

Arsenic

What is arsenic?

Arsenic is a naturally occurring metal found in the earth's crust. It occurs in various forms: elemental (metallic) arsenic; combined with other elements such as oxygen, chlorine, sulfur (inorganic arsenic); or combined with carbon and hydrogen (organic arsenic). Inorganic arsenicals are generally more toxic than organic forms.

How does arsenic enter the environment?

Arsenic occurs naturally in the soil and small amounts may enter the air, water and land from windblown dust, and may get into the water by runoff and leaching. Arsenic may eventually settle out in the sediment and soil. Some fish and shellfish may take in arsenic. Most of the arsenic in fish/shellfish is in the organic form which is the less harmful form. Some seaweed may contain arsenic in inorganic forms that may be more harmful. Volcanic eruptions are another natural source of arsenic. Industrial processes such as mining and smelting of arsenic containing ores and burning coal may release arsenic to the environment. Arsenic has also been used as a pesticide and may persist in the soil after application to fields.

How may I be exposed to arsenic?

As arsenic occurs naturally in the environment, you may be exposed to small amounts by eating food, drinking water, breathing air, and ingesting soil. The level of arsenic a person is exposed to depends on how close they are to arsenic-rich geologic deposits, mining and smelting operations, coal-fired power plants, agricultural fields where arsenic-containing pesticides may have been used, or hazardous waste sites.

Certain occupations may involve production or use of arsenic compounds. In addition, certain products such as decks or structures that have been treated with CCA (chromated copper arsenate) wood may be a source of arsenic. Food is usually the largest source of arsenic. The largest dietary source of arsenic is seafood, followed by rice/rice cereal, mushrooms, and poultry. Although most of the exposure pathways for children are the same as those for adults, children may be at a higher risk of exposure because of normal hand-to-mouth activities.

Arsenic can occasionally be found in private drinking water wells. In N.C. the concentration varies by geographic location. Statewide approximately 2 ¼ percent of wells tested have exceeded the maximum contaminant level (MCL) of 10 parts per billion recommended by the EPA. However, in certain counties (Alexander, Anson, Dare, Montgomery, Stanly, Union), 5% or more of the wells tested have arsenic levels exceeding the MCL.

What guidelines have been set to protect human health?

Regulations have been developed by both the States and Federal government agencies to limit exposure to arsenic. In addition, various health and safety organizations have developed guidelines to limit work exposures to arsenic. The US EPA set limits on the amount of arsenic that industries can release to the environment as well as restricting or canceling many uses of arsenic-containing pesticides. The U.S. EPA also set a limit of arsenic in drinking water at 10 ppb (parts per billion). The Occupational Safety and Health Administration (OSHA) set limits for worker exposures. The National Toxicology Program (NTP), the International Agency for research on cancer (IARC) and the EPA have classified arsenic as a human carcinogen.

How can arsenic affect my health?

If your drinking water contains high levels of inorganic arsenic, you may experience irritation of your stomach and intestines, with symptoms such as stomachache, nausea, vomiting, and diarrhea.

Long-term oral exposure to inorganic arsenic in food or water can affect the skin causing hyperpigmentation (patches of darkened skin) and the appearance of small "corns" or "warts" on the palms, soles, and torso. Direct skin contact with high concentrations of inorganic arsenic compounds, may cause the skin to become irritated, with some redness and swelling. However, it does not appear that skin contact is likely to lead to any serious internal effects.

Other effects from eating or drinking inorganic arsenic include decreased production of red and white blood cells, which may cause fatigue, abnormal heart rhythm, blood-vessel damage resulting in bruising, and impaired nerve function causing a "pins and needles" sensation in your hands and feet.

Breathing high levels of inorganic arsenic may cause a sore throat and irritated lungs. Inhaled inorganic arsenic can increase the risk of lung cancer.

Chronic eating or drinking of arsenic may increase the risks of developing skin cancer and cancer in the liver, bladder, and lungs.

There is some evidence that suggests long-term exposure to inorganic arsenic in children may result in lower IQ scores. There is some evidence that exposure to arsenic in early life (including gestation and early childhood) may increase mortality in young adults. In addition, some data suggest that inhalation of inorganic arsenic may also interfere with normal fetal development, although this is not certain. Arsenic is found at low levels in breast milk.

How can I limit my exposure to arsenic?

If you use a private well as a water source for drinking and cooking, then the well water should be tested for arsenic. If you have arsenic in your drinking water at levels higher than the EPA's

MCL (10 ppb), use of a water treatment system or an alternative source of water for drinking and cooking should be considered.

If you use arsenic-treated wood in home projects, Personal protective equipment (PPE) should be worn to prevent exposure to arsenic-containing sawdust. These measures may include dust masks, gloves, and protective clothing. Arsenic-treated wood should never be burned in open fires, or in stoves, residential boilers, or fire places, and should not be composted or used as mulch.

If you live in an area with a high level of arsenic in the water or soil, substituting cleaner sources of water and limiting contact with soil (for example, through use of a dense groundcover or thick lawn) would reduce family exposure to arsenic.

Discourage your children from putting objects in their mouths which should help prevent your children from eating soil. Make sure they wash their hands frequently and before eating.

If your job has the potential for arsenic exposure, make sure you wear all the personal protective equipment recommended. It is sometimes possible to carry arsenic from work on your clothing, skin, hair, tools, or other objects removed from the workplace. You may contaminate your car, home, or other locations outside work where children might be exposed to arsenic. Talk with the health and safety personnel at your worksite about use and care of PPE and whether you should be showering and changing clothes before you leave work, storing your street clothes in a separate area of the workplace, or laundering your work clothes at home separately from other clothes.

When should I see a doctor?

Contact your physician if you or your children have symptoms that you think are caused by arsenic exposure. You should inform your physician about the symptoms and when, how and for how long you think you and/or your children were exposed to arsenic.

Is there a medical test to tell if I have been exposed to arsenic?

Tests can measure arsenic in your blood, urine, hair, or fingernails, and these tests are often helpful in determining if you have been exposed to above-average levels of arsenic in the past. If arsenic is detected, then your physician may recommend treatment (depending on your symptoms and the level detected).

For Additional Information: Contact N.C. Department of Health and Human Services, Division of Public Health, (919) 707-5900.

References

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

CDC. NIOSH Pocket Guide to Chemical Hazards. Sept 2005. DHHS (NIOSH) Publication No 2005-149

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https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0278_summary.pdf