

Arsenic Exposure Investigation Bruni, Webb County, Texas

July 7, 2017



TEXAS
Health and Human
Services

Table of Contents

Purpose	1
Background	1
Biological Sampling	2
Data Analysis	3
Biological Sampling Results	3
Private Well Water Sampling	5
Discussion	6
Limitations	7
Conclusions	7
Recommendations	8
Actions Planned	8
Authors and Technical Advisors	9
Acknowledgements	9
References	10
Appendix A	12
Appendix B	13
Attachment A	15
Attachment B	18
Attachment C	22
Attachment D	25
Attachment E	27
Attachment F	32

Purpose

The Texas Department of State Health Services (DSHS) conducted an exposure investigation on July 8, 2016 through July 11, 2016 in Bruni, Texas to evaluate residents for possible exposure to arsenic in their drinking water. Total and inorganic urinary arsenic levels were measured in 81 residents (12 of these residents were under 20 years of age).

The primary objectives of this investigation were to:

- Provide residents of Bruni with an assessment of their current exposure to arsenic through confidential and independent laboratory testing of their urine.
- If required, provide individuals with recommendations on how to reduce their exposure.
- Determine if participants' results were greater than arsenic levels found in the general population of the U.S.
- Provide aggregate summary results (not linked to any one individual) to help with the broader efforts in the community to reduce potential health risks.

A full list of acronyms and abbreviations used in this report are included in Appendix B.

Background

Bruni, Texas is located in Webb County on State Highway 359. Bruni has a population of 379 persons, with 89% describing themselves as being of Hispanic origin [1]. The main source of residential drinking water is supplied by the Bruni Rural Water Supply Corporation (BRWSC), which provides water to 216 connections [2].

Some residents of Bruni were concerned about arsenic exposure because their drinking water has had the highest levels of arsenic in the state for the past six consecutive years [3]. Arsenic levels in the BRWSC ranged from 26 micrograms per liter ($\mu\text{g/L}$) to 103 $\mu\text{g/L}$. These levels are consistently above the U.S. Environmental Protection Agency's (EPA) maximum contaminant level (MCL) for arsenic in drinking water of 10 $\mu\text{g/L}$ [3,4]. A table showing the arsenic levels by year is included in Appendix A.

Exposure Investigation Design

Prior to conducting the investigation, DSHS took measures to ensure that the safety, confidentiality, rights, and welfare of the people involved were protected. The protocol was reviewed and approved by the DSHS Institutional Review Board (IRB).

Arsenic can be measured in blood, hair, fingernails, and urine. Measurement of arsenic in blood is not considered to be a reliable indicator of chronic exposure to low levels of arsenic because arsenic is cleared from the blood within a few hours [5]. Because of large inter-individual variability and potential contamination from other sources, nail and hair samples also are not considered to be reliable indicators [5]. Urine arsenic is considered to be the most reliable method for measuring exposure to arsenic – particularly exposures occurring within a few days of the specimen collection [5]. Fluctuations in urine excretion rates make a 24-hour collection the optimal sample. However, the difficulties associated with collecting a 24-hour sample have resulted in the use of a first morning void or a random spot sample in

most exposure investigations. In past studies, first morning void urine results have correlated well with 24-hour results [5].

Additionally, because ingested arsenic primarily leaves the body in the urine, generally within a few days following exposure, DSHS tested resident's urine as an indicator of recent exposure [6]. DSHS offered free urine testing to all adults and children who reside in Bruni. Participants were recruited through letters (Attachment A) sent to households identified by the U.S. Postal Service as having a Bruni, Texas mailing address. Of the 141 households recruited, DSHS tested urine from 81 participants, representing 32% of the households with a Bruni address. Of the 81 participants, 46 (57%) were female, 12 (15%) were under 20 years of age, and 73 (90%) were Hispanic or Latino.

A brief questionnaire (Attachment B) was completed with each participant at the time he/she came in to pick up the urine-sampling supplies. The questionnaire asked participants questions pertaining to: 1) their source of tap water, 2) their primary water source for drinking, cooking, and making ice, and 3) other possible sources of exposure to arsenic, such as smoking, gardening, hobbies, and pesticides.

Each participant signed a consent form (Attachment C) outlining the purpose of the investigation, the procedures involved, the expected time commitment, any reasonable foreseeable risks or discomforts, potential benefits to the participant or to others, how their information will be kept confidential, and who they may contact with any questions or concerns regarding the consent form or the specimen collection procedures.

In addition, DSHS collected water samples from five private wells to determine arsenic levels. Prior to sampling, property owners were asked to sign an access agreement form allowing DSHS staff to enter the premises for sample collection (Attachment D).

Biological Sampling

Biological samples were collected using approved procedures and materials. Sterile 120 milliliter (ml) urine specimen cups and specimen collection instructions were supplied to participants. Participants were asked to collect the first morning void and place the sample in the freezer until it could be delivered to DSHS at the local community center. Upon receipt, DSHS froze any urine samples that were not frozen. DSHS staff delivered the frozen samples to the DSHS Chemical Threat Laboratory in Austin, Texas for analysis. Confidentiality and chain-of-custody was maintained throughout sample collection and delivery.

Data Analysis

The urine samples were analyzed using the DSHS Laboratory Service Section Chemical Threat high performance liquid chromatography-inductively coupled plasma-mass spectrometry (LC-ICP-MS) speciation method. This method separates and measures the different types of arsenic, including inorganic and organic compounds and arsenic metabolites. Urine creatinine also was analyzed to adjust for differences in urine output and the state of hydration (the amount of water in the subject's urine). This is a standard practice in medicine when presenting urine test results. Test results were reported as micrograms of arsenic per liter ($\mu\text{g/L}$) and as micrograms of arsenic per gram of creatinine ($\mu\text{g/g}$ creatinine).

Results for creatinine-corrected total arsenic and inorganic arsenic were compared to 2011-2012 National Health and Nutrition Examination Survey (NHANES) 95th percentile values [7]. Ninety-five percent of the general population of the U.S. is estimated to have urinary arsenic concentrations at or below the NHANES 95th percentile value. In addition, participants' total urine arsenic results were compared to a clinical reference interval [8]. The clinical reference interval is the range of values used by healthcare professionals to interpret test results for a particular patient. There is no clinical reference interval for inorganic arsenic.

Fisher's exact test was used to determine if those reporting consumption of tap water (with or without a filter) were more likely to have urinary arsenic concentrations greater than the NHANES 95th percentile value. Fisher's exact test is a statistical test used to determine if the proportion of people with an outcome in one group is the same as the proportion of people with that outcome in another group. Wilcoxon rank sum test was used to compare median arsenic values between those reporting tap water consumption and those reporting exclusive bottled water consumption. This test is used to compare the distribution of an outcome (in this case, urinary arsenic concentrations) between two groups.

Biological Sampling Results

Individual test results and an explanation of their meaning were provided to each of the participants in writing (Attachment E). Recommendations for follow-up actions were made based on individual results. In accordance with state and federal confidentiality laws, individual test results were not made available to the general public.

Arsenic was detected in 100% of the 81 urine samples analyzed. Total arsenic levels for the 81 participants ranged from less than 1 to 117 $\mu\text{g/L}$. The median total arsenic level was 13 $\mu\text{g/L}$. Total arsenic levels after creatinine correction ranged from less than 1 to 106 $\mu\text{g/g-creatinine}$, with a median concentration of 12 $\mu\text{g/g-creatinine}$.

Inorganic arsenic levels for the 81 participants ranged from less than the level of detection¹ (<LOD) to 115.3 $\mu\text{g/L}$. The median inorganic arsenic level was 12.2 $\mu\text{g/L}$. Inorganic arsenic levels after creatinine

¹ The level of detection is the lowest quantity or concentration of a component that can be reliably detected with a given laboratory method. For this investigation method the level of detection is 0.02 $\mu\text{g/L}$.

correction ranged from <LOD to 105.7 µg/g-creatinine, with a median concentration of 11.0 µg/g-creatinine (Table 1).

	Unit	Min	Max	Median ^d (95% Confidence Interval)
Total arsenic	µg/L ^a	<1	116.9	13.1 (6.4-21.7)
	µg/g-c ^b	<1	105.7	12.0 (8.2-18.5)
Inorganic arsenic	µg/L	<LOD ^c	115.3	12.2 (6.4-21.0)
	µg/g-c	<LOD	105.7	11.0 (7.7-18.1)

^a µg/L = micrograms arsenic per liter urine

^b µg/g-c = micrograms inorganic arsenic per gram creatinine

^c LOD = Level of Detection, the lowest quantity or concentration that a component can be reliably detected by a given laboratory method.

^d median is the value that lies in the middle of a list of numbers

Seventeen participants' (21%) total creatinine-corrected urinary arsenic concentrations were greater than 35 µg/g-creatinine, the clinical reference value, and 8 (10%) had total creatinine-corrected urinary arsenic concentrations greater than the 2011-2012 NHANES 95th percentile value of 50 µg/g-creatinine. As stated previously, there is no clinical reference value for inorganic arsenic levels, and 29 (36%) had urinary inorganic arsenic concentrations greater than the 2011-2012 NHANES 95th percentile value of 20 µg/g-creatinine (Table 2).

	Clinical reference interval	95 th Percentile	Number of samples above the reference values	
			Clinical reference interval	95 th Percentile
Total arsenic	<35 µg/g-c ^a	50 µg/g-c	17 (21%)	8 (10%)
Inorganic arsenic	Not available	19 µg/g-c	N/A	29 (36%)

^a µg/g-c = micrograms inorganic arsenic per gram creatinine

Of the 81 people who were tested, more than 93% reported that the BRWSC water was the source of their tap water, and the remaining residents reported a private well as their source of tap water. Fifty-two participants (64%) reported that they consume the tap water (Table 3). Twenty-seven participants (33%) use tap water to make ice, 41 (51%) eat food cooked with tap water, and 20 (25%) drink tap water (tap water uses are not mutually exclusive). With respect to other possible routes of exposure to arsenic, 7 (9%) people reported that they currently use tobacco products, 10 (12%) people reported that they have contact with chemicals, including pesticides, and 15 (19%) reported eating seafood in the 3 days prior to the urine test.

The median creatinine-corrected total and inorganic-related arsenic concentrations among those that consume tap water were 24 µg/g-creatinine and 20 µg/g-creatinine, respectively (Table 3). Among those that said they never consume tap water, median creatinine-corrected total and inorganic-related arsenic concentrations were both 2.9 µg/g-creatinine.

Participants that reported consumption of tap water had significantly higher median concentrations of creatinine-corrected total arsenic ($p < 0.0001$) and inorganic-related arsenic ($p < 0.0001$) than those who said they never used tap water for consumption (Table 3). They were also more likely to have creatinine-corrected total urinary arsenic concentrations greater than the clinical reference value ($p = 0.0003$) and inorganic-related urinary arsenic concentrations above NHANES 95th percentile values ($p = 0.02$; results not shown to protect participant confidentiality). There was no difference between adults and children or males and females.

Table 3. Comparison of median urinary arsenic concentrations by tap water use

	Does not consume tap water (n=29)		Consumes tap water (n=52)		p-value ^c
	Median ^a (95% CI) ^b	Min-Max	Median (95% CI)	Min-Max	
Total urinary arsenic ($\mu\text{g/g-creatinine}$)	2.9 (2.6-6.7)	<1-46.8	24.2 (12.9-30.3)	2.2-105.7	<0.0001
Urinary Inorganic-related species ($\mu\text{g/g-creatinine}$)	2.9 (2.6-5.7)	<LOD ^d -40.4	19.9 (12.9-29.2)	2.2-105.7	<0.0001

^a median is used to predict the most likely outcome

^b CI = confidence interval

^c Calculated using Wilcoxon Rank Sum test

^dLOD = Level of Detection, the lowest quantity or concentration that a component can be reliably detected by a given laboratory method.

Private Well Water Sampling

The water samples obtained from properties with private wells were collected from either a sink faucet within the home or from an outdoor faucet located near the well head. Water was allowed to flow at high volume for approximately 1 minute and then reduced to minimum volume before collecting the sample. The water samples were collected in sterile 1 Liter (L) containers and refrigerated. They were delivered to the DSHS Chemical Threat Laboratory in Austin, Texas for analysis. The water samples were analyzed for arsenic using EPA method 200.8 [9].

Two properties indicated that they had systems in place to filter water coming into the home. For these homes DSHS collected samples both pre- and post-filtration to determine the filters capability of removing arsenic.

Water Sampling Results

Individual water test results and an explanation of their meaning were provided to the participants in writing (Attachment F). The results of the well water samples were compared to the MCL. All five of the water samples that were collected with no filtration exceeded the MCL. The results ranged from 30 µg /L to 90 µg/L (Table 4).

Contaminant	Level of Detection ^a	Range	Number detected	MCL ^b	Number above MCL
Arsenic no filtration or pre-filtration ^c	2.0 µg/L ^d	30 - 90 µg/L	5	10 µg/L	5

^a LOD = Level of Detection, the lowest quantity or concentration that a component can be reliably detected by a given laboratory method.

^b MCL = Maximum Contaminant Level, the maximum legal amount of a chemical that is allowed in public drinking water under the Federal Safe Drinking Water Act.

^c This includes all water samples that did not pass through a filtration system prior to collection.

^d µg/L = micrograms arsenic per liter water

Discussion

Arsenic is a naturally occurring element in the earth’s crust; it is usually found in combination with other elements. Arsenic compounds can be classified into three main groups: 1) inorganic arsenic compounds, 2) organic compounds, and 3) arsine gas. In the environment, arsenic is most often found as inorganic arsenic, which is formed when arsenic combines with other elements such as oxygen, sulfur, and chlorine. Organic forms of arsenic, which result when arsenic combines with carbon and hydrogen, generally are considered less toxic than the inorganic forms [5].

The presence of chemical contaminants in the environment does not always result in people being exposed. People may be exposed to chemicals by breathing, eating, drinking, or by getting a substance on their skin. The degree to which arsenic compounds can be detected in urine depends on the concentration of the contaminant in the environment, the amount of contaminant that a person ingests, and how often ingestion occurs. The presence of contaminants in the public water supply is what drove this investigation.

All of the participants tested in this investigation had detectable levels of total arsenic in their urine. Having detectable levels of arsenic in the body is common since arsenic is found naturally in the environment, including the air, water, and food [6]. Foods such as fish, shellfish, beans, and rice are common sources of the organic forms of arsenic and can cause higher than normal urinary total arsenic levels.

Clinical reference levels for interpreting urinary inorganic arsenic levels do not exist; however, eight (10%) and 29 (36%) of the participants had total and inorganic creatinine corrected urinary arsenic levels greater than 95% of the U.S. population², respectively. This investigation also shows that

² According to 2011-2012 NHANES 95th percentile value of 50.4 µg/g-creatinine for total, and 19.6 µg/g-creatinine for inorganic arsenic

participants who indicated that they drink tap water were statistically significantly more likely to have urinary inorganic arsenic levels greater than those who said they never used tap water for consumption. Collectively, these results suggest that the drinking water in Bruni is a source of arsenic exposure.

Limitations

Limitations of this investigation include:

- The health effects associated with arsenic exposure cannot be determined.
- Arsenic has a short half-life in the body (hours); therefore, the levels found in the body only represent recent exposures.
- Participants were a self-selected sample of the Bruni population; results may not be generalizable to the entire Bruni population.
- The results are based on a one time sampling event.

Conclusions

According to the information collected during this investigation,

1. For the majority of the participants, the levels of arsenic measured in urine were similar to those measured in the general U.S. population.
2. Approximately 35% of the participants had urinary inorganic arsenic levels that were higher than those found in other non-occupationally exposed populations.
3. Individuals reporting tap water consumption had significantly higher median concentrations of total arsenic and inorganic-related arsenic than those who said they never used tap water for consumption, suggesting that consumption of water is a source of arsenic.
4. Water samples collected from the five private wells had arsenic levels above the MCL.
5. Arsenic above the MCL has been documented consistently in the BRWSC.
6. Consumption, including cooking of unfiltered tap water, is not recommended in the Bruni area.

Recommendations

Based upon the results of this investigation DSHS recommends that:

1. Individuals with inorganic arsenic levels greater than 19.6 µg/g-creatinine consult with their personal physician to determine if further testing is warranted.
2. Households connected to the BRWSC use bottled water or properly filtered water for consumption.
3. All individuals discuss their urine arsenic level results with a personal health care provider. Participants of this investigation and/or their health care providers may discuss their results with DSHS by sending an email to epitox@dshs.texas.gov with Bruni EI in the subject line, and their specific request in the body of the message.
4. The BRWSC continue its efforts to reduce the arsenic levels in the public water supply system.
5. Well water with arsenic exceeding the MCL not be used for drinking or food preparation. Private well owners should consider an alternative drinking water source, such as bottled water, or using a water filtration system that is able to remove arsenic.
6. Private well owners with a filtration system in place ensure that the system is properly well-maintained and that filters are routinely changed to prevent breakthrough of arsenic in the drinking water.

Actions Planned

1. This report will be available to participants, citizens, the Bruni Rural Water Supply Corporation, the Texas Commission on Environmental Quality (TCEQ), and other interested parties through hard copies and the DSHS website.
2. DSHS will work with TCEQ to address the issue of arsenic in the public drinking water supply.
3. DSHS will continue to answer community questions regarding this investigation. Questions regarding this document should be sent to epitox@dshs.texas.gov with Bruni EI in the subject line.

Authors and Technical Advisors

Heidi Bojes, PhD
Section Director, Toxicologist
Environmental & Injury Epidemiology and Toxicology
Texas Department of State Health Services

Tina Walker
Health Educator
Environmental & Injury Epidemiology and Toxicology
Texas Department of State Health Services

Emily Hall
Epidemiologist
Environmental & Injury Epidemiology and Toxicology
Texas Department of State Health Services

Acknowledgements

Technical assistance provided by

Leticia Nogueira, PhD,
Unit Director
Environmental & Injury Epidemiology and Toxicology
Texas Department of State Health Services

Jocelyn Hover-Jeansonne, Chemist
Chemical Threat Team Lead
Chemical Threat Laboratory
Texas Department of State Health Services

DSHS staff that assisted in sample collection include Tom Ellerbee, Josh Duty, Diana Rangel, Sandra Hernandez, and Chandi Jaggi (Texas A&M Intern).

References

1. US Census:
<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF> MCL.
2010.
2. Texas Commission on Environmental Quality, Texas Drinking Water Watch.
http://dww2.tceq.texas.gov/DWW/JSP/DataSheet.jsp?tinwsys_is_number=6376&tinwsys_st_code=TX&wsnumber=TX2400003 &DWWState=TX&begin_date=&end_date=&counter=
3. Texas Commission on Environmental Quality, Texas Drinking Water Watch.
http://dww2.tceq.texas.gov/DWW/JSP/Violations.jsp?tinwsys_is_number=6376&tinwsys_st_code=TX&wsnumber=TX2400003 &DWWState=TX
4. Federal Register. Part VIII Environmental Protection Agency, 40 CFR Parts 9, 141, and 142 National Primary Drinking Water Regulations; Arsenic Clarifications to Compliance and New Source Contaminants Monitoring; Final Rule. Vol. 66, No. 14/Monday, January 22, 2001 / Rules and Regulations.
5. Kalman DA et al. The Effect of Variable Environmental Arsenic Contamination on Urinary Concentrations of Arsenic Species. Environ Health Perspect 1990; 89:145-51.
6. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Arsenic. Atlanta: US Department of Health and Human Services, August 2007.
7. National Health and Nutrition Examination Survey (NHANES) conducted by the Centers for Disease Control and Prevention (CDC).
8. Wu AHB. Tietz Clinical Guide to Laboratory Tests. 4th ed. St. Louis: WB Saunders; 2006.
9. U.S. EPA, Method 200.8, Revision 5.4: Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma – Mass Spectrometry.
https://www.epa.gov/sites/production/files/2015-08/documents/method_200-8_rev_5-4_1994.pdf

Appendices

Appendix A

The Bruni Rural Water Supply Corporation (BRWSC) historically has had levels of arsenic that exceeded the U.S. Environmental Protection Agency’s (EPA) maximum contaminant level (MCL) for arsenic in drinking water of 10 micrograms per liter (µg/L). Arsenic levels in the BRWSC ranged from 26.0 micrograms per liter (µg/L) to 103 µg/L from 2011 through 2016 as noted in the table below.

Arsenic levels in Bruni Rural Water Supply Corporation						
Year	2011	2012	2013	2014	2015	2016
*All levels are shown in micrograms per liter (µg/L)						
Range of arsenic levels	70 - 103 µg/L	74 - 95 µg/L	26 - 93 µg/L	40 – 96 µg/L	66 - 92 µg/L	56 – 93 µg/L
Average yearly arsenic levels	86 µg/L	88.4 µg/L	64.1 µg/L	72.2 µg/L	78.7 µg/L	80.5 µg/L

Appendix B

Acronyms and Abbreviations

BRWSC	Bruni Rural Water Supply Corporation
CI	Confidence interval
DSHS	Texas Department of State Health Services
EPA	U.S. Environmental Protection Agency
ICP-MS	Inductively coupled plasma mass spectrometer
IRB	Institutional Review Board
L	Liter
<LOD	Less than the level of detection
MCL	maximum contaminant level
µg/L	micrograms per liter
µg/g-creatinine	micrograms per gram creatinine
mL	milliliter
NHANES	National Health and Nutrition Examination Survey
PWS	Public Water Supply
TCEQ	Texas Commission on Environmental Quality

Attachments

Attachment A
Investigation Recruitment Letter



Free Urine Testing for Bruni, Texas Residents

July 8-11, 2016

In response to concerns about exposure to naturally occurring arsenic in drinking water, staff from the Texas Department of State Health Services (DSHS) will be conducting **free urine testing** July 8th through July 11th, 2016 in your area. The DSHS laboratory will test the samples for arsenic only. Information from the testing will help DSHS identify whether further public health recommendations are needed to help residents reduce their exposure to arsenic.

DSHS will offer **free urine testing** for arsenic to any resident of Bruni that would like to be tested. To participate, come by the Bruni Community Center on the dates and times listed below. No appointment is necessary. When you arrive, DSHS staff will provide you with a specimen collection cup and instructions. Urine samples must be provided to DSHS staff prior to the Bruni Community Center closing on July 11th. During this time you will also be asked to complete a brief questionnaire.

Bruni Community Center

303 12th Street

Bruni, Texas 78344

Friday, July 8th – 10:00 am - 7:00 pm

Saturday, July 9th – 10:00 am - 7:00 pm

Sunday, July 10th – 10:00 am - 7:00 pm

Monday, July 11th – 10:00 am - 7:00 pm

To reach us July 8th – 11th, 2016, please call (512) 981-8397 or (512) 981-8415.

If you have any questions prior to these dates, please send an email to epitox@dshs.texas.gov or call Tina Walker or Diana Rangel with the Health Assessment and Consultation Program.

Tina Walker
Health Educator
1-800-588-1248, ext. 2932

Diana Rangel
Community Liaison
1-800-588-1248, ext. 6572

www.dshs.texas.gov/epitox/assess.shtm



**Análisis de Orina Gratuitos para Los Residents de Bruni, Texas
8 al 11 de Julio del 2016**

En respuesta a la preocupación que existe en la comunidad sobre la exposición al arsénico en el agua potable, el personal del Departamento Estatal de Servicios de Salud de Texas (DSHS, por sus siglas en inglés) estará ofreciendo **exámenes de orina gratuitos** durante el 8 de Julio al 11 de Julio del 2016 en su área para detectar la presencia de arsénico. Los resultados de los análisis le ayudarán a DSHS a identificar si recomendaciones de salud pública son necesarias para reducir la exposición de los residentes al arsénico.

DSHS le ofrecerá **exámenes de orina sin costo** a los residentes de Bruni que gusten participar. Para participar visite el Bruni Community Center durante los horarios indicados en este folleto. Citas no son requeridas. Al llegar, un empleado de DSHS le entregará un recipiente para su muestra con instrucciones sobre la colección de orina. Las muestras tendrán que ser entregadas al personal de DSHS antes que se cierre el Bruni Community Center el 11 de Julio. Al entregar las muestras, se le pedirá que complete un cuestionario breve.

**Bruni Community Center
303 12th Street
Bruni, Texas 78344**

**Viernes, 8 de Julio 10:00 AM – 7:00 PM
Sábado, 9 de Julio 10:00 AM – 7:00 PM
Domingo, 10 de Julio 10:00 AM – 7:00 PM
Lunes, 11 de Julio 10:00 AM – 7:00PM**

Para comunicarse con nosotros durante el 8 de Julio al 11 de Julio del 2016, por favor llame al (512)-981-8397 o (512)-981-8415.

Si tiene preguntas, por favor comuníquese con el Exposure Assessment, Surveillance, and Toxicology Group al o llame a:

Tina Walker
Health Educator
1-800-588-1248, extensión 2932

Diana Rangel
Community Liaison
1-800-588-1248, extensión 6572

Attachment B

Investigation Questionnaire

ID Number: _____

DSHS Staff: _____

Arsenic Investigation Questionnaire

1. First Name: _____ Last Name: _____ MI: _____

2. What is your current address? _____

3. Date of Birth: _____ Sex: Male Female

4. Do you consider yourself Hispanic or Latino? Yes No

5. Race: (circle) White / Black or African-American / Asian / Pacific Islander / Other _____

6. How many years have you lived in Bruni? less than 1 1-5 5-10 more than 10

a. If less than one year, where did you live before (city and state)? _____

7. Best Phone #: _____

8. What is your current occupation? _____

9. How long have you done this type of work? _____

10. Do you have contact with chemicals (including pesticides) at your current job? Yes No

If so, what chemicals? _____

11. What are your hobbies? (e.g. gardening, stained glass, gunsmith, auto repair, etc.) _____

12. Please provide the following information on all individuals currently living in your household.

Full Name	Age	Occupation	Hobbies

Please include any notes on the reverse side

Date:

13. Do you use any of the following tobacco products?

Cigarettes Cigars Snuff Chewing tobacco Other _____

14. Please list any medications you are currently taking (including: over the counter, prescription, vitamins or supplements).

Medication/ Product name and brand	What is it taken for?

15. Do you use any herbal or natural remedies? Yes No If yes, please describe _____

16. What is the source of tap water in your home? Private well Municipal water Unknown
 Other (*specify*) _____

17. What kind of water do you drink? Tap water, unfiltered Tap water, filtered (specify type of filter)
 Bottled water, store bought Bottled water, reusable bottle Other (specify) _____

18. How many glasses of water do you drink per day? _____

19. How many glasses of other types of drinks made with drinking water do you drink per day? (e.g. coffee, tea)? _____

20. What kind of water do you use to make ice? Bottled water, store bought Bottled water, reusable bottle
 Tap water, unfiltered Tap water, filtered (specify type of filter) _____
 Other (specify) _____

21. What kind of water do you use to prepare food?

- Tap water, unfiltered Tap water, filtered (specify type of filter) _____
 Bottled water, store bought Bottled water, reusable bottle Other (specify) _____

22. Have you eaten any of the following foods in the last three days?

- Fish (*specify type*) _____
 Rice Beans

Please include any notes on the reverse side of page

ID # _____

Attachment C
Participant Consent for Urine Specimen Testing



Participant Consent for Urine Specimen Testing Exposure Investigation for Arsenic in Water

The Texas Department of State Health Services (DSHS) is investigating arsenic exposure for people who drink water from the Bruni area.

- We are offering **free, voluntary urine arsenic testing** for residents from the Bruni area.
- Along with the free testing, **exposure information will be collected** with a questionnaire.

This investigation will let you know your own levels of arsenic and will help DSHS identify if public health actions are needed to reduce exposure

Participation

I understand that I will benefit from participating by learning if I (or my child/ward) have recently had elevated exposure to arsenic. If arsenic is detected outside acceptable levels, I will receive information about arsenic exposure and how to reduce current and future exposures.

I understand that my **participation is voluntary**. Furnishing any information is voluntary and even if I agree to participate and sign this form, I can stop my participation or my child's/ward's participation at any time. I understand and agree that there is no provision for compensation or medical treatment offered by DSHS based upon the test results or in the event of injury from participation. I understand that I must sign this form to participate.

Procedure/Tests:

I understand that:

- I am providing a **urine sample to test for arsenic only**.
- A representative of the Texas Department of State Health Services will provide urine specimen cups and instructions to me.
- I understand that I will collect the first urine of the morning in the specimen container.
- I understand that I should deliver the sample to the DSHS staff at the exposure investigation site.

Results

I understand that every effort will be made to provide the results of my tests in writing to me within approximately 2 months. I will receive an actual test result in addition to laboratory reference values with an explanation of their significance. Results that are of immediate health concern will be reported to me as soon as they are known. If my results reveal an elevated value of arsenic, I understand that I should notify my personal physician.

Confidentiality

I understand that confidentiality will be protected to the fullest extent possible according to state and federal laws. Forms containing my name or address will be kept in locked cabinets at the Texas Department of State Health Services. Any reports produced from this investigation will give only group information and not identify specific individuals.

Contact

If I have any additional questions about this investigation or the test, I may contact DSHS at (512) 776-7269.

Consent

The risks and benefits of this exposure investigation have been explained to me. All of my questions have been satisfactorily answered. I hereby freely and voluntarily give my signed consent for participating in the testing described above.

I, (please print) _____, the undersigned, agree to urine sampling and completing questionnaires for:

(____) Myself.

(____) My child/ward, _____, age - _____, ID# _____

(____) My child/ward, _____, age - _____, ID# _____

(____) My child/ward, _____, age - _____, ID# _____

(____) My child/ward, _____, age - _____, ID# _____

(____) My child/ward, _____, age - _____, ID# _____

Signature: _____ Date: _____

Address: _____ Bruni, TX 78344

Phone # _____

Witness: _____ (print name) _____ (signature)

Attachment D
Environmental Investigation Access Agreement



Texas Department of State Health Services Environmental Investigation Access Agreement

Name (please print): _____

Address of property to be sampled: _____

Home Phone#: _____

Cell Phone#: _____

I consent to officers, employees, and authorized representatives of the Texas Department of State Health Services (DSHS) entering and having access to this property for the following purpose:

- Conducting water sampling activities;

I realize that these actions taken by DSHS are undertaken pursuant to its response responsibility under the Health and Safety Code, Title 6, Chapter 503.005; Health Risk Assessments and Title 2, Subtitle H, Chapter 161.0211, subchapter C; Epidemiology or Toxicology Investigations.

This written permission is given by me voluntarily, on behalf of myself and all other co-owners of this property, with knowledge of my right to refuse and without threats or promises of any kind.

Date

Signature

Sample Location Questions:

1. Are you the owner or the tenant of the property? **(please circle one)** If you are the owner, go to #3.
2. If you are the tenant, please write in the owner's name: _____
Go to #3 and write in the owner's address and phone number.
3. If you are the owner but live at a different address, write your address below (this is the address where the sample results will be mailed to, otherwise, the results will be mailed to the address at the top of the page);

Owner's Address: _____

Phone #: _____

I DO NOT authorize access by DSHS at the above-referenced property.

Print Name

Signature

Date

Attachment E
Investigation Results Letters



TEXAS DEPARTMENT OF STATE HEALTH SERVICES

JOHN HELLERSTEDT, M.D.
COMMISSIONER

P.O. Box 149347
Austin, Texas 78714-9347
1-888-963-7111
TTY: 1-800-735-2989
www.dshs.state.tx.us

January 27, 2017

Dear «prefix» «Last_Name»,

You are receiving this letter because you participated in the Bruni, Texas Arsenic Exposure Investigation conducted by the Texas Department of State Health Services (DSHS) from July 8, 2016 through July 11, 2016. DSHS recently determined that the urine arsenic results previously reported to you were not correct. The revised results from your sample are attached to this letter.

DSHS compared the total and inorganic arsenic results from your sample to results found in people throughout the United States (US). Specifically, we looked to see if each result was greater than arsenic levels found in 95% of the US population (the 95th percentile)³ as well as a reference value used by physicians (clinical reference value)⁴. Having a value greater than one or both of the reference values does not mean you will get sick. It does, however, suggest your exposure to arsenic may be higher than most individuals across the US.

If your results are greater than the 95th percentile or the clinical reference value, DSHS recommends you share your results and any health concerns that you have with your physician. You can provide your physician with our contact information prior to your appointment if they have any questions about the test results.

A summary report of our findings is currently being prepared and will be available later this year.

If you have any questions, please contact the Health Assessment and Consultation Program at 1-800-588-1248 or by email at epitox@dshs.texas.gov. Si tiene preguntas o prefiere la información en español, llame a Emily Hall al 1-800-588-1248 extensión 2652.

Sincerely,

Tina Walker
Health Educator
Health Assessment and Consultation Program
Texas Department of State Health Services

³ Based on the 2011-2012 National Health and Nutrition Examination Survey (NHANES) conducted by the Centers for Disease Control and Prevention.

⁴ From the *Tietz Clinical Guide to Laboratory Tests*, 2006.

Arsenic is a chemical element that exists in several different organic and inorganic forms. Inorganic arsenic compounds are found in soils, groundwater, and some foods, and are considered more toxic than organic arsenic compounds.

For this investigation DSHS looked at total and inorganic arsenic levels in your urine sample.

Total arsenic includes all inorganic and organic arsenic compounds found in your sample.

Inorganic arsenic includes inorganic arsenic compounds and their related metabolites.

The table below gives the total arsenic and inorganic arsenic levels detected in your urine sample.

Urine Sample Results^a

Contaminant	Your Result	Clinical Reference Value ^b	95 th Percentile ^c	Range of Arsenic Levels in the 81 Bruni Participants
Total Arsenic	«Total_as_1 abcalc_cc»	<35.0 µg/g-creatinine	50.4 µg/g-creatinine	<1.0 – 105.7 µg/g-creatinine
Inorganic Arsenic ^d	«Total_inor ganic_labcal c_cc»	Not available	19.6 µg/g-creatinine	<LOD ^e – 105.7 µg/g-creatinine

^a. Results are expressed as micrograms of arsenic per gram creatinine (µg/g-creatinine). Standardizing the results per gram creatinine is a standard practice in medicine when presenting urine test results.

^b. The clinical reference value is from the *Tietz Clinical Guide to Laboratory Tests*, 2006, and is typically used in clinical settings. There is no clinical reference interval for inorganic arsenic.

^c. 95th percentiles are from the 2011-2012 National Health and Nutrition Examination Survey (NHANES) conducted by the Centers for Disease Control and Prevention.

^d. Inorganic arsenic results include laboratory results for inorganic arsenic compounds (arsenous acid and arsenic acid), and their related metabolites (dimethylarsinic acid [DMA] and monomethylarsonic acid [MMA]).

^e. <LOD = less than limit of detection

Having a value greater than one or both of the reference values does not mean you will get sick. It does, however, suggest your exposure to arsenic may be higher than most individuals across the US.

If your **total arsenic** and/or **inorganic arsenic** results are above the respective reference value, DSHS recommends that you share your results and any health concerns that you have with your physician.

If you have any questions, please contact the Health Assessment and Consultation Program at 1-800-588-1248 or by email at epitox@dshs.texas.gov.



TEXAS DEPARTMENT OF STATE HEALTH SERVICES

JOHN HELLERSTEDT, M.D.
COMMISSIONER

P.O. Box 149347
Austin, Texas 78714-9347
1-888-963-7111
TTY: 1-800-735-2989
www.dshs.state.tx.us

January 27, 2017

Dear «parent_prefix» «parent_last_name»,

You are receiving this letter because your child, «First_Name» «Last_Name», participated in the Bruni Arsenic Exposure Investigation conducted by the Texas Department of State Health Services (DSHS) from July 8, 2016 through July 11, 2016. DSHS recently determined that the urine arsenic results previously reported to you were not correct. The revised results from your child's sample are attached to this letter.

DSHS compared the total and inorganic arsenic results from your child's sample to results found in people throughout the United States (US). Specifically, we looked to see if each result was greater than arsenic levels found in 95% of the US population (the 95th percentile)⁵ as well as a reference value used by physicians (clinical reference value)⁶. Having a value greater than one or both of the reference values does not mean your child will get sick. It does, however, suggest their exposure to arsenic may be higher than most individuals across the US.

If your child's results are greater than the 95th percentile or the clinical reference value, DSHS recommends you share their results and any health concerns that you have with your child's physician. You can provide your child's physician with our contact information prior to their appointment if they have any questions about the test results.

A summary report of our findings is currently being prepared and will be available later this year.

If you have any questions, please contact the Health Assessment and Consultation Program at 1-800-588-1248 or by email at epitox@dshs.texas.gov. Si tiene preguntas o prefiere la información en español, llame a Emily Hall al 1-800-588-1248 extensión 2652.

Sincerely,

Tina Walker
Health Educator
Health Assessment and Toxicology Program
Texas Department of State Health Services

⁵ Based on the 2011-2012 National Health and Nutrition Examination Survey (NHANES) conducted by the Centers for Disease Control and Prevention.

⁶ From the *Tietz Clinical Guide to Laboratory Tests*, 2006.

Arsenic is a chemical element that exists in several different organic and inorganic forms. Inorganic arsenic compounds are found in soils, groundwater, and some foods, and are considered more toxic than organic arsenic compounds.

For this investigation DSHS looked at total and inorganic arsenic levels in your urine sample.

Total arsenic includes all inorganic and organic arsenic compounds found in your sample.

Inorganic arsenic includes inorganic arsenic compounds and their related metabolites.

The table below gives the total arsenic and inorganic arsenic levels detected in your urine sample.

Urine Sample Results^a

Contaminant	Your Result	Clinical Reference Value ^b	95 th Percentile ^c	Range of Arsenic Levels in the 81 Bruni Participants
Total Arsenic	«Total_as_labcalc_cc»	35.0 µg/g-creatinine	50.4 µg/g-creatinine	<1.0 – 105.7 µg/g-creatinine
Inorganic Arsenic ^d	«Total_inorganic_labcalc_cc»	Not available	19.6 µg/g-creatinine	<LOD ^e – 105.7 µg/g-creatinine

^f Results are expressed as micrograms of arsenic per gram creatinine (µg/g-creatinine). Standardizing the results per gram creatinine is a standard practice in medicine when presenting urine test results.

^g The clinical reference value is from the *Tietz Clinical Guide to Laboratory Tests*, 2006, and is typically used in clinical settings. There is no clinical reference interval for inorganic arsenic.

^h 95th percentiles are from the 2011-2012 National Health and Nutrition Examination Survey (NHANES) conducted by the Centers for Disease Control and Prevention.

ⁱ Inorganic arsenic results include laboratory results for inorganic arsenic compounds (arsenous acid and arsenic acid), and their related metabolites (dimethylarsinic acid [DMA] and monomethylarsonic acid [MMA]).

^j <LOD = less than limit of detection

Having a value greater than one or both of the reference values does not mean you will get sick. It does, however, suggest your exposure to arsenic may be higher than most individuals across the US.

If your **total arsenic** and/or **inorganic arsenic** results are above the respective reference value, DSHS recommends that you share your results and any health concerns that you have with your physician.

If you have any questions, please contact the Health Assessment and Consultation Program at 1-800-588-1248 or by email at epitox@dshs.texas.gov.

Attachment F
Investigation Well Water Results Letter



TEXAS DEPARTMENT OF STATE HEALTH SERVICES

JOHN HELLERSTEDT, M.D.
COMMISSIONER

P.O. Box 149347
Austin, Texas 78714-9347
1-888-963-7111
TTY: 1-800-735-2989
www.dshs.state.tx.us

September 13, 2016

Re: Arsenic Water Testing – Results

Dear Mr.

On July 11, 2016, staff from the Texas Department of State Health Services (DSHS) collected a water sample from your residence at _____, Bruni, Texas. The water sample was analyzed for arsenic by the DSHS Laboratory, Austin, Texas.

The analysis indicates that your water sample has an arsenic concentration of _____ milligrams per liter (mg/L).

The water sample result was compared to the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL). The MCL is the maximum concentration of a substance that is allowed in public drinking water systems under the Safe Drinking Water Act. The current MCL for arsenic is 0.01 mg/L.

The water sample result indicates that the level of arsenic in your well water exceeds the MCL. Due to the potential health risks associated with the ingestion of arsenic, DSHS recommends you do not use your water for drinking or food preparation when the arsenic levels are above the MCL. However, at these levels, we do not expect adverse health effects to occur when using the water for bathing and other personal hygiene needs.

If you have any questions, please contact me at 1-800-588-1248 or tom.ellerbee@dshs.texas.gov.

Sincerely,

Tom Ellerbee
Health Assessor
Health Assessment and Consultation Program
Texas Department of State Health Services