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Arsenic and Cancer Risk

- [What is arsenic?](#)
- [How are people exposed to arsenic?](#)
- [Does arsenic cause cancer?](#)
- [Other health effects of arsenic](#)
- [Are arsenic levels regulated?](#)
- [Can I limit my exposure to arsenic?](#)
- [To learn more](#)

What is arsenic?

Arsenic is a natural element in rocks and soil, water, air, and in plants and animals. People can also be exposed to arsenic in the environment from some agricultural and industrial sources.

Although it is sometimes found in its pure form as a steel grey metal, arsenic is usually part of chemical compounds:

- **Inorganic compounds** (arsenic combined with elements other than carbon): These compounds are found in industry, in building products (such as some “pressure-treated” woods), and in arsenic-contaminated water. This form of arsenic tends to be more toxic and has been linked to cancer.
- **Organic compounds** (arsenic combined with carbon and other elements): These compounds tend to be much less toxic than the inorganic arsenic compounds and are not thought to be linked to cancer. Organic arsenic compounds are found in some foods, such as fish and shellfish.

How are people exposed to arsenic?

Arsenic occurs naturally in the environment. We normally take in small amounts in the air we breathe, the water we drink, and the food we eat. People can also be exposed to arsenic in other ways, such as in some man-made products.

In food

For most people, food is their largest source of arsenic exposure, although much of this is likely to be in the less dangerous, organic form. The highest levels of arsenic (in all forms) in foods can be found in seafood, rice, rice cereal (and other rice products), mushrooms, and poultry, although many other foods, including some fruit juices, can also contain arsenic.

Rice is of particular concern because it is a major part of the diet in many parts of the world. It is also a major component of many of the cereals eaten by infants and young children. (Nearly all rice products have been found to contain at least some arsenic, although the levels can vary widely.)

In drinking water

Drinking water is an important and potentially controllable source of arsenic exposure. In parts of China, Taiwan, Bangladesh, and western South America, high levels of arsenic occur naturally in drinking water, and can be a major source of arsenic exposure.

Water in some areas of the United States, especially in the West, also naturally contains arsenic. Most US areas with higher levels of arsenic in drinking water are rural communities. (As discussed below, public drinking water systems in the US are required to test for arsenic and to keep it below a certain level.)

Natural arsenic levels tend to be higher in drinking water that comes from ground sources, such as wells, as opposed to water from surface sources, such as lakes or reservoirs.

At work

Arsenic has not been produced in the United States since 1985, although it is still imported from other countries. In the past, workers in smelters and in plants that manufactured, packaged, or distributed products that contained arsenic had high exposures from breathing in arsenic fumes and dust.

treated before 2004 may still contain CCA. (For more information, see “How can I limit my exposure to arsenic?”)

Does arsenic cause cancer?

In most cases, the American Cancer Society does not determine if something causes cancer (that is, if it is a carcinogen), but we do look to other respected organizations for help with this. Based on the available evidence, several expert agencies have evaluated the cancer-causing potential of arsenic.

International Agency for Research on Cancer (IARC)

The IARC is part of the World Health Organization (WHO). One of its major goals is to

In drinking water: The Environmental Protection Agency (EPA) has set a limit on the maximum level of arsenic allowed in US drinking water of 10 micrograms per liter (g/L), or 10 parts per billion (ppb).

For bottled water, the Food and Drug Administration (FDA) has set a limit of 10 ppb.

In certain foods: There are no federal limits for arsenic in most foods, although the FDA has issued (or proposed) guidance for industry on limits (“action levels”) in certain foods that are more likely to contain arsenic. For example, the FDA has issued guidance to manufacturers to not exceed inorganic arsenic levels of 100 ppb in infant rice cereals. It has also issued guidance to not exceed inorganic arsenic levels of 10 ppb in apple juice. These are recommendations for manufacturers and are not legally enforceable limits.

In the community: The EPA has set limits on the amount of arsenic that industrial sources can release into the environment, and it has restricted the use of arsenic in pesticides.

At work: The Occupational Safety & Health Administration (OSHA), the federal agency responsible for health and safety regulations in most workplaces, limits workplace exposure to inorganic arsenic to 10 micrograms per cubic meter of air, averaged over an 8-hour period. When working at potentially higher exposure levels, OSHA requires employers to provide personal protective equipment such as respirators.

Can I limit my exposure to arsenic?

Arsenic is a naturally occurring element, so it’s not possible to avoid it completely. Most arsenic compounds have no smell or taste, so usually you can’t tell if arsenic is in your air, food, or water. Still, there are some things you can do that may lower your exposure.

In drinking water

Public drinking water systems in the US are required to test for arsenic and to keep it below a certain level (10 parts per billion, or ppb). If your drinking water comes from a public source, you can find out about the levels of certain substances in your drinking water, including arsenic, by contacting your local water system. You can also contact the EPA’s Safe Drinking Water Hotline at 1-800-426-4791 for information about drinking water safety.

If you get your water from a private source such as a well, you may want to have your

water tested for arsenic levels by a reputable laboratory. People who live in areas with high levels of arsenic in the water may consider using alternative sources of drinking water, such as bottled water. Common household water filters do not effectively remove arsenic.

In foods

Some foods naturally contain more arsenic than others. For example, the highest concentrations of arsenic have been found in **seafood**, although this is mainly in the less harmful organic form.

Rice and rice products are a particular concern because they are a major food source in many parts of the world and are included in the diets of many infants and children. The FDA has recommended that manufacturers limit inorganic arsenic in infant rice cereals to 100 ppb. Neither the FDA nor the American Academy of Pediatrics (AAP) recommend specific limits on how much rice or rice products should be eaten, but they do recommend that families eat a wide variety of foods for a well-balanced diet that includes grains other than rice, such as wheat, barley, and oats. This can help reduce any possible health effects from eating too much of any one type of food.

According to the FDA, cooking rice in larger amounts of water (similar to how pasta is cooked) can lower the amount of inorganic arsenic in rice by about half, but this type of cooking can also lower its nutrient value, especially for white rice. The FDA also notes that rinsing rice before cooking has very little effect on arsenic levels, and it can also lower its nutrient value.

Concerns have also been raised about arsenic levels in some **fruit juices** (particularly apple juice). The FDA has conducted routine testing for arsenic in apple juice for many years and has found that in general it has low levels of inorganic arsenic. Still, the FDA supports the USDA's [*Dietary Guidelines for Americans, 2010*](#) *95* *Te* *T Guide* *Tj m9 gmuch of any one type of food.o*.

with your employee health and safety representative or your employer. Ways to reduce or prevent exposure can include using personal protective equipment and using safer work practices. If needed, OSHA, the federal agency responsible for health and safety regulations in most workplaces, can provide more information or assistance.

From pressure-treated wood

Some pressure-treated lumber products contain an inorganic arsenic compound known as CCA. The sale of CCA-treated lumber for most residential (home) uses was stopped at the end of 2003. However, many structures such as home foundations, decks, fences, or playground play sets that contain CCA-treated lumber are still in use.

A special concern is the use of CCA-treated lumber around children, especially in play sets. Children might swallow small amounts of arsenic if they put their hands in their mouths after touching the wood or the soil around it.

If you aren't sure if a wooden play set contains arsenic, contacting the manufacturer might help you find out. But if this information isn't available, it's safest to assume that it does.

To reduce exposure, the **US Consumer Product Safety Commission (CPSC)** recommends that parents and caregivers make sure children's hands and other exposed body parts are thoroughly washed with soap and water after playing on all pressure-treated wood playground equipment. It has also been suggested that children not eat while on wooden playground equipment.

The CPSC also recommends that CCA-treated wood not be used where routine contactpg 1A-treated

dispose of it safely.

To learn more

Along with the American Cancer Society, other sources of information about arsenic include:

Centers for Disease Control and Prevention (CDC) [Arsenic Fact Sheet](#)⁶ [ToxFAQs for Arsenic](#)⁷

Food and Drug Administration (FDA) Arsenic in Food and Dietary Supplements: www.fda.gov/food/environmental-contaminants-food/arsenic-food-and-dietary-supplements⁸ What You Can Do to Limit Your Exposure to Arsenic: www.fda.gov/food/environmental-contaminants-food/what-you-can-do-limit-exposure-arsenic⁹

National Cancer Institute (NCI) Arsenic: www.cancer.gov/about-cancer/causes-prevention/risk/substances/arsenic¹⁰

National Toxicology Program (NTP) Report on Carcinogens: Arsenic and Inorganic Arsenic Compounds: <https://ntp.niehs.nih.gov/ntp/roc/content/profiles/arsenic.pdf>¹¹

World Health Organization (WHO) Fact Sheet on Arsenic: www.who.int/en/news-room/fact-sheets/detail/arsenic¹²

Consumer Product Safety Commission (CPSC) CCA-Pressure Treated Wood: www.cpsc.gov/s3fs-public/270_0.pdf¹³

Hyperlinks

1. publications.iarc.fr/120
2. ntp.niehs.nih.gov/ntp/roc/content/profiles/arsenic.pdf
3. www.cancer.org/cancer/risk-prevention/understanding-cancer-risk/determining-if-something-is-a-carcinogen.html
4. www.cancer.org/cancer/risk-prevention/understanding-cancer-risk/known-and-probable-human-carcinogens.html
5. www.dietaryguidelines.gov/

6. wwwn.cdc.gov/TSP/substances/ToxSubstance.aspx?toxid=3
7. wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsLanding.aspx?id=19&tid=3
8. www.fda.gov/food/environmental-contaminants-food/arsenic-food-and-dietary-supplements
9. www.fda.gov/food/environmental-contaminants-food/what-you-can-do-limit-exposure-arsenic
10. www.cancer.gov/about-cancer/causes-prevention/risk/substances/arsenic
11. ntp.niehs.nih.gov/ntp/roc/content/profiles/arsenic.pdf
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13. www.cpssc.gov/s3fs-public/270_0.pdf

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