

Appendix

1. Health effects from chronic arsenic ingestion.
2. Arsenic exposure dose equations
3. Sampling Consent Form

Health Effects from Chronic Arsenic Ingestion

One of the most common effects of both acute and long-term arsenic ingestion is a pattern of skin changes, including changes in skin pigmentation (hyperpigmentation, interspersed with small areas of hypopigmentation of the face, neck, and back), generalized hyperkeratosis, or thickening of the skin, and formation of hyperkeratotic warts on the palms and soles. These effects are most often reported at chronic dose levels ranging from about 0.01 to 0.1 mg/kg-day.

Human studies document gastrointestinal irritation from chronic oral exposure to arsenic at dose levels of about 0.01 mg/kg-day and above. Symptoms include nausea, diarrhea, and vomiting. Damage to the liver and elevated levels of hepatic enzymes are reported at dose levels of 0.01 to 0.01 mg/kg-day. Hematological effects, including anemia, have been documented at chronic oral exposures of 0.05 mg/kg-day and above. Neurological effects, including peripheral neuropathy and numbness in hands and feet, possibly developing into a painful “pins and needles” sensation, are reported at chronic oral doses of 0.03-0.01 mg/kg-day.

Cardiovascular effects include cardiac arrhythmia and myocardial depolarization. A serious vascular condition called Blackfoot disease is endemic in an area of Taiwan where residents are exposed to arsenic in drinking water from about 0.014-0.065 mg/kg-day. Studies in a Chile report indicate that consumption of drinking water doses of 0.02-0.06 mg/kg-day increases in the incidence of Raynaud’s disease and cyanosis of the fingers and toes (ATSDR 2000).

Arsenic has been classified as a human carcinogen by the U.S. Environmental Protection Agency (EPA), the National Toxicology Program (NTP), and the International Agency for Research on Cancer (IARC). Reports indicate that arsenic in drinking water increases the risk of skin, liver, bladder, kidney, lung, and prostate cancer. Studies suggest that cancer effects might occur following long-term exposure (ATSDR 2000).

Exposure Dose Equations

ADHS estimated exposure doses for persons living in the New River area. The doses were estimated using the following equations:

Ingestion of chemicals in water:

$$\underline{CDI = CW \times IR \times EF \times ED}$$

$$\underline{BW \times AT}$$

CDI: chronic daily intake (mg/kg-day)

CW: concentration in water (mg/L)

IR: intake rate (L/day)

EF: exposure frequency (days/yr)

ED: exposure duration (yrs)

BW: body weight (kg)

AT: Averaging time (days)

Variable Assumptions	Adults	Children
IR (ingestion, water):	2	1
EF:	350	350
ED:	30	6
BW:	70	15
AT:	10950	2190

Water Intake Rate for Tooth brushing

Fluoride concentration: 1 mg/ ml water*

Estimated fluoride ingestion: 0.3 mg/ brushing*

Estimated water intake: 0.3 ml/ brushing x 2 brushings = 0.6ml/day

Barnhart et al. 1974

Consent Form for Water Sampling New River/Cave creek area

We would like to invite you to help in a study to find out if you have been exposed to arsenic. The Arizona Department of Health Services (ADHS) is offering free well water testing. Testing is free for residents living in the areas with high arsenic levels in water. By joining in this testing you will know the amount of arsenic or other materials in your well. This will help ADHS to determine if any help is needed. The time it will take for ADHS to do the testing will about 30 minutes.

Benefits

I understand that I will benefit by learning if there is arsenic or other materials in my well water. If high levels of arsenic or other materials are found in my well water, I will receive information on how to reduce exposure.

Risks

There are no risks in joining in the testing portion of this study.

Procedure/Tests:

A member of ADHS will take water samples from the faucet that I choose.

Participation

I understand that my giving a water sample is not required. Giving any information is voluntary and even if I agree to participate and sign this form, I can stop at any time. I understand that I must sign this form to have my water tested.

Results

I understand every effort will be made to send the results of my tests in writing to me within 2 months. Results that are of importance will be reported to me as soon as they are available.

Confidentiality

All personal information will be protected by law. Any reports will give only group information and not identify individuals. I understand that if I have my water tested, any forms with my name or address will be kept locked in cabinets at ADHS. Test results may be shared with other federal, state, and local public health and environmental agencies. These agencies must also protect this confidential information.

Contact

If I have any additional questions or if I feel I have been harmed by this investigation or the testing, I may contact: Brian Hasty of ADHS at (602) 230 5801.

Consent

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

I, (print) _____, agree to have my well water sampled for arsenic and other materials.

Signature: _____

Date: _____

Address: _____

Street

City

State

Zip code

Phone #: _____

Witness:

(Print name)

(Signature)