

HEALTH CONSULTATION

PUBLIC HEALTH EVALUATION

OF

PRIVATE WELL SAMPLING DATA

IN

WESTON, FAIRFIELD COUNTY, CONNECTICUT

March 12, 2014

Prepared by

The Connecticut Department of Public Health

SUMMARY

INTRODUCTION

In the summer of 2013, the Weston/Wesport Health Department, requested that the Connecticut Department of Public Health (CT DPH) evaluate the public health significance of private well sampling data from Weston, Connecticut. The main focus of this health consultation will be evaluating private well sampling data from Weston.

In the winter/spring 2013, a resident in the town tested her well for arsenic because of a concern over health issues which she thought might be related to arsenic exposure. She then encouraged others in the town to test their wells after arsenic levels in her well were found to have concentrations that exceeded Connecticut's Action Level (AL). The source of the arsenic in well water is thought to be natural occurring. At the time of this health consultation, 267 wells have been sampled and the results have been shared with the Weston/Westport health department.

CONCLUSIONS

CT DPH evaluated past exposure of arsenic in well water. CT DPH reached the following conclusions in the health consultation:

Conclusion 1

CT DPH has concluded that in the past, residents of Weston who cooked and drank with the median to the highest concentrations of arsenic in well water were exposed to these contaminants at levels that could harm people's health. Exposure to the median and up to the highest levels of arsenic over a lifetime, can lead to increased risk of skin, lung, liver, and bladder cancer. Exposure to the highest levels of arsenic in well water may result in less serious dermal effects.

Basis for Conclusion

Exposure has occurred and exposure to the median and up to the highest concentrations of arsenic exceeds a level that could harm people's health. The dose is above a level where action needs to be taken to prevent or reduce exposure. Cancer risk from exposure to arsenic to the median and up to the highest level of arsenic are moderate. Noncancer health effects from exposure to the highest arsenic level cannot be ruled out.

Next Steps

The Weston/Westport Health Department and the CT DPH recommends that residents with private wells test their well for arsenic to find out if arsenic levels are above the Connecticut AL. If arsenic levels exceed the Connecticut Action Levels (AL), then the CT DPH and Weston/Westport Health Department recommends consulting a water treatment company to

determine the most effective method of treatment. CT DPH recommends that residents test their wells for arsenic every 5 years.

Conclusion 2

CT DPH has concluded that in the past, residents who used well water contaminated with arsenic for cooking, drinking, were exposed to this contaminant. Exposure to minimum concentrations of arsenic are not expected to harm people's health.

Basis for Conclusion

Exposure has occurred but the concentration does not exceed a level where action needs to be taken to prevent or reduce exposure. Minimum arsenic levels are below Connecticut ALs. Connecticut ALs are screening levels that are protective of public health.

Next Steps

No additional steps need to be taken at this time. CT DPH recommends that residents test their wells for arsenic every 5 years.

The conclusions and recommendations in this health consultation are based on the data and information made available to the Connecticut Department of Public Health (CT DPH). CT DPH will review additional information when received. The review of additional data could change the conclusions and recommendations listed in this document. This report was supported by funds from a cooperative agreement with the Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services. This document has neither been reviewed nor cleared by ATSDR.

BACKGROUND AND STATEMENT OF ISSUE

In the summer of 2013, the Weston/Westport Health Department requested that the Connecticut Department of Public Health (CT DPH) evaluate the public health significance of private well sampling data from Weston, Connecticut. The main focus of this health consultation will be evaluating private well sampling data from Weston.

In the winter/spring 2013, a resident in the town tested her well for arsenic because of a concern over health issues which she thought might be related to arsenic exposure. She then encouraged other residents in the town to test their well after arsenic levels in her well were found to have concentrations that exceeds Connecticut's Action Level (AL) of 10 ug/L or parts per billion (ppb). The source of the arsenic in well water is thought to be naturally occurring. At the time of this health consultation, 267 wells have been sampled and the results have been shared with the Weston/Westport health department.

Demographics

The site is Weston, Connecticut whose population is approximately 10,179. The total area is approximately 20.7 square miles (United States Census Bureau 2010). There are approximately 3289 private wells in Weston. Nearly every residence in Weston uses a private well, with the exception of a few community wells.

According to 2010 census data, 96% of residents are Caucasian and approximately 2% are Hispanic.

Environmental Contamination and Health Comparison Values

Private Well Sampling Data

As stated previously, in 2013, community members had 267 residential wells sampled (one sample per well) privately by labs and sent to the Weston/Westport Health Department. CT DPH evaluated risks at different exposure levels.

One hundred and five samples out of 267 tested positive for arsenic with 62 samples exceeding Connecticut's Action Level (AL). ALs are health-based levels developed to be protective of children and adults with frequent, long-term exposure to contaminants in private well water (CT DPH 2013).

Detected arsenic concentrations ranged from 2 ppb to 115 ppb (up to 11.5 times the AL). The median arsenic concentration was 10.5 ppb (just exceeding the AL).

Table 1. Summary of Private Well Sampling Results from 267 Residences in Weston, Connecticut, 2013.

| Contaminant | Concentration Range (ppb) | Number of Exceedances of Comparison Value/Number of Samples Taken | Comparison Value (ppb) | Comparison Value Source |
|-------------|---------------------------|---|------------------------|-------------------------|
| Arsenic | BDL-115 | 62/267 | 10 | CT AL |

ppb=parts per billion

BDL=Below Detection Limit

CT AL=Connecticut Action Level. Available at:

http://www.ct.gov/dph/LIB/dph/environmental_health/EOHA/pdf/Action_Level.pdf

DISCUSSION

Exposure Pathway Analysis

To evaluate potential exposures to private well contaminants from well water in Weston, CT DPH evaluated the environmental data and considered how people might come into contact with contaminants in private well water. The possible pathways of exposure are dermal, inhalation, and ingestion. In other words, in order to be exposed to contaminants in private well water, one must come into contact with the water by touching it during shower/bathing, breathing vaporized water particles (during showering/bathing), drinking the water or cooking with it.

Past Conditions

Sixty-two wells tested had water that contained arsenic levels that exceeded the AL. Since our current advice to homeowners with private wells in Weston includes testing their wells for arsenic and consulting a water treatment company to determine the most effective method of treatment if the arsenic levels exceed the AL, it is assumed that residents followed our advice and are no longer being exposed to the contaminated well water. Appendix A contains a fact sheet with this advice. Therefore, it is assumed that there are no current, ongoing exposures, and all exposures to contaminated well water are treated as a past exposure pathway.

Public Health Implications for Adults and Children

When determining the public health implications of exposure to hazardous contaminants, CT DPH considers how people might come into contact with contaminants and compares contaminant concentrations with health protective comparison values. When contaminant levels are below health-based comparison values, health impacts from exposure to those levels are unlikely. Contaminant levels exceeding comparison values do not indicate that health impacts are likely but instead warrant further evaluation. In this health consultation, CT DPH used established Action Levels for private wells as health protective screening values. As stated

previously, these values are health-based levels developed to be protective of children and adults with frequent, long-term exposure to contaminants in private well water. CT DPH only evaluated completed exposure pathways where private well contamination exceeded the Connecticut Action Levels. General toxicology information on arsenic is provided in Appendix A.

Since the risk for noncancer and cancer health effects from dermal and inhalation exposure (from typical household activities like bathing and showering) to arsenic are very minimal as compared with the risks from ingestion of this contaminant, only ingestion risks are included (Post 2003, Zhou et al 2007).

Table 1 indicates that arsenic was detected in some private wells at levels above the AL in Weston. CT DPH assumed that contact with private well water occurred daily through normal routine activities like cooking and drinking and children ingested 1 L/day and adults ingested 2 L/day of private well water. In addition, it was assumed that contact with well water from cooking and drinking occurred for a lifetime of 70 years (EPA 1997). It is important to note, however, that we do not know exactly how long the arsenic has been in the well water.

Noncancer Effects

Arsenic

CT DPH did not calculate noncancer risk from exposure to the minimum arsenic concentration (2 ppb) because it did not exceed CT DPH's Action Level of 10 ppb.

Using the maximum detected concentrations of 115 ppb as the exposure level, the maximum daily dose from ingestion exposure is 6.8 ug/kg/day. The median arsenic concentration of 10.5 ppb results in a median daily dose of 0.6 ug/kg/day.

The dose from the median and maximum arsenic concentration exceeds the Agency for Toxic Substances and Disease Registry's (ATSDR's) Minimum Risk Level (MRL) for chronic oral exposure of 0.3 ug/kg/day (ATSDR 2000) and EPA's reference dose (RfD) which is also 0.3 ug/kg/day (IRIS 1993). MRLs and RfDs are estimates of daily exposure to humans that are likely to be without harmful noncancer effects. Because the median and maximum dose exceeded the MRL and RfD, noncancer effects from exposure to arsenic in private well water in Weston cannot be ruled out. The most sensitive group, small children and infants, are at a higher risk for adverse health effects from exposure to contaminants, thus there is an emphasis on this group when risk calculations are estimated. All dose and risk calculations for both noncancer and cancer effects from exposure to arsenic are provided in Appendix B.

In addition, using the above median and maximum concentrations for arsenic in well water resulted in a Hazard Index of 2 (median concentration) to 23 (maximum concentration). A Hazard Index greater than 1 indicates that noncancer effects from exposure cannot be ruled out. A Hazard index of less than 1 indicates that noncancer effects from exposure are unlikely. Because the Hazard Index is greater than 1 for maximum and median concentrations, noncancer effects from median and maximum levels in well water cannot be ruled out.

To provide further perspective on noncancer risk calculations, CT DPH compared the estimated dose with effect levels from toxicology literature (Table 2). The estimated median and maximum dose is lower than the effect level for serious human health effects reported in a range of toxicology studies. However, it should be noted that there are two studies that reported less serious human health dermal effects at a dose lower than the maximum dose estimated from exposure to private well water in Weston. Since the maximum dose exceeds two effect levels from toxicology literature, one cannot rule out risk for adverse health effects.

Table 2. Estimated Doses for Arsenic: A Comparison of Average Daily Doses (ADD) from Drinking Contaminated Water in Weston, CT to Noncancer Effect Levels From Toxicology Literature

| Median and Maximum Arsenic Dose from Private Well Water (µg/kg/day) | Effect Level from Literature (µg/kg/day) | Comment |
|--|---|--|
| 0.6 and 6.8 [^] | 1.18 | LOAEL* for chronic oral human exposure resulting in less serious dermal effects (Naujokas et al 2013) |
| | 1.4 | LOAEL for chronic oral human exposure resulting in less serious dermal effects (arsenical dermatosis) (ATSDR 2000) |
| | 14 | LOAEL for chronic oral human exposure resulting in hyperpigmentation, keratosis and possible vascular complications (Basis for EPA RfD from IRIS 1993) |
| | 32 | LOAEL for chronic oral human exposure resulting in serious dermal effects (melanosis and keratosis) (ATSDR 2000) |
| | 46 | LOAEL for chronic oral human exposure in hepato effects (hepatomegaly) (ASTDR 2000) |
| | 50 | LOAEL for chronic oral human exposure cardio effects (blackfoot disease)) (ATSDR 2000) |

[^] Median and Highest estimated ADD for noncancer effects using worst case exposure scenario

*Lowest Observed Adverse Effect Level

Cancer Effects

For estimating cancer risk, the United States Environmental Protection Agency (US EPA) typically provides a potency factor for an environmental contaminant, such as arsenic. This potency factor (known as a slope factor or unit risk factor) is an upper-bound estimate of theoretical cancer risk for the general population for a lifetime of exposure to account for the

possibility that potency may vary between the individuals. Though it cannot be calculated, true excess risk to an individual is likely to be less than the calculated risk.

CT DPH did not calculate lifetime cancer risk from exposure to the minimum arsenic concentration (2 ppb) because it did not exceed CT DPH's Action Level of 10 ppb.

If a community member drank contaminated well water every day for a lifetime of 70 years (default lifetime exposure duration, EPA1997) at the median arsenic concentration of 10.5 ppb, using the US EPA's oral cancer slope factor, the theoretical risk would be 2 in 10,000. Background rates of cancers in United States are 1 in 2 or 3 (NCI 2001). This cancer risk estimate from exposure to arsenic in well water in Weston results in moderate increases in lifetime incremental cancer risk relative to background cancer rates and action to reduce that exposure is definitely warranted.

If a community member drank contaminated well water in Weston every day for 70 years at the maximum concentration of 115 ppb, the theoretical risk would be 2 in 1,000. The cancer risk estimate from exposure to arsenic in well water in Weston results in moderate increases in lifetime incremental cancer risk and action is warranted to reduce exposure. Lifetime cancer risk increases with an increase in arsenic concentration.

If a theoretical cancer risk is greater than 1×10^{-4} (one excess cancer in 10,000), then it is thought to be a moderate risk of cancer related to that chemical exposure and action to reduce exposure is definitely warranted. If the risk is below 1×10^{-6} , then the possible cancer risk from chemical exposure is thought to be insignificant and action to reduce exposure is usually not warranted.

Table 3: Cancer Risk Estimates From Lifetime Exposure to Arsenic in Private Wells in Weston, Connecticut

| Contaminant | Cancer Risk (Median) | Cancer Risk (Upper End) |
|---|-----------------------------|--------------------------------|
| Arsenic | 2 in 10,000 | 2 in 1,000 |
| Action Warranted to Reduce Exposure? | Yes | Yes |

Uncertainty

One must also emphasize that there is a large degree of uncertainty in the noncancer and cancer risk calculations because of data limitations on arsenic in private well water and the lack of information about exposure duration. A single measurement does not give sufficient data to base a decision about where arsenic (or any other contaminant) in a private well is likely to result in

noncancer or cancer health effects. In addition, since we do not know how long the private well water was contaminated, it is not possible to know how long residents were actually exposed to the contaminated water.

CONCLUSIONS

Sixty-two private wells in Weston had arsenic concentrations that exceeded state drinking water ALs. Health education outreach has been conducted to encourage people to test their private wells and consult a water treatment company to determine the most effective method of treatment if the arsenic levels exceed the AL.

CT DPH has concluded that in the past, residents who used well water contaminated with arsenic for cooking and drinking were exposed to arsenic. Some of these homeowners and their families may have been exposed to this contaminated water for a long time, but the actual exposure time is unknown. Residents who cooked and drank with the median to the highest concentrations of arsenic were exposed to these contaminants at levels that could harm people's health. Exposure to the median to the highest levels of arsenic over a long period of time, can lead to increased risk of skin, lung, liver, and bladder cancer. Exposure to the highest levels of arsenic in well water may result in less serious dermal effects. Residents who were exposed to minimum arsenic concentrations were not exposed at levels that could harm people's health.

RECOMMENDATIONS

1. CT DPH recommends that the Weston/Westport Health Department continue to advise residents with a private well in Weston to test their well for arsenic every 5 years and consult a water treatment company to determine the most effective method of treatment if arsenic levels exceed the AL.
2. CT DPH recommends that the Weston/Westport Health Department continue to work with CT DPH in answering health related questions regarding exposure to arsenic in well water from Weston residents.

PUBLIC HEALTH PLAN

Actions Taken

1. The Weston/Westport Health Department, held a public meeting in March 2013 for residents who had concerns regarding arsenic in well water. The objective of this meeting was to provide information to the community residents about exposures and health impacts related to the private well contamination. CT DPH did a short presentation on the health effects of arsenic exposure in well water. CT DPH distributed 1 generic fact sheet at this session, on arsenic. (Appendix A).

Actions Planned

1. CT DPH will make this health consultation available to residents of Weston.
2. CT DPH will continue to work with the Weston/Westport Health Department to respond to health questions and concerns regarding private well contamination from Weston.
3. CT DPH will review any additional private well data for the town of Weston and update this health consultation, if necessary.

REFERENCES

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Appendix A
ATSDR Arsenic Fact Sheet

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

How can families reduce the risks of exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.

- If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

- If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air ($10 \mu\text{g}/\text{m}^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



Appendix B
Risk Calculations

Arsenic
NONCANCER RISK

Ingestion, child, aged 1-6 years

| Conc (ug/L) | Ing Rate (ug/L) | ED (yr) | 1/BW _c (1/kg) | 1/At _c (1/yr) | ADD _{ing} (ug/kg/day) | RFD (ug/kg/day) | HI |
|-------------|-----------------|---------|--------------------------|--------------------------|--------------------------------|-----------------|-------------|
| 10.5 | 1 | 6 | 0.058824 | 0.166667 | 0.617647059 | 0.3 | 2.058823529 |
| 115 | 1 | 6 | 0.058824 | 0.166667 | 6.764705882 | 0.3 | 22.54901961 |

CANCER RISK

Ingestion, child, aged 1-6 years

| [Conc] mg/L | Ing Rate (L/day) | ED (yr) | 1/BW _c (1/kg) | 1/At _c (1/yr) | ADD _{ing} (mg/kg/day) | Cancer Slope Factor (mg/kg/day) ⁻¹ | Cancer Risk Ing Child | Total Cancer Risk |
|-------------|------------------|---------|--------------------------|--------------------------|--------------------------------|---|-----------------------|---------------------|
| 0.0105 | 1 | 6 | 0.058823529 | 0.01428571 | 5.29412E-05 | 1.5 | 0.000079 | 2 x10 ⁻⁴ |
| 0.115 | 1 | 6 | 0.058823529 | 0.01428571 | 0.000579832 | 1.5 | 0.00087 | 2x10 ⁻³ |

Ingestion, child/adult, aged 6-30 years

| [Conc] mg/L | Ing rate (mg/L) | ED (yr) | 1/BW _c (1/kg) | 1/At _c (1/yr) | ADD _{ing} (mg/kg/day) | Cancer Slope Factor | Cancer Risk Ing Child/Adult |
|-------------|-----------------|---------|--------------------------|--------------------------|--------------------------------|---------------------|-----------------------------|
| 0.0105 | 2 | 24 | 0.0125 | 0.01428571 | 0.00009 | 1.500000000 | 0.000135 |
| 0.115 | 2 | 24 | 0.0125 | 0.01428571 | 0.000985714 | 1.500000000 | 0.001478571 |

WHERE:

- ADD_{ing} = Average daily dose from ingestion
AT_{nc} = Averaging time for noncancer risk: 6 years
AT_c = Averaging time for cancer risk: 70 years
B_{wc} = Child 50th %tile body weight for age 1-6 yrs; 17 kg (ATSDR 2010);
[Conc] = Median concentration, arsenic: 10.5ug/L, Maximum, 115 ug/L
CSF = Cancer slope factor, arsenic: 1.5 (mg/kg/day)⁻¹ (IRIS 1993)
ED = Exposure duration; 6 years
HI = Hazard index
Ing Rate = Ingestion rate, child: 1L/day, adult: 2L/day
RfD = EPA reference dose arsenic; 3E-4 mg/kg/day (IRIS 1993),
Risk_{AS} = Cancer risk from ingestion exposure to arsenic