



Arsenic

Understanding Your Arsenic Test Results

What is arsenic?

Arsenic is a chemical present in the environment as a naturally occurring substance and as a result of human activity. It is found in water, air, food and soil.

There are two general types of arsenic: **organic** and **inorganic**. The inorganic forms of arsenic are the harmful forms, while most of the organic forms of arsenic are essentially harmless.

There was arsenic found in my urine sample. Should I be concerned?

Everyone has a small amount of arsenic in their body from water, air, food and soil. Some fish and shellfish contain a form of organic arsenic called "fish arsenic." Fish arsenic is much less harmful than other forms of arsenic. Your body does not easily absorb fish arsenic and it leaves your body through the urine.

The most reliable way to test for recent arsenic exposure is through a urine test. If you had a fish meal or ate fish supplements within a few days of having a urine test, the test may show a high level of arsenic. This should not worry you because the fish arsenic has left your body through the urine.

Workers in industries where arsenic is used may be exposed to harmful forms of arsenic. These industries may include copper smelting, lead smelting, wood treatment or pesticide production. Urine tests and other medical screenings may be used by employers to check these workers for arsenic exposure.

What are some other ways that people can be exposed to arsenic?

Examples include:

- Drinking water from a private well contaminated by arsenic
- Handling lumber or burning wood that has been treated with arsenic-containing preservatives
- Living near a hazardous waste site that contains a large amount of arsenic

What should I do if I am concerned about my test results or possible arsenic exposures?

Talk to your health care provider about your concerns and whether or not you should be tested again. If you have another arsenic test, do not eat fish, shellfish or fish supplements for several days prior to the test. This will help keep fish arsenic out of your test result. If you get your drinking water from a private well, your local health department may be able to advise you on whether you should test for arsenic when you test the water quality of your well.

If you are exposed to arsenic at work, your employer is required to follow regulations set by the federal Occupational Safety and Health Administration (OSHA):

<https://www.osha.gov/index.html>

You may also contact one of the clinics in the New York State Occupational Health Clinic Network for medical consultation and support services:

http://www.health.ny.gov/environmental/workplace/clinic_network.htm

What are the health effects of arsenic?

Exposure to high levels of arsenic can cause nausea, vomiting, abnormal heart rate, damage to blood vessels, and a sensation of "pins and needles" in the hands and feet. Eating or breathing low levels of inorganic arsenic for a long time can cause darkening of the skin and the appearance of small corns or warts on the palms, soles and body. Breathing or eating inorganic arsenic can increase the risk for certain cancers.

The health effects of arsenic depend on its chemical form, how much enters the body, how it enters the body, how long the person has been exposed, the health status of the person, and other factors.

Why were my test results sent to the New York State Heavy Metals Registry?

Health care providers and laboratories are required by regulation to report urine arsenic test results to the New York State Department of Health. This reporting system is designed to identify people who may be harmed by arsenic through their jobs or from other sources so that measures can be taken to protect their health.

If you would like more information on exposure to and control of arsenic in the workplace, contact the State Health Department's Bureau of Occupational Health and Injury Prevention at 518-402-7900.



National Biomonitoring Program

Factsheet

Arsenic

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Arsenic is a naturally occurring element that is found in combination with either inorganic or organic substances to form many different compounds. Inorganic arsenic compounds are found in soils, sediments, and groundwater. These compounds occur either naturally or as a result of mining, ore smelting, and industrial use of arsenic. Organic arsenic compounds are found mainly in fish and shellfish. In the past, inorganic forms of arsenic were used in pesticides and paint pigment. They were also used as wood preservatives and as a treatment for a variety of ailments. Today, usage of arsenic-containing pesticides and wood preservatives is restricted.

How People Are Exposed to Arsenic

People are most likely to be exposed to inorganic arsenic through drinking water and to a lesser extent through various foods. Water sources in some parts of the United States have higher naturally occurring levels of inorganic arsenic than other areas. Other sources of inorganic arsenic exposure include contact with contaminated soil or with wood preserved with arsenic.

People are exposed to organic arsenic by consuming seafood.

How Arsenic Affects People's Health

Unusually large doses of inorganic arsenic can cause symptoms ranging from nausea, vomiting, and diarrhea to dehydration and shock. Long-term exposure to high levels of inorganic arsenic in drinking water has been associated with skin disorders and increased risks for diabetes, high blood pressure, and several types of cancer. Inorganic arsenic and arsenic compounds are considered to be cancer-causing chemicals. Forms of organic arsenic (for example, arsenobetaine) found in seafood are not known to be toxic to humans.

Levels of Arsenic in the U.S. Population

In the *Fourth National Report on Human Exposure to Environmental Chemicals (Fourth Report)*, CDC scientists measured total arsenic and seven different forms of arsenic in the urine of 2,557 participants aged six years and older who took part in the National Health and Nutrition Examination Survey (NHANES) during 2003–2004. By measuring arsenic in urine, scientists can estimate the amount of arsenic that has entered people's bodies.

- Inorganic arsenic is converted in the body into the breakdown product (metabolite) called dimethylarsinic acid (DMA). DMA and arsenobetaine were found to be the major components of urinary total arsenic levels.

Finding a measurable amount of the different forms of arsenic in urine does not imply that the levels of arsenic cause an adverse health effect. Biomonitoring studies on levels of arsenic

provide physicians and public health officials with reference values so that they can determine whether people have been exposed to higher levels of arsenic than are found in the general population. Biomonitoring data can also help scientists plan and conduct research on exposure and health effects.

Additional Resources

Agency for Toxic Substances and Disease Registry (ATSDR)

- **Public Health Statement for Arsenic**
<https://www.atsdr.cdc.gov/phs/phs.asp?id=18&tid=3>

Environmental Protection Agency

- **Consumer fact sheet on Arsenic**
<https://www.epa.gov/safewater/arsenic/>

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Centers for Disease Control and Prevention 1600 Clifton Road Atlanta, GA
30329-4027, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - [Contact CDC-INFO](#)





PUBLIC HEALTH STATEMENT

Arsenic

CAS#: 7440-38-2

Division of Toxicology and Environmental Medicine

August 2007

This Public Health Statement is the summary chapter from the Toxicological Profile for Arsenic. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important 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. For more information, call the ATSDR Information Center at 1-800-232-4636.

This public health statement tells you about arsenic and the effects of exposure to it.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites are then placed on the National Priorities List (NPL) and are targeted for long-term federal clean-up activities. Arsenic has been found in at least 1,149 of the 1,684 current or former NPL sites. Although the total number of NPL sites evaluated for this substance is not known, the possibility exists that the number of sites at which arsenic is found may increase in the future as more sites are evaluated. This information is important because these sites may be sources of exposure and exposure to this substance may harm you.

When a substance is released either from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. Such a release does not always lead to exposure. You can be exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to arsenic, many factors will determine whether you will be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider any other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT IS ARSENIC?

Arsenic is a naturally occurring element that is widely distributed in the Earth's crust. Arsenic is classified chemically as a metalloid, having both properties of a metal and a nonmetal; however, it is frequently referred to as a metal. Elemental arsenic (sometimes referred to as metallic arsenic) is a steel grey solid material. However, arsenic is usually found in the environment combined with other elements such as oxygen, chlorine, and sulfur. Arsenic combined with these elements is called inorganic arsenic. Arsenic combined with carbon and hydrogen is referred to as organic arsenic.

Most inorganic and organic arsenic compounds are white or colorless powders that do not evaporate. They have no smell, and most have no special taste. Thus, you usually cannot tell if arsenic is present in your food, water, or air.

Inorganic arsenic occurs naturally in soil and in many kinds of rock, especially in minerals and ores that contain copper or lead. When these ores are heated in smelters, most of the arsenic goes up the stack and enters the air as a fine dust. Smelters may collect this dust and take out the arsenic as a compound called arsenic trioxide (As₂O₃).

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However, arsenic is no longer produced in the United States; all of the arsenic used in the United States is imported.

Presently, about 90% of all arsenic produced is used as a preservative for wood to make it resistant to rotting and decay. The preservative is copper chromated arsenate (CCA) and the treated wood is referred to as "pressure-treated." In 2003, U.S. manufacturers of wood preservatives containing arsenic began a voluntary transition from CCA to other wood preservatives that do not contain arsenic in wood products for certain residential uses, such as play structures, picnic tables, decks, fencing, and boardwalks. This phase out was completed on December 31, 2003; however, wood treated prior to this date could still be used and existing structures made with CCA-treated wood would not be affected. CCA-treated wood products continue to be used in industrial applications. It is not known whether, or to what extent, CCA-treated wood products may contribute to exposure of people to arsenic.

In the past, inorganic arsenic compounds were predominantly used as pesticides, primarily on cotton fields and in orchards. Inorganic arsenic compounds can no longer be used in agriculture. However, organic arsenic compounds, namely cacodylic acid, disodium methylarsenate (DSMA), and monosodium methylarsenate (MSMA), are still used as pesticides, principally on cotton. Some organic arsenic compounds are used as additives in animal feed. Small quantities of elemental arsenic are added to other metals to form metal mixtures or alloys with improved properties. The greatest use of arsenic in alloys is in lead-acid batteries for automobiles. Another important use of arsenic

compounds is in semiconductors and light-emitting diodes.

1.2 WHAT HAPPENS TO ARSENIC WHEN IT ENTERS THE ENVIRONMENT?

Arsenic occurs naturally in soil and minerals and it therefore may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching. Volcanic eruptions are another source of arsenic. Arsenic is associated with ores containing metals, such as copper and lead. Arsenic may enter the environment during the mining and smelting of these ores. Small amounts of arsenic also may be released into the atmosphere from coal-fired power plants and incinerators because coal and waste products often contain some arsenic.

Arsenic cannot be destroyed in the environment. It can only change its form, or become attached to or separated from particles. It may change its form by reacting with oxygen or other molecules present in air, water, or soil, or by the action of bacteria that live in soil or sediment. Arsenic released from power plants and other combustion processes is usually attached to very small particles. Arsenic contained in wind-borne soil is generally found in larger particles. These particles settle to the ground or are washed out of the air by rain. Arsenic that is attached to very small particles may stay in the air for many days and travel long distances. Many common arsenic compounds can dissolve in water. Thus, arsenic can get into lakes, rivers, or underground water by dissolving in rain or snow or through the discharge of industrial wastes. Some of the arsenic will stick to particles in the water or sediment on the bottom of lakes or rivers, and some

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will be carried along by the water. Ultimately, most arsenic ends up in the soil or sediment. Although some fish and shellfish take in arsenic, which may build up in tissues, most of this arsenic is in an organic form called arsenobetaine (commonly called "fish arsenic") that is much less harmful.

1.3 HOW MIGHT I BE EXPOSED TO ARSENIC?

Since arsenic is found naturally in the environment, you will be exposed to some arsenic by eating food, drinking water, or breathing air. Children may also be exposed to arsenic by eating soil. Analytical methods used by scientists to determine the levels of arsenic in the environment generally do not determine the specific form of arsenic present. Therefore, we do not always know the form of arsenic a person may be exposed to. Similarly, we often do not know what forms of arsenic are present at hazardous waste sites. Some forms of arsenic may be so tightly attached to particles or embedded in minerals that they are not taken up by plants and animals.

The concentration of arsenic in soil varies widely, generally ranging from about 1 to 40 parts of arsenic to a million parts of soil (ppm) with an average level of 3–4 ppm. However, soils in the vicinity of arsenic-rich geological deposits, some mining and smelting sites, or agricultural areas where arsenic pesticides had been applied in the past may contain much higher levels of arsenic. The concentration of arsenic in natural surface and groundwater is generally about 1 part in a billion parts of water (1 ppb), but may exceed 1,000 ppb in contaminated areas or where arsenic levels in soil

are high. Groundwater is far more likely to contain high levels of arsenic than surface water. Surveys of U.S. drinking water indicate that about 80% of water supplies have less than 2 ppb of arsenic, but 2% of supplies exceed 20 ppb of arsenic. Levels of arsenic in food range from about 20 to 140 ppb. However, levels of inorganic arsenic, the form of most concern, are far lower. Levels of arsenic in the air generally range from less than 1 to about 2,000 nanograms (1 nanogram equals a billionth of a gram) of arsenic per cubic meter of air (less than 1–2,000 ng/m³), depending on location, weather conditions, and the level of industrial activity in the area. However, urban areas generally have mean arsenic levels in air ranging from 20 to 30 ng/m³.

You normally take in small amounts of arsenic in the air you breathe, the water you drink, and the food you eat. Of these, food is usually the largest source of arsenic. The predominant dietary source of arsenic is seafood, followed by rice/rice cereal, mushrooms, and poultry. While seafood contains the greatest amounts of arsenic, for fish and shellfish, this is mostly in an organic form of arsenic called arsenobetaine that is much less harmful. Some seaweeds may contain arsenic in inorganic forms that may be more harmful. Children are likely to eat small amounts of dust or soil each day, so this is another way they may be exposed to arsenic. The total amount of arsenic you take in from these sources is generally about 50 micrograms (1 microgram equals one-millionth of a gram) each day. The level of inorganic arsenic (the form of most concern) you take in from these sources is generally about 3.5 microgram/day. Children may be exposed to small amounts of arsenic from hand-to-mouth activities from playing on play structures or decks constructed out of CCA-treated wood. The potential exposure that children

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may receive from playing in play structures constructed from CCA-treated wood is generally smaller than that they would receive from food and water.

In addition to the normal levels of arsenic in air, water, soil, and food, you could be exposed to higher levels in several ways, such as the following:

- Some areas of the United States contain unusually high natural levels of arsenic in rock, and this can lead to unusually high levels of arsenic in soil or water. If you live in an area like this, you could take in elevated amounts of arsenic in drinking water. Children may be taking in higher amounts of arsenic because of hand-to-mouth contact or eating soil in areas with higher than usual arsenic concentrations.
- Some hazardous waste sites contain large quantities of arsenic. If the material is not properly disposed of, it can get into surrounding water, air, or soil. If you live near such a site, you could be exposed to elevated levels of arsenic from these media.
- If you work in an occupation that involves arsenic production or use (for example, copper or lead smelting, wood treating, or pesticide application), you could be exposed to elevated levels of arsenic during your work.
- If you saw or sand arsenic-treated wood, you could inhale some of the sawdust into your nose or throat. Similarly, if you burn arsenic-treated wood, you could inhale arsenic in the smoke.
- If you live in a former agricultural area where arsenic was used on crops, the soil could contain high levels of arsenic.
- In the past, several kinds of products used in the home (rat poison, ant poison, weed killer, some types of medicines) had arsenic in them. However, most of these uses of arsenic have ended, so you are not likely to be exposed from home products any longer.

1.4 HOW CAN ARSENIC ENTER AND LEAVE MY BODY?

If you swallow arsenic in water, soil, or food, most of the arsenic may quickly enter into your body. The amount that enters your body will depend on how much you swallow and the kind of arsenic that you swallow. This is the most likely way for you to be exposed near a waste site. If you breathe air that contains arsenic dusts, many of the dust particles settle onto the lining of the lungs. Most of the arsenic in these particles is then taken up from the lungs into the body. You might be exposed in this way near waste sites where arsenic-contaminated soils are allowed to blow into the air, or if you work with arsenic-containing soil or products. If you get arsenic-contaminated soil or water on your skin, only a small amount will go through your skin into your body, so this is usually not of concern.

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Both inorganic and organic forms leave your body in your urine. Most of the inorganic arsenic will be gone within several days, although some will remain in your body for several months or even longer. If you are exposed to organic arsenic, most of it will leave your body within several days.

1.5 HOW CAN ARSENIC AFFECT MY HEALTH?

Scientists use many tests to protect the public from harmful effects of toxic chemicals and to find ways for treating persons who have been harmed.

One way to learn whether a chemical will harm people is to determine how the body absorbs, uses, and releases the chemical. For some chemicals, animal testing may be necessary. Animal testing may also help identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method for getting information needed to make wise decisions that protect public health. Scientists have the responsibility to treat research animals with care and compassion. Scientists must comply with strict animal care guidelines because laws today protect the welfare of research animals.

Inorganic arsenic has been recognized as a human poison since ancient times, and large oral doses (above 60,000 ppb in water which is 10,000 times higher than 80% of U.S. drinking water arsenic levels) can result in death. If you swallow lower levels of inorganic arsenic (ranging from about 300 to 30,000 ppb in water; 100–10,000 times higher than most U.S. drinking water levels), you may experience irritation of your stomach and

intestines, with symptoms such as stomachache, nausea, vomiting, and diarrhea. Other effects you might experience from swallowing 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.

Perhaps the single-most characteristic effect of long-term oral exposure to inorganic arsenic is a pattern of skin changes. These include patches of darkened skin and the appearance of small "corns" or "warts" on the palms, soles, and torso, and are often associated with changes in the blood vessels of the skin. Skin cancer may also develop. Swallowing arsenic has also been reported to increase the risk of cancer in the liver, bladder, and lungs. The Department of Health and Human Services (DHHS) has determined that inorganic arsenic is known to be a human carcinogen (a chemical that causes cancer). The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans. EPA also has classified inorganic arsenic as a known human carcinogen.

If you breathe high levels of inorganic arsenic, then you are likely to experience a sore throat and irritated lungs. You may also develop some of the skin effects mentioned above. The exposure level that produces these effects is uncertain, but it is probably above 100 micrograms of arsenic per cubic meter ($\mu\text{g}/\text{m}^3$) for a brief exposure. Longer exposure at lower concentrations can lead to skin effects, and also to circulatory and peripheral nervous disorders. There are some data suggesting that inhalation of inorganic arsenic may also

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interfere with normal fetal development, although this is not certain. An important concern is the ability of inhaled inorganic arsenic to increase the risk of lung cancer. This has been seen mostly in workers exposed to arsenic at smelters, mines, and chemical factories, but also in residents living near smelters and arsenical chemical factories. People who live near waste sites with arsenic may have an increased risk of lung cancer as well.

If you have direct skin contact with high concentrations of inorganic arsenic compounds, your skin may become irritated, with some redness and swelling. However, it does not appear that skin contact is likely to lead to any serious internal effects.

Almost no information is available on the effects of organic arsenic compounds in humans. Studies in animals show that most simple organic arsenic compounds (such as methyl and dimethyl compounds) are less toxic than the inorganic forms. In animals, ingestion of methyl compounds can result in diarrhea, and lifetime exposure can damage the kidneys. Lifetime exposure to dimethyl compounds can damage the urinary bladder and the kidneys.

1.6 HOW CAN ARSENIC AFFECT CHILDREN?

This section discusses potential health effects in humans from exposures during the period from conception to maturity at 18 years of age.

Children are exposed to arsenic in many of the same ways that adults are. Since arsenic is found in the

soil, water, food, and air, children may take in arsenic in the air they breathe, the water they drink, and the food they eat. Since children tend to eat or drink less of a variety of foods and beverages than do adults, ingestion of contaminated food or juice or infant formula made with arsenic-contaminated water may represent a significant source of exposure. In addition, since children often play in the soil and put their hands in their mouths and sometimes intentionally eat soil, ingestion of contaminated soil may be a more important source of arsenic exposure for children than for adults. In areas of the United States where natural levels of arsenic in the soil and water are high, or in areas in and around contaminated waste sites, exposure of children to arsenic through ingestion of soil and water may be significant. In addition, contact with adults who are wearing clothes contaminated with arsenic (e.g., with dust from copper- or lead-smelting factories, from wood-treating or pesticide application, or from arsenic-treated wood) could be a source of exposure. Because of the tendency of children to taste things that they find, accidental poisoning from ingestion of pesticides is also a possibility. Thus, 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 activity.

Children who are exposed to inorganic arsenic may have many of the same effects as adults, including irritation of the stomach and intestines, blood vessel damage, skin changes, and reduced nerve function. Thus, all health effects observed in adults are of potential concern in children. There is also some evidence that suggests that long-term exposure to inorganic arsenic in children may result in lower IQ scores. We do not know if absorption of inorganic arsenic from the gut in children differs from adults.

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There is some evidence that exposure to arsenic in early life (including gestation and early childhood) may increase mortality in young adults.

There is some evidence that inhaled or ingested inorganic arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of inorganic 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.

In animals, exposure to organic arsenic compounds can cause low birth weight, fetal malformations, and fetal deaths. The dose levels that cause these effects also result in effects in the mothers.

1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO ARSENIC?

If your doctor finds that you have been exposed to substantial amounts of arsenic, ask whether your children might also have been exposed. Your doctor might need to ask your state health department to investigate.

Many communities may have high levels of arsenic in their drinking water, particularly from private wells, because of contamination or as a result of the geology of the area. The north central region and the western region of the United States have the highest arsenic levels in surface water and groundwater sources, respectively. Wells used to provide water for drinking and cooking should be

tested for arsenic. As of January 2006, EPA's Maximum Contaminant Level (MCL) for arsenic in drinking water is 10 ppb. If you have arsenic in your drinking water at levels higher than the EPA's MCL, an alternative source of water should be used for drinking and cooking should be considered.

If you use arsenic-treated wood in home projects, personal protection from exposure to arsenic-containing sawdust may be helpful in limiting exposure of family members. 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. EPA's Consumer Awareness Program (CAP) for CCA is a voluntary program established by the manufacturers of CCA products to inform consumers about the proper handling, use, and disposal of CCA-treated wood. You can find more information about this program in Section 6.5. Hand washing can reduce the potential exposure of children to arsenic after playing on play structures constructed with CCA-treated wood, since most of the arsenic on the children's hands was removed with water.

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. By paying careful attention to dust and soil control in the home (air filters, frequent cleaning), you can reduce family exposure to contaminated soil. Some children eat a lot of soil. You should prevent your children from eating soil. You should discourage your children from putting objects in their mouths. Make sure they wash their hands frequently and

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before eating. Discourage your children from putting their hands in their mouths or engaging in other hand-to-mouth activities. Since arsenic may be found in the home as a pesticide, household chemicals containing arsenic should be stored out of reach of young children to prevent accidental poisonings. Always store household chemicals in their original labeled containers; never store household chemicals in containers that children would find attractive to eat or drink from, such as old soda bottles. Keep your Poison Control Center's number by the phone.

It is sometimes possible to carry arsenic from work on your clothing, skin, hair, tools, or other objects removed from the workplace. This is particularly likely if you work in the fertilizer, pesticide, glass, or copper/lead smelting industries. You may contaminate your car, home, or other locations outside work where children might be exposed to arsenic. You should know about this possibility if you work with arsenic.

Your occupational health and safety officer at work can and should tell you whether chemicals you work with are dangerous and likely to be carried home on your clothes, body, or tools 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. Material safety data sheets (MSDS) for many chemicals used should be found at your place of work, as required by the Occupational Safety and Health Administration (OSHA) in the U.S. Department of Labor. MSDS information should include chemical names and hazardous ingredients, and important properties, such as fire and explosion data, potential health effects, how you get the

chemical(s) in your body, how to properly handle the materials, and what to do in the case of emergencies. Your employer is legally responsible for providing a safe workplace and should freely answer your questions about hazardous chemicals. Your state OSHA-approved occupational safety and health program or OSHA can answer any further questions and help your employer identify and correct problems with hazardous substances. Your state OSHA-approved occupational safety and health program or OSHA will listen to your formal complaints about workplace health hazards and inspect your workplace when necessary. Employees have a right to seek safety and health on the job without fear of punishment.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO ARSENIC?

Several sensitive and specific 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. These tests are not usually performed in a doctor's office. They require sending the sample to a testing laboratory.

Measurement of arsenic in your urine is the most reliable means of detecting arsenic exposures that you experienced within the last several days. Most tests measure the total amount of arsenic present in your urine. This can sometimes be misleading, because the nonharmful forms of arsenic in fish and shellfish can give a high reading even if you have not been exposed to a toxic form of arsenic. For this reason, laboratories sometimes use a more

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complicated test to separate “fish arsenic” from other forms. Because most arsenic leaves your body within a few days, analysis of your urine cannot detect if you were exposed to arsenic in the past. Tests of your hair or fingernails can tell if you were exposed to high levels over the past 6–12 months, but these tests are not very useful in detecting low-level exposures. If high levels of arsenic are detected, this shows that you have been exposed, but unless more is known about when you were exposed and for how long, it is usually not possible to predict whether you will have any harmful health effects.

1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health. Regulations *can* be enforced by law. The EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that develop regulations for toxic substances. Recommendations provide valuable guidelines to protect public health, but *cannot* be enforced by law. The Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH) are two federal organizations that develop recommendations for toxic substances.

Regulations and recommendations can be expressed as “not-to-exceed” levels, that is, levels of a toxic substance in air, water, soil, or food that do not exceed a critical value that is usually based on levels that affect animals; they are then adjusted to

levels that will help protect humans. Sometimes these not-to-exceed levels differ among federal organizations because they used different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or other factors.

Recommendations and regulations are also updated periodically as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for ARSENIC include the following:

The federal government has taken several steps to protect humans from arsenic. First, EPA has set limits on the amount of arsenic that industrial sources can release into the environment. Second, EPA has restricted or canceled many of the uses of arsenic in pesticides and is considering further restrictions. Third, in January 2001, the EPA lowered the limit for arsenic in drinking water from 50 to 10 ppb. Finally, OSHA has established a permissible exposure limit (PEL), 8-hour time-weighted average, of 10 $\mu\text{g}/\text{m}^3$ for airborne arsenic in various workplaces that use inorganic arsenic.

1.10 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department, or contact ATSDR at the address and phone number below.

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating,

DEPARTMENT of HEALTH AND HUMAN SERVICES, Public Health Service
Agency for Toxic Substances and Disease Registry

www.atsdr.cdc.gov/

Telephone: 1-800-232-4636

Fax: 770-488-4178

E-Mail: cdcinfo@cdc.gov



PUBLIC HEALTH STATEMENT

Arsenic

CAS#: 7440-38-2

Division of Toxicology and Environmental Medicine

August 2007

and treating illnesses that result from exposure to hazardous substances.

Toxicological profiles are also available on-line at www.atsdr.cdc.gov and on CD-ROM. You may request a copy of the ATSDR ToxProfiles™ CD-ROM by calling the toll-free information and technical assistance number at 1-800-CDCINFO (1-800-232-4636), by e-mail at cdcinfo@cdc.gov, or by writing to:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental
Medicine
1600 Clifton Road NE
Mailstop F-32
Atlanta, GA 30333
Fax: 1-770-488-4178

Organizations for-profit may request copies of final Toxicological Profiles from the following:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Phone: 1-800-553-6847 or 1-703-605-6000
Web site: <http://www.ntis.gov/>

**DEPARTMENT of HEALTH AND HUMAN SERVICES, Public Health Service
Agency for Toxic Substances and Disease Registry**

www.atsdr.cdc.gov/

Telephone: 1-800-232-4636

Fax: 770-488-4178

E-Mail: cdcinfo@cdc.gov



Agency for Toxic Substances & Disease Registry

Arsenic

CAS ID #: 7440-38-2

Affected Organ Systems: Dermal (Skin), Gastrointestinal (Digestive), Hepatic (Liver), Neurological (Nervous System), Respiratory (From the Nose to the Lungs)

Cancer Classification: EPA: Confirmed human carcinogen. IARC: Carcinogenic to humans . NTP: Known to be a human carcinogen.

Please contact [NTP](#), [IARC](#), or [EPA's IRIS Hotline](#) with questions on cancer and cancer classification.

Chemical Classification: Inorganic substances

Summary: 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 arsenic (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 plants.

Community Members



ToxFAQs

Fact sheet that answers the most frequently asked questions about a contaminant and its health effects.

Public Health Statement

Summary about a hazardous substance taken from Chapter One of its respective ATSDR Toxicological Profile.

Fact Sheets

Chromated copper arsenate (CCA) is a water-soluble inorganic pesticide most commonly used as a wood preservative to make it resistant to attack by termites and fungi that cause decay.

Emergency Responders



Medical Management Guidelines (MMG) for Acute Chemical Exposure

Medical Management Guideline (MMG) for Acute Chemical Exposure
Publication intended to aid emergency department physicians and other

Toxicological and Health Professionals



Toxicological Profile

Succinctly characterizes the toxicologic and adverse health effects information for a hazardous substance.

Addendum to the Profile (PDF, 3414KB*)

Addendum to the Toxicological Profile for Arsenic (September 2015)

ToxGuide (PDF, 74KB*)

Quick reference guide providing information such as chemical and physical properties, sources of exposure, routes of exposure, minimal risk levels, children's health, and health effects for a substance

Priority List of Hazardous Substances

Prioritization of substances based on a combination of their frequency, toxicity, and potential for human exposure at National Priorities List (NPL) sites.

Minimal Risk Levels (MRL)

The MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse, non-cancer health effects over a specified duration of exposure. The information in this MRL serves as a screening tool to help public health professionals decide where to look more closely to evaluate possible risk of adverse health effects from human exposure.

Interaction Profiles

Succinctly characterizes the toxicologic and adverse health effects information for mixtures of hazardous substances.

Medical Education and Training



Case Study in Environmental Medicine (CSEM)

Self-instructional publication designed to increase primary care provider's knowledge of a hazardous substance in the environment and to aid in the evaluation of potentially exposed patients.

- Page last reviewed: March 3, 2011
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- Content source: [Agency for Toxic Substances and Disease Registry](#)

Agency for Toxic Substances and Disease Registry, 4770 Buford Hwy NE,
Atlanta, GA 30341
Contact CDC: 800-232-4636 / TTY: 888-232-6348





National Toxicology Program
U.S. Department of Health and Human Services

<https://ntp.niehs.nih.gov/go/contact>

Contact Us

Receive NTP News by Email

[Register](#) to have notices of NTP news, events, and publications delivered to your inbox.

Primary Contacts

Contact the Office of Liaison, Policy and Review for general questions about the NTP policies, programs, or mailing lists.

Office of Liaison, Policy and Review

National Toxicology Program
P.O. Box 12233, MD K2-03
Research Triangle Park, NC 27709
Telephone: 919-541-7539
[use our [contact form](#)]

Contact Central Data Management for all other questions or if you are unclear about whom to contact.

Central Data Management

P.O. Box 12233, MD K2-05
Research Triangle Park, NC 27709
Telephone: 919-541-3419
cdm@niehs.nih.gov (or use our [contact form](#))

Program Contacts:

NTP Center for Phototoxicology

NCTR/FDA, HFT-110
3900 NCTR Road
Jefferson, AR 72079
Telephone: (870) 543-7672
[use our [contact form](#)]

NTP Interagency Center for the Evaluation of Alternative Toxicological Methods

P.O. Box 12233, MD K2-16
Research Triangle Park, NC 27709
Telephone: 919-316-4668
Website: <http://ntp.niehs.nih.gov/go/niceatm>
[use our [contact form](#)]

Office of Health Assessment and Translation

P.O. Box 12233, MD K2-04
Research Triangle Park, NC 27709
Telephone: 919-541-2999
Website: <http://ntp.niehs.nih.gov/go/ohat>

P.O. Box 12233, MD K2-02
Research Triangle Park, NC 27709
Telephone: 919-541-5710
[use our [contact form](#)]

Office of the Report on Carcinogens

P.O. Box 12233, MD K2-14
Research Triangle Park, NC 27709
Telephone: 919-316-4637
Website: <http://ntp.niehs.nih.gov/go/oroc>
[use our [contact form](#)]

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