second set of well water samples from this property was collected on October 12, 2009 by ADEQ, and data from this sample set was submitted to ADH on October 15, 2009.

The site is solely residential, and is located on approximately 17 acres of land northwest of the city limits of Alexander, Saline County, Arkansas. The property is within a rural area, and approximately six to twelve homes within the area still have not yet been connected to a

municipal water supply. Currently, the rental property at this site houses a toddler and several school-aged children, and the entire family is using private well water as the sole source for drinking water and household water use such as bathing, cooking, and washing.
According to historical information, in October 2002, the well water at the rental property was tested by ADH Engineering Division personnel, along with four other residential wells within a quarter-mile radius of the property. The well at the rental property was found to have 57 parts per billion (ppb) of DDT in the water. The four surrounding wells on neighboring properties all showed no detectable levels of DDT in the water [1].

A follow-up inspection of the property by ADEQ in January 2007, confirmed that all the original bags of DDT and drums containing hazardous waste (thought to be the source of DDT concentrations detected in the drinking water) had been removed from the residence. However, debris still remained in the crawl space as evidenced by residual levels of a white, powdery substance that was observed on the ground inside the crawl space. ADH then made a site-visit to inform residents of plans for more water sampling.

On April 24, 2007, ADH/ATSDR cooperative agreement personnel and ADH Engineering Division personnel collected well water samples from the rental property, along with four other residential wells within a quarter-mile radius of the property (the same wells that were tested in 2002). The results again showed the four surrounding wells on neighboring properties to have no detectable levels of DDT in the water. The results from the April 2007 water samples showed a detected level of DDT at 0.34 ppb at the rental property. An evaluation of the DDT at that concentration (0.34 ppb) showed that there would be no appreciable risks and should not cause harm to a person's health [1]. A letter and a copy of the health consultation were sent to both the renter and property owner, which indicated these results.

After final stages of remediation were begun on the property by ADEQ in 2009, water samples were taken again. In August 2009, a water sample taken from the kitchen tap line of the rental property still showed a detectable level of DDT. Therefore, ADEQ sampled again in October 2009 for confirmation testing.

Specifically, at a joint agency meeting held in October 2009, ADH concurred with ADEQ that re-sampling of the residential well water should take place and be evaluated for public health effects. Furthermore, it was agreed upon that ADH should write a letter of recommendation to the home renters and the property owner informing them of the findings as quickly as possible. ADEQ also stated that their agency would attempt to resample the well water at the private

residence, and possibly try to locate any alternative sources of contamination, should high levels of pesticide continue to be detected.

When ADEQ personnel arrived at the rental property on October 12, 2009, it was discovered through talking with the renter that the well filter had not been changed in at least three and a half years. ADEQ personnel assisted in removing the old filter, purging approximately six gallons of water from the well, and installing a new filter and canister to the well for use. Once the well water was again serviceable, ADEQ purged the kitchen tap line and took another sample. The data from the kitchen tap sample after the well filter had been changed showed a detected level of DDT at 54.9 ppb [2].

Site Description and Demographics

Refer to the health consultation "Residential Pesticide Contamination" dated August 28, 2007, for a complete site description and demographic description of this site, as the information has not changed [1].

Discussion

Exposure to a contaminant of concern is determined by examining human exposure pathways. An exposure pathway has five parts:

1. A source of contamination (e.g., contaminated well),
2. An environmental medium such as water, soil, or air that can hold or move the contamination,
3. A point at which people come in contact with a contaminated medium (e.g. residential drinking-water well),
4. An exposure route, such as drinking or skin contact with well water, and
5. A population who could come in contact with the contaminants.

An exposure pathway is eliminated if at least one of the five parts is missing and will not occur in the future. For a completed pathway, all five parts must exist and exposure to a contaminant must have occurred, is occurring, or will occur. For this evaluation, a complete pathway has been identified for an infant, child, and adult.

Since the residential drinking-water well at the rental property is known to contain elevated levels of DDT, the rental family has the potential to come into contact with those pesticide concentrations through the well water by either drinking the water from the tap or bathing/showering in the water from the tap. Therefore, screening of the data was done to determine the potential harm of the DDT concentration in the residential well for both the ingestion and absorption (dermal contact) exposure pathways.

The level of DDT detected in the water sample was screened using ATSDR Health Comparison Values. Health Comparison Values are doses or substance concentrations set well below levels that are known or anticipated to result in adverse health effects. These values help health assessors make consistent decisions about what substance concentrations or dose levels require a closer look. The ATSDR Health Comparison Value for DDT is 0.1 ppb for theoretical cancer risk evaluation; for environmental media evaluation it is 5 ppb for a child and 20 ppb for an adult [3]. Since the concentration of DDT in the most recent kitchen tap water sample was 54.9 ppb, further evaluation was needed to determine potential public health risks to anyone using the water for drinking or bathing/showering at the rental property.

Analysis of the sample data was conducted by calculating an exposure dose using standard exposure assumptions for an infant (average weight of 10 kilograms), child (average weight of 16 kilograms), and adult (average weight of 70 kilograms). For drinking water calculations, it was estimated that an infant or child would drink up to one liter per day, and an adult would drink up to two liters per day. For the skin contact calculations, it was estimated that an infant, child, or adult could spend 20, 10, or five minutes per day bathing or showering. Once the estimated daily exposure dose of each of these pathways was found, non-cancer and theoretical cancer risk calculations were used to determine potential adverse health effects [4].

To put the calculated exposure doses into a meaningful context for non-cancer effects, a Hazard Quotient (HQ) value was calculated for each potentially exposed infant, child, or adult for both the drinking pathway and the skin contact pathway. An HQ is the average daily intake divided by a chemical specific reference dose (RfD). The Environmental Protection Agency (EPA) Regional Screening Level was the source for the chemical RfD for DDT. If the HQ for a chemical is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If the HQ exceeds one, there is some possibility that non-cancer effects may occur, although an HQ above one does not indicate an effect will definitely occur. This is because of the margin of safety built-in to the calculation of all RfD values. The larger the HQ value, the more likely it is that an adverse effect may possibly occur.

The calculated non-cancer HQs for drinking water exposure and skin contact (via a bath or shower) using the tap water sample concentration of 54.9 ppb DDT are:

Drinking Water Exposure	Hazard Quotient (HQ)
Infant	**11**
Child	**6.8**
Adult	**3.2**
Skin Contact Exposure (*20* minutes)	HQ
Infant	**2.4**
Child	**3**
Adult	**2.8**
Skin Contact Exposure (*10* minutes)	HQ
Infant	**1.2**
Child	**1.5**
Adult	**1.4**
Skin Contact Exposure (*5* minutes)	HQ
Infant	0.6
Child	0.7
Adult	0.7

Numbers in **bold** represent HQ values greater than one.

For the drinking water calculation, all HQ values are greater than 1.0. From the values shown in the table for the skin contact calculation, the less time spent in contact with the water (using a shower or bath scenario), the lower the HQ value. Spending 10 minutes or longer bathing or showering will result in a HQ value greater than one. Spending 5 minutes or less bathing or showering each day may result in a HQ value less than one, which is more desirable.

To characterize potential cancer effects from ingestion or dermal contact of DDT directly from the residence well water, a theoretical Lifetime Cancer Risk (LCR) value was calculated. The LCR is an estimated theoretical excess cancer risk expressed as the proportion of a population that may be affected by a carcinogen during a specified time of exposure. For this scenario, the specified exposure time used was six years (approximate amount of time the renters have lived at the property). Risk values greater than one in 1,000,000 (or 1×10^{-6}), that represent no risk of cancer (termed "insignificant"), but less than one in 10,000 (or 1×10^{-4}, termed "low") are within the EPA's target risk range and considered an adequate level of health safety. If the additional

LCR is greater than one in 10,000, it is generally considered a “moderate” potential risk and an indicator that further evaluation would be warranted.

The calculated LCR for drinking exposure and skin contact (via a bath or shower) using the tap water sample concentration of 54.9 ppb DDT are:

Drinking Water Exposure	Theoretical Lifetime Cancer Risk (LCR)
Infant	1.6×10^{-4}
Child	9.9×10^{-5}
Adult	4.7×10^{-5}
Skin Contact Exposure (*20* minutes)	LCR
Infant	3.5×10^{-5}
Child	4.4×10^{-5}
Adult	4.1×10^{-5}
Skin Contact Exposure (*10* minutes)	LCR
Infant	1.7×10^{-5}
Child	2.2×10^{-5}
Adult	2.0×10^{-5}
Skin Contact Exposure (*5* minutes)	LCR
Infant	8.2×10^{-6}
Child	1.0×10^{-5}
Adult	9.6×10^{-6}

For the drinking water exposure the theoretical LCR for an infant is considered “low” and the theoretical LCR for a child or adult is considered “very low”; however, future evaluation of this water is needed as indicated from the results. As with the previous scenario, the less time spent bathing/showering in this water results in a lower theoretical LCR value. Spending either 20 minutes or 10 minutes bathing may result in a “low” LCR value. Spending 5 minutes bathing may result in an “insignificant” LCR value.

According to the ATSDR toxicology (ToxFAQs) fact sheet, high levels of DDT can affect the nervous system causing excitability, tremors, and seizures [5]. Human studies were conducted

and it was observed that these [previously mentioned] effects went away once exposure to DDT stopped, and no effects were seen in people who took small daily doses of DDT by capsule for 18 months as part of the study. In animal studies, short-term exposure to large amounts of DDT in food affected the nervous system, while long-term exposure to smaller amounts affected the animal's liver. Also in animals, short-term oral exposure to small amounts of DDT (or its breakdown products) may have harmful effects on reproduction [5].

The Department of Health and Human Services (DHHS) determined that DDT may reasonable be anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) determined that DDT may possibly cause cancer in humans. The EPA determined that DDT (as well as DDE and DDD) are probable human carcinogens. Some occupational studies in DDT-exposed workers did not show increases in cancer. Studies in animals given DDT with the food have shown that DDT can cause liver cancer [5].

Community Health Concerns

During this investigation of the residential pesticide contamination in the well water at this site in Alexander, AR, no specific health concerns were presented to ADH by the residents of this rental property or other area residents.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health.

Since there are young children known to be living on the property, adults and caregivers should be made aware of the potential on-site risks in order to prevent unnecessary or excess exposure to the residential well water for prolonged periods of time. There is no evidence that DDT, DDE, or DDD cause birth defects in people; however, it is not known whether children differ from adults in their susceptibility to these pesticides. Until more research is done, it is assumed

that children exposed to large amounts of DDT will have health effects similar to the effects seen in adults, including potential adverse health effects to the nervous system, liver, or reproductive system [5].

Conclusions

After calculating theoretical risk values based on the DDT concentration (54.9 ppb) found in the kitchen tap line from the well water at the rental property, ADH/ATSDR conclude that until further notice from our offices, residents should not: 1) drink the water at all, and/or 2) make skin contact with the water for greater than five minutes per day, since the high level(s) of DDT currently found in the water could harm an adult's and/ or a child's health. Therefore, water at this rental property is considered a **public health hazard** until DDT concentrations are much lower.

Recommendations

ADH/ATSDR recommends the following:

1. The family renting the house should temporarily discontinue the use of well water for drinking and cooking purposes, and also limit bathing or showering time to five minutes or less until concentrations of DDT from the well water are shown to be lower. Using alternative water sources such as bottled water for drinking or cooking is advised.

2. The property owner or renter may consider installing an activated carbon filter to the well, which can aid in the removal of pesticides in water.

3. The property owner should consider connecting the house tap water line to a public water works system as soon as it becomes available.

4. More samples should be taken from the residential kitchen tap and bathroom tap in the near future. Since this is a private drinking water well, the property owner should obtain a contractor to have water samples periodically collected until it is shown that concentrations of pesticides (including DDT) in the drinking water are below levels to cause public health concern. The owner should coordinate these efforts through the state and federal agencies as appropriate.

5. Efforts to find all possible sources of the DDT and other possible pesticides should be made in order to eliminate future well water contamination. Since most of the DDT and debris have been removed from the rental property, it is possible an alternative source may still exist. Again, the property owner should coordinate this through a private

contractor, with the assistance of ADEQ/EPA and ADH/ATSDR as needed and/or requested.

6. If there are urgent health concerns, biomonitoring tests provided by a primary care physician or pediatrician are an option for the children and/or adults residing in the rental property to determine if there is an excessive amount of DDT concentration in the body. Laboratory tests can detect DDT levels in fat, blood, or urine. These tests may show low, moderate, or excessive exposure to this compound, but cannot tell the exact amount a person was exposed to, or whether they will experience adverse effects; so, the tests are for the family's health information purposes only.

Public Health Action Plan

The Public Health Action Plan implemented by ADH/ATSDR with regards to the residential pesticide contamination at the rental property in Alexander, Saline County, is as follows:

Completed Actions

- ADH personnel conducted a site visit to collect well water samples from the property and surrounding residences on October 8, 2002, and reported the test results on November 5, 2002.
- ADH personnel accompanied by ADEQ personnel conducted a site visit on April 17, 2007, to collect surface soil samples and inform neighboring residences of future well water sampling.
- ADH personnel conducted a site visit on April 24, 2007, to collect private well water samples from the property and surrounding residences.
- ADH evaluated private well water and surface soil sample data to determine public health risks.
- ADEQ wrote and sent a letter of findings to the homeowner informing them of the surface soil results on June 6, 2007.
- ADH wrote and sent letters of findings to the homeowner and home renter informing them of the well water results on June 22, 2007. ADH sent an ATSDR Fact Sheet on DDT to the homeowner and home renters on June 22, 2007.
- ADH spoke with both the owner and renter to receive verbal consent to include specific address and housing information within this report. Certified letters were then mailed to both individuals confirming their verbal consent to allow ADH/ATSDR to use their information on July 13, 2007.
- ADH requested ADEQ to send a letter of findings regarding the surface soil results to the renter(s) on July 13, 2007.
- ADEQ informed ADH that follow-up with the homeowner was occurring to ensure that all contaminated surface soil from the crawl-space of the house and surrounding property

at 7125 Anderson Road, Alexander, had been removed and disposed of properly. This was based on a letter from ADEQ to the homeowner, dated June 6, 2007, which recommended "surface removal" of soil and debris under the crawl space of the residence within 30 days of receipt of the letter.

- ADEQ and ADH held a joint-agency meeting in which ADEQ requested ADH to send a letter regarding the well water sampling results and applicable recommendations to the renter(s) and property owner on October 12, 2009.
- ADH called homeowner and home renter by phone on October 16, 2009, informing them of well water sampling evaluation and advised them to use an alternate water source for drinking as well as limit bathing/showering to less than five minutes.
- ADH wrote and sent letters of findings along with ATSDR ToxFAQs fact sheets about DDT to the homeowner and home renter informing them of the well water results on October 20, 2009.

Future Activities

- ADH will continue to work with ADEQ in order to evaluate new sampling data from the property well water, as well as inform the homeowner and home renter of all findings of future evaluations.
- ADH will continue to monitor concentrations of pesticides in the well water at this site from data provided to our offices, as well as assist in future data evaluation to discover if any alternate source of the contaminant exists off site.
- ADH will continue to educate private citizens in regards to the health risks associated with the DDT, as needed.
- ADH will continue to work with ATSDR PART Workgroup, as requested, until this site is no longer assessed as a public health hazard.

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Certification

The Arkansas Department of Health prepared this health consultation for residential pesticide contamination remediation and follow-up evaluation at 7125 Anderson Road, Saline County, Alexander, Arkansas, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and procedure existing at the time the health consultation was initiated. Editorial review was completed by the cooperative agreement partner.

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

Alan W. Yarbrough
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References

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