



Arsenic

Health Effects and Reducing Exposure



Learning Objectives

- Describe characteristics and identify sources of arsenic
- Discuss health effects of arsenic
- Determine actions for reducing exposures to arsenic



Description

- Naturally occurring heavy metal found in earth's crust
- White to light gray powder
- Found at 1014 National Priority List sites, or “Superfund” sites



Uses

- Medications
 - Fowler's and Pearson's Solutions
 - Treatment of psoriasis and asthma
- Wood preservative to prevent rot and insect damage
- Pesticides – insecticides, fungicides, herbicides
- Ceramic enamels, glass, and fireworks

How Are We Exposed?

Ingestion

- Drinking water
- Food grown in contaminated soil

Inhalation

- Dust from sanding
- Smoke from burning arsenic treated wood

Workplace

- Mining
- Metal processing by-product
- Burning fossil fuels



Health Effects: Cancer

- Lung cancer
- Liver cancer
- Bladder cancer
- Renal cancer
- Prostate cancer
- Skin cancer
- Childhood leukemia



Loyola University Medical
Education Network

Health Effects: Cardiac



Loyola University Medical
Education Network

- Ischemic heart disease
- High blood pressure
- Vascular disease (Blackfoot disease)
- Anemia (low red blood cells and white blood cells)

Health Effects: Skin

- Acute contact: redness and swelling
- Long term exposure: dark discoloration, scaly, and cancer



Loyola University Medical
Education Network



Health Effects: Other

- Diabetes
- Nerve damage – “pins and needles”
- Sore throat, lung irritation, erosion of nasal septum
- Nausea and vomiting
- Possible danger to unborn baby
- Causes some cancer cells to self – destruct



Indication of Exposure

- Urine – most accurate test for exposure within the last few days
- Blood
- Hair and nails – identifies high levels of exposure or exposure over 6 –12 months



How to Reduce Risk

- Avoid products with arsenic
- Wash vegetables thoroughly that are grown in contaminated soil
- Have drinking water tested and treat if needed, or use an alternative source
- Wear protective equipment if sanding pressure treated wood
 - Wood preservative industry has voluntarily agreed to stop making arsenic-based pressure treated wood
- If exposed at work shower and change clothes before leaving



Policy

- Safe Drinking Water Act, 1974
www.epa.gov/safewater/sdwa/sdwa.html
- January 2001, EPA's maximum contaminant level (MCL) for arsenic was lowered from 50 parts per billion (ppb) to 10 ppb, but the rule will not be enforceable until 2006. Also, research is showing that 10 ppb may not be low enough to protect health

Policy



- OSHA 8-hour day/40-hour week air level for worker exposure is 10 mcg/m³, measured by air monitoring.



Resources

- ATSDR ToxFAQs
<http://www.atsdr.cdc.gov/tfacts2.pdf>
- New Jersey Fact Sheet
www.state.nj.us/health/eoh/rtkweb/0152.pdf
- EPA IRIS Report www.epa.gov/iris/subst/0278.htm
- Environmental Defense Fund's Scorecard
www.scorecard.org
- World Health Organization Fact Sheet
<http://www.who.int/inf-fs/en/fact210.html>



In Review

- What is arsenic and how are we exposed to it
- How does arsenic effect our health
- How can we reduce our exposure to arsenic



References

- ATSDR (2000). Arsenic. Public Health Statement. Available on-line: <http://www.atsdr.cdc.gov/toxprofiles/phs2.html>.
- Bartolome, B., Cordoba, S., Nieto, S., Fernandez-Herrera, J., & Garcia-Diez, A. (1999). Acute arsenic poisoning: clinical and histopathological features. British Journal of Dermatology, 141, 1106-1109.
- Gewolb, J. (2001). How arsenic fights - and triggers – cancer. Science Now, 11/15/01; 2.
- Hwang, Y., Bornschein, R., Grote, J., Menrath, W., & Roda, S. (1997). Archives of Environmental Health, 5(2); 139-147.



References

- Karagas, M., Tosteson, T., Blum, J., Morris, J., Baron, J., & Laue, B. (1998). Design of and epidemiologic study of drinking water arsenic exposure and skin and bladder cancer risk in a U.S. population. Environmental Health Perspectives Supplements, 106(4); 1047-1050.
- Loyola University Medical Education Network (2002). Anatomy Photographs. Available on-line at: <http://www.lumen.luc.edu/lumen/>
- Lockwood, J., Schervish, M., Gurian, P., & Small, M. (2001). Characterization of arsenic occurrence in source waters of U.S. community water systems. Journal of the American Statistical Association, 96(456); 1184-1193.



References

- New Jersey Department of Health and Senior Services (1998). Arsenic. Hazardous Substance Fact Sheet. Available on-line:
<http://www.state.nj.us/health/eoh/rtkweb/0152.pdf>
- NIOSH (2002). Arsenic. NIOSH Pocket Guide to Chemical Hazards. Available on-line:
<http://www.cdc.gov/niosh/npg/pgintrod.html>.
- Tsai, S., Wang, T., & Ko, Y. (1999). Mortality for certain diseased in areas with high levels of arsenic in drinking water. Archives of Environmental Health, 54(3), 186-193.



References

- Weir, E. (2002). Arsenic and drinking water. Canadian Medical Association Journal, 166(1); 69.
- World Health Organization (2001). Arsenic in drinking water. Environmental Health, September; 36,44.



Arsenic

UMSBON Environmental Health
Education Center