Letter Health Consultation

IOWA ARMY AMMUNITION PLANT

MIDDLETOWN, IOWA

SEPTEMBER 19, 2013

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.

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LETTER HEALTH CONSULTATION

IOWA ARMY AMMUNITION PLANT

MIDDLETOWN, IOWA

Prepared By:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry (ATSDR)
Division of Community Health Investigations
Western Branch

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta, GA 30333

September 10, 2013

I am writing to let you know of the work the Agency for Toxic Substances and Disease Registry (ATSDR) has completed to respond to your concerns that neighboring residents could be exposed to harmful levels of environmental contaminants released from the Iowa Army Ammunition Plant (IAAAP) in Middletown, Iowa. In your letter, you expressed concern that chemicals from the plant have contaminated private drinking water wells, public streams and the soil. To determine if contaminants were present at levels that might be harmful ATSDR reviewed the results of private well, surface water, and off-post soil samples collected since the 1999 Public Health Assessment (PHA) was released.

We used appropriate health comparison values to screen the sampling results. Octogen (HMX) did not exceed ATSDR's comparison values in any water or sediment sample. Cyclonite (RDX) did not exceed ATSDR's comparison values in sediment samples. Only two chemicals, RDX and nitrate, exceeded ATSDR's comparison values in off-site surface water, private well water, or both. The following evaluation focuses on those chemicals. Chemicals, such as RDX and nitrate that are detected at concentrations above ATSDR's comparison values do not necessarily mean that exposure to them will cause harm; instead they represent chemicals that warrant a more detailed, site-specific evaluation to determine if they might be harmful or not.

We used the highest RDX and nitrate concentrations found in places where community residents might come into contact with them to calculate the highest possible dose from drinking the water. These doses were compared to ATSDR's health based comparison values or Minimal Risk Levels (MRL). The following sections briefly describe our evaluation. Tables 1, 2, and 3 illustrate the range of contaminant concentrations detected in the off-post surface water, sediment and private drinking water wells, and the health-based comparison value. Table 4 summarizes the exposure evaluation conducted for RDX and nitrate.

Surface Water

1) We calculated the amount of RDX a child might get into its body, or dose, from creek water using extremely conservative exposure assumptions. We assumed the child would drink one (1) liter of creek water with the highest RDX concentration measured between 2000 and 2010 every day for a year. The highest concentration was 40.4 micrograms per liter (µg/l). A 45 pound (20 kilogram [kg]) child (average weight of a 5 to 6 year-old child; the youngest child assumed to have regular access to the creek) would ingest approximately 2 µg/kg/day (micrograms of RDX per kilogram body weight per day). This is 100 times less than ATSDR's acute (1-14 days) MRL of 200 µg/kg/day and 50 times less than ATSDR's intermediate MRL of 100 µg/kg/day (14 – 364 days) [ATSDR 2012]. Therefore frequent

exposure to even the highest concentration of RDX measured in the creek water is not harmful.

2) Next, we evaluated whether a child drinking one (1) liter of water from the stream every day throughout his childhood could experience harmful health effects. We assumed the child would drink one (1) liter of creek water every day for 14 years, beginning at 2 years of age. We assumed the RDX concentration was equal to the maximum annual average RDX concentration measured between 2000 and 2010. The maximum average annual RDX level in the creek surface water was 15.2 µg/l. For a child between 2 and 6 years of age and average weight (25 pounds [12 kg] to 45 pounds [18 kg]) the maximum calculated RDX dose is 0.87 µg/kg/day. The calculated dose decreases as the child's body weight increases. For example, by the time a child is between 11 and 16 years of age, the calculated dose is 0.27 µg /kg/day. These doses are 100 times less than ATSDR's chronic MRL of 100 µg/kg/day (365 days and greater). The estimated lifetime cancer risk, for the entire 14 year exposure, is 1.1E-5 and is consider a low risk for development of cancer.

Well Water

1) A limited amount of private well water sampling results is available. The most recent samples were collected in April 2009 to determine if explosives, related compounds, and nitrates were still present in four drinking water wells. We evaluated whether a 1 year old child could be at risk of experiencing health effects by drinking one (1) liter of water from the well with the highest RDX concentration measured in 2009 (4.3 µg/L). This is an extremely conservative evaluation, as this well has not been used to supply drinking water since elevated nitrate levels were first detected in the well in 1993. If a 22 pound (10 kg) child (average weight of a child approximately one year old) drank one liter of this water every day, they would receive a dose of approximately 0.45 µg/kg/day, which is much lower than the acute MRL (200 µg /kg/day), and lower than the intermediate and chronic MRL (both are 100 µg/kg/day). The estimated cancer risk for a child with this exposure is about 3E-6 (that is 3 in 1,000,000). This translates to a very low cancer risk.
2) One of four private residential wells sampled near IAAAP contained nitrates above the 10 mg/L federal drinking standard. However, the water is not used for drinking. The source of the nitrates measured in groundwater has not been determined and may not be related to IAAP activities. Other possible sources include agricultural runoff and failing septic systems; nitrates in groundwater has been documented in many areas of Iowa. Exposure to high levels of nitrates in drinking water is a concern for fetuses and infants under 4 months of age. The most serious health condition is acute acquired methemoglobinemia which reduces the ability of blood to carry oxygen. Methemoglobinemia can cause blue skin (cyanosis). If left untreated the symptoms become more severe and may include difficulty in breathing, irregular heartbeat, coma, and even death. To protect a developing fetus, women of childbearing age should limit their exposure to nitrates in drinking water.

Sediment

RDX was not detected in most Brush Creek sediment samples. No sediment data is available following the 2003 and 2009 floods, but all previous measurements were much lower than health-based screening values.

Conclusions and Recommendations

1) Exposure to the RDX and HMX levels measured in off-site surface water and sediment are not harmful. As a prudent public health practice ATSDR supports continued monitoring.
2) RDX and HMX detected in private wells in 2009 are below levels of health concern and remain at the relatively low levels reported in our 1999 Public Health Assessment. As a prudent public health practice, ATSDR supports continued monitoring.
3) Private well water in one home near IAAAP contained nitrates above the 10 mg/L federal drinking standard. The source of the nitrates has not been determined and may not be related to IAAP activities. ATSDR recommends that if residents drink water from their private well, they periodically test the water for nitrate contamination. For more information on the health effects of nitrates and nitrites, see ATSDR's ToxFAQs at: http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=1186&tid=258.

When requested, we will continue providing technical assistance to the IAAAP site management team, Department of Defense, U.S. Environmental Protection Agency (EPA), and the State, to help assess the possible health implications from exposures to chemicals associated with site contamination or clean-up efforts.

We hope that you will find this information useful. If you have any further questions about this evaluation, please contact CAPT Susan Neurath, Federal Program Liaison, at 770-488-3368 or email at SNeurath@cdc.gov.

Sincerely,

Sven E. Rodenbeck, Sc.D., P.E., BCEE
Rear Admiral, US Public Health Service
Acting Branch Chief
Western Branch
Division of Community Health Investigations
Agency for Toxic Substances and Disease Registry

Enclosure

cc:
Mr. Roger Allison, IAAAP
Ms. Ronie Shackleford, US Army Public Health Command
Mr. Sandeep Mehta, EPA

Table: Summary of ATSDR's Evaluation of IAAAP Sampling Results

Environmental Media	Contaminant	Concentration	Calculated Dose	Comparison Value	Non-Cancer Concern	Cancer Risk
Surface Water	RDX	40.4 µg/L Maximum Measured Concentration	2 µg/kg/d *	200 µg/kg/d[1]; ATSDR Acute MRL [2] 100 µg/kg/d; ATSDR Intermediate and chronic MRL	None	Not Evaluated[3]
* The calculated dose assumes a 5-6 year old child would drink 1 liter of water having the maximum RDX concentration every day for 1 year.						
Surface Water	RDX	15.2 µg/L Highest Average Annual Concentration	0.87 µg/kg/d *	200 µg/kg/d; ATSDR Acute MRL 100 µg/kg/d; Intermediate MRL	None	Low
* The calculated dose assumes a child would drink 1 liter of water with the highest average annual RDX concentration every day between ages 2 and 16.						
Private Well	RDX	4.3 µg/L	0.45 µg/kg/d *	200 µg/kg/d; ATSDR Acute MRL 100 µg/kg/d; Intermediate MRL	None	Very Low
* The calculated dose assumes a 1 year old child drinks 1 liter of water from the well every day for 1 year.						
Private Well	Nitrate Source is undefined and may not be related to IAAAP activities	11 mg/L Maximum Measured Concentration	Not calculated. Compared measured concentration to federal drinking water standard.	10 mg/L; EPA MCL [4]	None for the well described (not used for drinking water). However, higher levels may pose a risk of methemoglobinemia, residents are encouraged to routinely have their wells tested.	None

Notes

1. Micrograms of RDX ingested per kilogram body weight per day.
2. MRL – Minimal Risk Level; developed by ATSDR to estimate the daily human exposure to a hazardous substance that is likely to be without appreciable risk of no-cancer health effects over the specified duration of exposure.
3. Exposure assumptions were selected to evaluate the potential for health effects following a brief exposure to the highest measured concentration.
4. MCL – Maximum Contaminant Level; developed by the US Environmental Protection Agency (EPA) as a part of the Safe Drinking Water Act.

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