



TOXICITY EFFECTS OF ARSENIC ON HUMAN HEALTH

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Abstract

Arsenic is one of the rapidly emerging serious environmental pollutants. It is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land it is highly toxic in its inorganic form. People are exposed to inorganic arsenic through drinking contaminated water, using contaminated water in food preparation and irrigation of crops industrial processes, eating contaminated food and smoking tobacco. Arsenic has many ill effects in our health mainly through drinking water and food can lead to chronic arsenic poisoning skin lesions and skin cancer. The immediate symptoms of acute arsenic poisoning include diarrhea, vomiting, and abdominal pains. These are followed by numbness and tingling of the extremities, muscles cramping and death in extreme cases. 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. We can also make sure that all foods are prepared in clean water. If we work in industries that use arsenic, take extra precautions. Bring your own water from home, and wear a mask to reduce accidental arsenic inhalation. While traveling, consider drinking bottled water only.

Keywords: - pollutants, contaminated, health, lesions, cancer, numbness, tingling, extremities, poisoning, precautions.

Introduction

Water is life. Life on earth also originated in water. Generally no living being can survive without water. But in modern era, this water is becoming completely polluted due to human overexploitation activities. Due to this many types of diseases are arising in the world. There are so many reasons for contamination of water, in which the main reason being the presence of residual and waste substances in water. The most harmful of these residual and waste materials are heavy metals through release by many causes like through release from the suddenly mine tailings, disposal of high metal wastes, growing industrial areas, leaded gasoline and paints, usage of fertilizers inland, animal manures, E-waste, sewage sludge, pesticides, wastewater irrigation, coal, etc.

Almost all heavy metals are toxic at higher concentration but some of them are lethal at very low concentration. But of this arsenic is one of the rapidly emerging serious environmental pollutants. However, in many countries including India and Bangladesh, people are consuming arsenic through drinking water at much higher level (Srivastava *et al.*, 2013). The ground water of many parts in India are contaminated by its. In other words arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land it is highly toxic in its inorganic form. People are exposed to inorganic arsenic through drinking contaminated water, using contaminated water in food preparation and irrigation of crops industrial processes, eating contaminated food and smoking tobacco.

Arsenic has many ill effects in our health mainly through drinking water and food can lead to chronic arsenic poisoning skin lesions and skin cancer. Arsenic has an affinity toward the SH group of proteins that leads to inhibition of cellular respiration, impaired glycolysis and oxidative process and finally death of cells. Though almost all the systems are being affected, liver and kidneys are most susceptible to arsenic toxicity (Sharma *et al.*, 2016).

Sources of Exposure

Inorganic arsenic is naturally present at high level in ground water. Many countries including Argentina, Bangladesh, Cambodia, Chile, China, India, etc have arsenic contaminated water in some part of country. Drinking these contaminated water, crop irrigated or food prepared with these crop water give an exposure. Fish, shell fish, meat poultry, dairy product and cereals can also dietary sources of arsenic. In sea food arsenic is mainly found in less toxic form. People who not smoke tobacco can also be exposed to the natural inorganic arsenic content of tobacco. Tobacco plants can take up arsenic naturally present in soil. Arsenic in food occurs as relatively nontoxic organic compounds (arsenobetaine and arsenocholine). Seafood, fish, and algae are the richest organic sources. These organic compounds cause raised arsenic levels in blood but are rapidly excreted unchanged in urine. Arsenic intake is higher from solid foods than from liquids including drinking water. Organic and inorganic arsenic compounds may enter the plant food chain from agricultural products or from soil irrigated with arsenic contaminated water (Ratnaike R. N., 2023).

Heating effects

Inorganic arsenic is a confirmed carcinogen and is the most significant chemical contaminant in drinking water globally. It has acute as well as long term effect on our health. The arsenic dosage levels brought about a reduction in antioxidant enzymes followed by an increase in lipid peroxidation levels causing neurotoxicity by generation of free radicals in brain tissue (Rao & Avani, 2004).

Acute effects

The immediate symptoms of acute arsenic poisoning include diarrhea, vomiting, and abdominal pains. These are followed by numbness and tingling of the extremities, muscles cramping and death in extreme cases. Haematological abnormalities reported are haemaglobinuria, intravascular coagulation, bone marrow depression, severe pancytopenia, and normocytic normochromic anaemia and basophilic stippling. Renal failure was reported in four of eight sailors exposed to arsine. Respiratory failure and pulmonary oedema are common features of acute poisoning. The most frequent neurological manifestation is peripheral neuropathy that may last for as long as two years. The peripheral neuropathy may lead to rapid, severe ascending weakness, similar to Guillain-Barré syndrome, requiring mechanical ventilation. Encephalopathy is a common manifestation and the possibility of arsenic toxicity must be considered if the etiology of encephalopathy is uncertain. Encephalopathy has occurred after intravenous administration of arsphenamines. The basis for the encephalopathy is thought to be due to hemorrhage.

Long term Effect

The first symptom of long term exposure to high levels of inorganic arsenic are usually observed in the skin and include pigmentation changes skin lesions and hard patches on the palms soles of the feet (hyperkeratosis). According to Mishra, *et al.*, (2017), the most commonly observed symptoms of chronic arsenic poisoning are skin cancer, conjunctivitis, melanosis. These occur after a minimum exposure of approximately five years and may be a precursor to skin cancer. In addition to skin cancer, long term exposure to arsenic may also cause cancer of bladder, liver, kidney and lungs. The International Agency for Research on Cancer has classified arsenic as carcinogenic to human. Other adverse health effects that may be associated with long term ingestion of inorganic arsenic include developmental effect, diabetes, pulmonary disease and cardiovascular disease. Arsenic induced myocardial infarction in particular can be significant cause of excess mortality.

Arsenic is also associated with adverse pregnancy and infant mortality, which impact on child health. Numerous studies have demonstrated negative impacts of arsenic exposure on cognitive development, intelligence and memory.

Prevention and Control

The best management option could be natural agents with antioxidant and anti-inflammatory properties. Further work is necessary to evaluate the best possible treatment option against arsenic-

induced organ damage .There are a number of options to reduce levels of arsenic in drinking water. Some of them are given below-:

- Substitute high arsenic sources such as groundwater with low arsenic microbiologically safe sources such as rain water and treated surface water.
- Discriminate between high arsenic and low arsenic sources.
- Blend high arsenic water with high arsenic water to achieve an acceptable arsenic concentration level.
- Install arsenic removal system – either centralized or domestic and ensure the appropriate disposal removed of removed arsenic. These systems include oxidation, coagulation precipitation, absorption ion exchange etc.

Conclusion

Arsenic is one of WHO's 10 chemicals of major public health concern. Consumption of arsenic leads to various health related issues related to mental as well as physical health. Commonly we consume arsenic in drinking water. The contaminated water can cause various severe diseases, cancer is one of them. So we should avoid such water and other sources of arsenic to live long healthy life. WHO's work to reduce arsenic exposure include setting guidelines values reviewing evidence and providing risk management recommendation. 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. We can also make sure that all foods are prepared in clean water. If we work in industries that use arsenic, take extra precautions. Bring your own water from home, and wear a mask to reduce accidental arsenic inhalation. While traveling, consider drinking bottled water only.

Under the 2030 Agenda of Sustainable Development in the indicator of “Safely managed drinking water services” calls for tracking the population drinking water. So, drinking water must be tested before it is used to keep people healthy and safe.

“Only healthy people can make a healthy nation”.

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