



## **Arsenic (As) - a danger to the body and health, where it is contained**

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**Abstract.** The article discusses the main properties of arsenic a ( As ) and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The best natural sources of arsenic a are indicated. The use of the mineral in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of arsenic a on the human body under certain medical conditions and diseases.

**Keywords:** arsenic , As , arsenic, useful properties, contraindications, sources

Arsenic (As) is a hazardous chemical found in groundwater and is of concern to WHO. Water polluted by it threatens health not only if it is drunk, but even if crops are irrigated. Long-term exposure to high doses leads to cancer, diabetes, heart disease and even death. We tell you all about the toxin so that you can protect yourself and loved ones from deadly diseases.

### **The effect of arsenic on the body: where it is located, how it accumulates and is excreted**

The total content of the element in the body usually does not exceed 15 mg. Its main routes of entry are ingestion and inhalation (absorption through the skin is negligible). It is distributed by the blood throughout the body and mainly accumulates in the liver, lungs, and small intestine. <sup>[one]</sup>

Approximately 70% of the trace element is excreted through the kidneys with urine. Sometimes it is absorbed and excreted unchanged, but if it reacts with important biological molecules, then it disrupts their functions.

The level of harm done depends on four factors:

- amount;
- duration of exposure;
- the form;

- individual sensitivity. <sup>[2]</sup>

The less poison there is in the body, the better. A single low dose is excreted within a few days after ingestion. An exception is keratin-rich tissues such as hair and nails, so they are used for testing when arsenic poisoning is suspected. <sup>[3]</sup>

### **Sources of arsenic - what foods contain it?**

The toxin enters the body from contaminated food and water, which poses the greatest threat to health. Absorption through the skin is minimal, so bathing, handwashing, laundry is not a problem. Arsenic can also be found in pharmaceuticals, pesticides, and feed additives. People who smoke tobacco are at high risk of poisoning, as tobacco crops actively absorb the component from the soil, insecticides. <sup>[4, 5, 6]</sup>

### **Foods with arsenic - types, toxicity, risks**

An element can be organic or inorganic. The latter is one of the most common chemical contaminants of drinking water in the world and is recognized as a carcinogen. The organic form is less harmful to health.

Food sources of organic arsenic:

- cereals (especially [rice](#));
- dairy;
- meat and poultry;
- seafood.

In vegetables, fruits, rice and other grains, the component comes from the soil. <sup>[7, 8, 9]</sup>

### **Daily dose of arsenic - safe and lethal**

Some scientists rank the component among the vital ultramicroelements - they believe that it is necessary for a person in scanty concentrations, like chromium, vanadium, nickel, selenium. There are suggestions that arsenic plays a role in the metabolism of the essential amino acid methionine, inhibits the activity of certain genes. <sup>[ten]</sup>

Scientists have not yet been able to confirm the functions of arsenic for the body, since the need for it is extremely small, and the prevalence is very high. They found that under laboratory conditions in an ultraclean environment, 10–15 mcg/day is sufficient for an adult. However, in most countries, men and women consume 12–50 micrograms per day.

According to WHO recommendations, water can contain no more than 10 µg / l of the toxin. However, millions of people are exposed to higher concentrations of 100 µg/L and above. A dose of 50 mg can be lethal. <sup>[eleven]</sup>

### **Useful properties of arsenic for health**

Despite its potential toxicity, arsenic is found in some homeopathic remedies that are designed to combat depression, obsessive-compulsive disorder (OCD), insomnia, allergies, asthma, syphilis, psoriasis, rheumatism, cough, and other conditions. But science has proven its benefits only in the treatment of cancer of the blood and bone marrow. In other cases, there is no convincing scientific evidence to support its effectiveness.

## **Harmful properties of arsenic for children and adults**

1. **Provokes skin problems** - with severe chronic exposure, it causes focal hyperpigmentation, hyperkeratosis (thickening). <sup>[12, 13]</sup>
2. **Demonstrates carcinogenic activity** - provokes cancer of the skin, lungs, bladder (sometimes the liver, kidneys and other organs). <sup>[14, 15]</sup>
3. **Causes heart and circulation problems** - abnormal heartbeat, high blood pressure, circulatory system failure, gangrene. <sup>[16]</sup>
4. **Violates intrauterine development of the fetus** - leads to low birth weight, problems with the hormonal and nervous systems. <sup>[17]</sup>
5. **It impairs the mental abilities of children** - prolonged use of drinking water with a poison concentration of 50 µg / l impairs intellectual abilities. <sup>[eighteen]</sup>

## **Interaction of arsenic with minerals and vitamins in the body**

- [Selenium](#). The toxic substance blocks the useful anti-carcinogenic activity of selenium - it accelerates its excretion with bile, interferes with absorption. <sup>[19]</sup>
- Folic acid. With its deficiency, the processing of the poison and its removal from the body are disturbed.

## **Application in medicine**

The element trioxide is administered intravenously for the treatment of cancer of the bone marrow, blood (acute promyelocytic leukemia). The drug increases the death of cancer cells and helps to achieve remission. In dentistry, it is used to get rid of the dental nerve.

## **Scientific studies of the effect of arsenic on the body of men, women and children**

- Studies by American scientists have shown that dietary supplements based on algae can contain a lot of arsenic - 8 out of 9 samples contained more than the permissible level. Long-term use of such supplements leads to progressive alopecia, memory loss, rash, increased fatigue, nausea, and vomiting. After refusing them, the symptoms gradually disappear and blood counts return to normal. <sup>[twenty]</sup>
- In 2000, arsenic trioxide was approved in the US for the treatment of relapsed acute promyelocytic leukemia. The drug leads to complete remission in 70% of patients and causes few side effects. <sup>[21, 22]</sup>
- The susceptibility of arsenic by the body plays an important role in its toxicity. Scientists have found that the same concentrations affect people differently. In some men and women, hyperkeratosis of the soles and palms turns into malignant formations, while in others, precancerous forms do not worsen and remain so for life. <sup>[23, 24]</sup>

## **Arsenic poisoning - symptoms and signs of excess**

Acute poisoning occurs when a large dose is taken once or in a short period of time. The main symptoms of an overdose that can eventually lead to shock, convulsions and death are:

- red swollen skin;
- vomit;

- sore throat, stomach;
- diarrhea with blood;
- tingling of fingers;
- muscle spasms. [25, 26, 27, 28]

Such side effects are rare. More often, people suffer from chronic poisoning due to a minor overdose for several months, years. [29]

### **Treatment of arsenic poisoning, prevention and control of consumption**

There is no specific therapy for increased toxicity, so protection remains the best treatment. Full recovery can take from several weeks to months (depending on the severity of the symptoms). Since filtration of the poison and its disposal is not possible in some areas, scientists advise replacing contaminated groundwater with purified surface and rainwater. Cleaning technologies can also be used, from oxidation to membrane methods.

### **Expert comment**

#### **Tatyana Eliseeva, nutritionist**

Currently, at least 140 million people in more than 30 countries consume water with a high concentration of arsenic. It can cause serious damage to many organs and systems, so you need to take extra precautions to protect yourself from the poison at home, and drink bottled water when traveling.

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