

# Human Exposure to Arsenic Compounds

MITHE-SN • CANADIAN NETWORK OF TOXICOLOGY CENTRES

## Research of Benefit to Canadians

Canadian researchers are providing important insight that is necessary to an improved understanding of cancer-causing effects of many environmental contaminants. By understanding causal effects of arsenic, regulatory agencies will be able to develop scientifically sound guidelines and measures to prevent and reduce cancers that may be associated with exposure to arsenic.

## Pressure-treated Wood Containing CCA

Humans are exposed to naturally occurring and human made (anthropogenic) sources of arsenic in the environment. Pressure-treated wood that contains chromated copper arsenate (CCA) is widely used in many structures including residential decks and playgrounds. What happens to children who play on these structures? Our team


Chromated copper arsenate (CCA) is widely used in residential decks and children's playgrounds

of researchers first measured the levels of arsenic and chromium on children's hands before and after playing in playgrounds either constructed with or without such treated wood. Because of the contact with the CCA-treated wood, children who play in CCA playgrounds have on average four times higher levels of arsenic and chromium on their hands compared to children who play in non-CCA playgrounds.

In order to understand how much of the arsenic and chromium on children's hands ends up in the body, our researchers measured the levels of arsenic and chromium in children's urine and saliva. Because most arsenic in the body is excreted into the urine, measuring arsenic in urine serves as a marker. Although the increased levels should not be ignored, the maximum amounts of arsenic and chromium on the hands of all children tested were lower than the average daily dietary intake of total arsenic and chromium in Canadian children.



The NSERC Metals in the Human Environment Strategic Network (MITHE-SN) provided funding for this research that, apart from children's exposure to arsenic and chromium in playgrounds, also evaluated the extent of arsenic exposure in the general population. Arsenic is the 20th most abundant element in the earth's crust and, as such, is present in all food and water sources, albeit at different levels. Consequently, the main sources of human exposure to arsenic are water and food. Depending on how arsenic binds to other elements, such as oxygen, sulfur, and carbon, to form the various arsenic compounds, the toxicity of arsenic is very different. For example, a single meal of lobster can result in the ingestion of arsenic at a level that is a thousand times higher than the total arsenic from drinking water consumed in a whole day. However, the high levels of arsenic in lobsters do not pose a health concern to consumers because

 **More than 20 arsenic compounds of different toxicities are present in the natural environment**

the arsenic present in lobsters is primarily in the form of the innocuous arsenobetaine (a non-toxic arsenic compound). In fact, more than 20 arsenic compounds of different toxicities are present in the natural environment. To enable the identification and detection of different arsenic compounds, our researchers have developed critical assay methods.

## About MITHE-SN


The **Metals in the Human Environment Strategic Network** is a collaboration of academia, government, and industry. The Network conducts research in support of science-based environmental and human health risk assessments for metals in water, soil, and food, within well articulated and planned inter-disciplinary research themes. Our research program is strongly linked across Canada, with field sites in the Maritimes, Québec, Ontario, The Prairies, British Columbia, the Yukon, and Nunavut. The Network also features strong links among academic and government scientists. Implicit in the MITHE-SN approach is a commitment to joint, interactive, centralized planning, project accountability for both intellectual and financial objectives, and regular reporting of research progress beyond the usual publication in scientific journals.

Reference Link: [www.mithe-sn.org](http://www.mithe-sn.org) Telephone: **519-824-4120**, Ext. **52950**

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## Dietary Influence of Arsenic Compounds

Our research team was able to differentiate the highly toxic arsenic compounds from the less toxic compounds in food, water, urine, and saliva. They continue to determine the chemical forms and levels of arsenic in food items that are commonly consumed in Canada. The identification and quantitative measurements of the individual

**Genetic damage to human cells from exposure to arsenic and other environmental contaminants is investigated** 

arsenic compounds in human diet are essential to the assessments of daily dietary intake of the different arsenic compounds. Studies are also being conducted on human health effects arising from exposure to the various arsenic compounds, including damage to genetic material in the human body from exposure to the combined effect of arsenic and other environmental contaminants and the impact on the body's protective system to repair the damage.

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