

# International Journal of Innovative Research in Science, Engineering and Technology

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## Effect of Arsenic Poisoning on Human Health

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**ABSTRACT:** Long-term exposure to arsenic in drinking water can cause cancer in the skin, lungs, bladder and kidney. It can also cause other skin changes such as thickening and pigmentation. The likelihood of effects is related to the level of exposure to arsenic and in areas where drinking water is heavily contaminated, these effects can be seen in many individuals in the population. Increased risks of lung and bladder cancer and skin changes have been reported in people ingesting arsenic in drinking water at concentrations of 50 µg/litre, or even lower. Exposure to arsenic in the workplace by inhalation can also cause lung cancer. The likelihood of cancer is related to the level and duration of exposure. Increased risks of lung cancer have been observed at exposure levels that add up to more than 750 (µg/m<sup>3</sup>).year. For example, 15 years of exposure to a workroom air concentration of 50 µg/m<sup>3</sup> correspond to 750 (µg/m<sup>3</sup>).year). Smoking and arsenic exposure combined increase the risk of lung cancer. As regards the possible method by which arsenic causes cancer, the evidence in humans indicates that arsenic can cause damage to whole chromosomes (clastogenic effects) but does not appear to cause damage to individual genes.

**KEYWORDS:** arsenic, cancer, poisoning, exposure, long term, lung, chromosomes, genes, bladder

### I. INTRODUCTION

Soluble inorganic arsenic can have immediate toxic effects. Ingestion of large amounts can lead to gastrointestinal symptoms such as severe vomiting, disturbances of the blood and circulation, damage to the nervous system, and eventually death. When not deadly, such large doses may reduce blood cell production, break up red blood cells in the circulation, enlarge the liver, color the skin, produce tingling and loss of sensation in the limbs, and cause brain damage.

Long-term exposure to inorganic arsenic in drinking water in Taiwan has caused blackfoot disease, in which the blood vessels in the lower limbs are severely damaged, resulting eventually in progressive gangrene. Its occurrence in Taiwan may be influenced by factors such as poor nutrition. However, arsenic exposure has caused other forms of blood vessel disease in the limbs in several other countries.[1,2]

The relationship between arsenic exposure and other health effects is less clear. The evidence is strongest for high blood pressure, heart attacks and other circulatory disease. The evidence is weaker for diabetes and reproductive effects; it is weakest for strokes, long-term neurological effects, and cancer at sites other than lung, bladder, kidney and skin.

Because it targets widely dispersed enzyme reactions, arsenic affects nearly all organ systems. The most sensitive endpoint from arsenic exposure is dermal effects. While several studies may identify effects on other endpoints at the same exposure level that produces dermal effects, the database for dermal effects is stronger than for effects on other endpoints

Key physiologic effects from arsenic exposure that will be covered in detail later.

- Patchy skin hyperpigmentation, small focal keratoses, and other skin lesions are common effects of heavy chronic exposure.
- It is difficult to establish strong associations between arsenic exposure and disease, as the prevalence and spectrum of diseases linked to chronic arsenic exposure differ not only between countries, but even within countries.

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- Arsenic can cause lung and skin cancers and may cause other cancers.
- The association between chronic arsenic exposure and cancer is strongest for skin, lung, and bladder cancer. Liver (angiosarcoma), kidney, and other cancers have limited strength of association [3,4]

Note that when strength of association (defined as the magnitude of the relative risk in the exposed group compared with that in the control group) is mentioned throughout this section, it refers to one of the five criteria used to decide whether a positive association in epidemiologic studies indicates causality. It is not absolutely required to establish causality. In addition, fulfillment of some criteria may occur when the association is a result of chance or bias. Failure to demonstrate a positive association in an epidemiologic study does not always indicate there is no association between the agent and the effects studied.

## Dangers of lead and arsenic poisoning

### Arsenic poisoning

**Nerve damage**

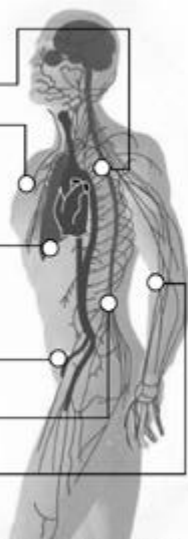
**Skin damage:**

- Hyperkeratosis (scaling skin)
- Pigment changes

**Increased cancer risk:**

- Lung
- Bladder
- Kidney and liver cancers

**Circulatory problems in skin**



### Lead poisoning

**High levels of lead**

- Mental retardation, coma, convulsions and death

**Low levels of lead**

- Reduced IQ and attention span, impaired growth, reading and learning disabilities, hearing loss and a range of other health and behavioral effects.

Sources: Alliance to End Childhood Lead Poisoning and news wires

The Denver Post

In the United States, excess cancer mortality associated with arsenic is not generally seen

Unlike other arsenicals, arsine gas causes a hemolytic syndrome.

## II. DISCUSSION

Arsenic is a unique element with distinct physical characteristics and toxicity whose importance in public health is well recognized. The toxicity of arsenic varies across its different forms. While the carcinogenicity of arsenic has been confirmed, the mechanisms behind the diseases occurring after acute or chronic exposure to arsenic are not well understood. Inorganic arsenic has been confirmed as a human carcinogen that can induce skin, lung, and bladder cancer. There are also reports of its significant association to liver, prostate, and bladder cancer. Recent studies have also suggested a relationship with diabetes, neurological effects, cardiac disorders, and reproductive organs, but further studies are required to confirm these associations. The majority of research to date has examined cancer incidence after a high exposure to high concentrations of arsenic. However, numerous studies have reported various health effects caused by chronic exposure to low concentrations of arsenic. [5,6]

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Arsenic keratoses (below) on the palms of a patient who ingested arsenic from a contaminated well over a prolonged period (photo courtesy Dr. Joseph Graziano).



An assessment of the health effects to arsenic exposure has never been performed in the South Korean population; thus, objective estimates of exposure levels are needed. Data should be collected on the biological exposure level for the total arsenic concentration, and individual arsenic concentration by species. In South Korea, we believe that biological exposure assessment should be the first step, followed by regular health effect assessments.

### III. RESULTS

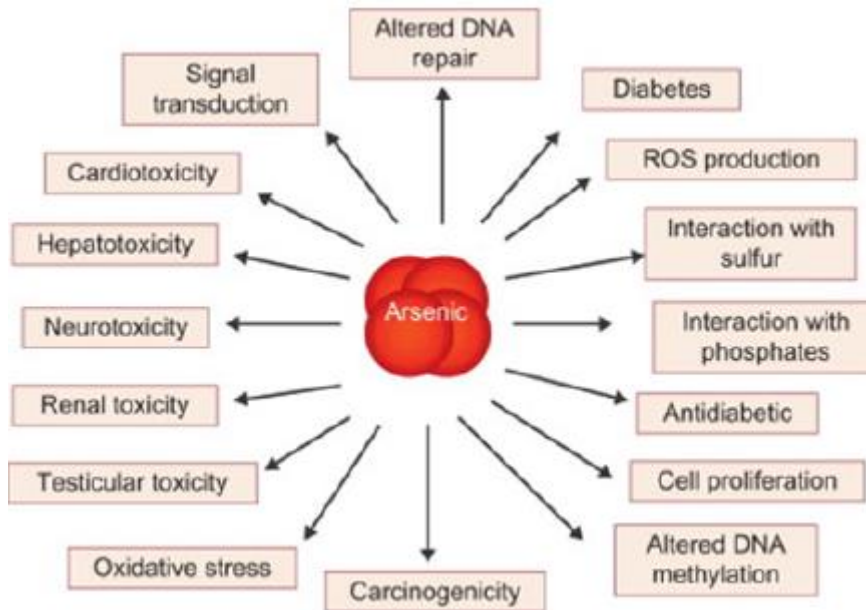
Given its toxicity, arsenic exposure is an important issue in public health, and more research is warranted. Cancers of the skin, lungs, and bladder have been confirmed to be associated with arsenic exposure, while human data on liver cancer, kidney cancer, prostate cancer, and leukemia are limited. For diabetes and other disorders, further research regarding its non-carcinogenic toxicity is needed. Recent, previous studies have investigated the health effects of chronic exposures to low concentrations of arsenic, but additional studies are required. To determine the level of arsenic exposure and its associated health effects in the South Korean population, biological monitoring data that can objectively assess human exposure must be developed. However, data on the total arsenic exposure level and that by arsenic species are lacking in the Korean population; therefore, further research of this kind is needed to support effective public health management.[7,8]

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Symptoms of arsenic poisoning may include:

- red or swollen skin
- skin changes, such as new warts or lesions
- abdominal pain
- nausea and vomiting
- diarrhea
- abnormal heart rhythm
- muscle cramps
- tingling of fingers and toes

Long-term exposure to arsenic can cause more severe symptoms. You should seek emergency help if you experience any of the following after a suspected arsenic exposure:

- darkening skin
- constant sore throat
- persistent digestive issues[9,10]

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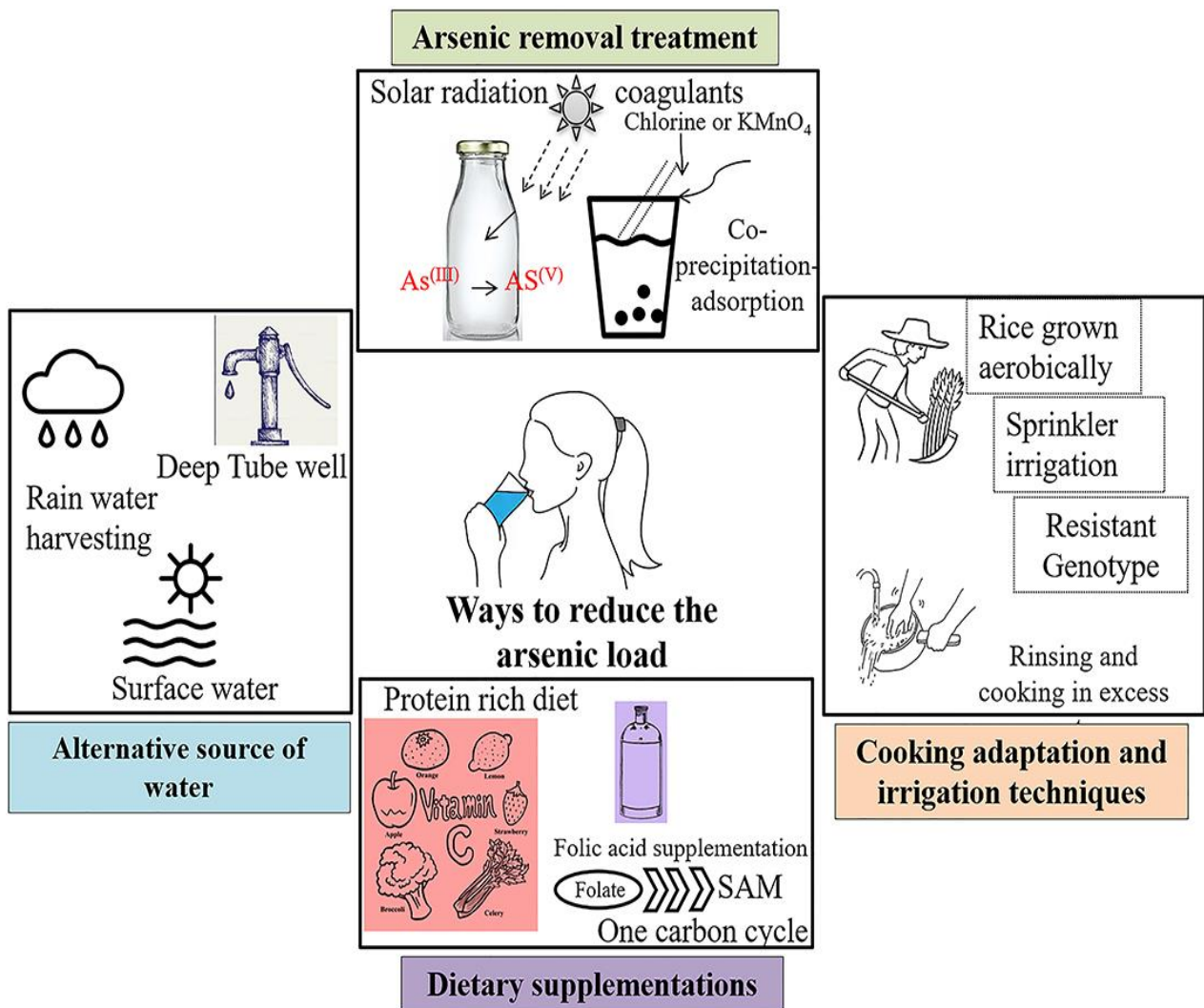
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According to the World Health Organization, long-term symptoms tend to occur in the skin first, and can show up within five years of exposure. Cases of extreme poisoning may lead to death.

## IV. CONCLUSIONS

There's no specific method used to treat arsenic poisoning. The best way to treat the condition is to eliminate arsenic exposure. Full recovery may not happen for weeks or months. It all depends on how long you've been exposed. The severity of your symptoms can also play a role.[11,12]



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Vitamin E and selenium supplements have been used as alternative remedies to limit the effects of arsenic exposure. It's thought that these substances cancel each other out. Still, more human studies are needed to support vitamin E and selenium as viable treatment methods.

Arsenic poisoning may lead to other health complications. Diabetes, heart disease, and neurotoxicity are possible after prolonged exposure. In pregnant women, arsenic poisoning can lead to fetal complications or birth defects after delivery. Developmental effects can occur in children who are regularly exposed to arsenic.

Ground water continues to be the most common source of arsenic poisoning. One of the most effective preventive measures against arsenic poisoning is to make sure you drink clean, filtered water. You can also make sure that all foods are prepared in clean water.

If you work in industries that use arsenic, take extra precautions. Bring your own water from home, and wear a mask to reduce accidental arsenic inhalation.[13,14] While traveling, consider drinking bottled water only.

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