

1

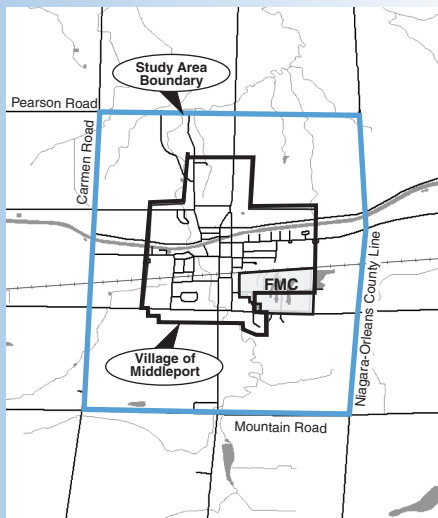
To quantify the relationship between arsenic in soil and arsenic in urine of children less than 7 years old. Arsenic in urine is a biomarker of recent arsenic exposure.

2

To provide Middleport residents with information on their biomarker levels of arsenic relative to reference levels that indicate a potential for elevated exposure and a need for follow-up.

3

To provide the Middleport community and interested health agencies with information regarding residential exposure to arsenic from soil.



Middleport Environmental Exposure Investigation

Study Results



Exponent®

For more information,
please call
1-800-326-7102

www.exponent.com



The Nature of Arsenic and How It Is Used

Arsenic is a natural element that is widely distributed in the earth's crust. Two main forms of arsenic are **inorganic arsenic** and **organic arsenic**. Organic forms such as in food are usually less harmful than the inorganic forms. **Inorganic arsenic occurs naturally** in water, soil, and in many kinds of rock, especially in minerals and ores that contain copper or lead.

Everyone normally is exposed to small amounts of arsenic through the air we breathe, the water we drink, and the food we eat. Of these, **food** is usually the largest **source of arsenic**. **Fish and seafood contain** the greatest amounts of **arsenic**, but this arsenic is mostly in the organic form, the form least harmful. Young children are likely to eat small amounts of dust or dirt each day, which is another way they may be exposed to arsenic. Arsenic in water is more efficiently absorbed by the body than arsenic in soil.

If you are **exposed to arsenic**, many factors determine whether you will be harmed. These factors include the **dose** (how much), the **duration** (how long), the **frequency** (how often), the form of arsenic, and how you come in **contact** with it. Other factors may include your age, sex, diet, family traits, lifestyle, and state of health.

Questions & Answers

What was the biomonitoring study about?

Biomonitoring refers to testing a population for clinical measures of possible exposure to a particular substance, in this case arsenic. This study investigated whether residents of the Middleport community have been exposed to excess levels of arsenic from soil.

The study focused on levels of urinary speciated arsenic, a measure of exposure to inorganic arsenic from soil. Study investigators compared speciated arsenic levels in urine to arsenic levels in soil, house dust, and homegrown produce. Careful attention was given to other exposure factors such as diet, individual activities (such as playing in creeks), and other potential sources of arsenic.

Who participated in the study?

Young children less than age 7 were the primary focus of the study because of their greater potential for soil exposure. Seventy-seven young children or nearly half of the available population in this age group within the study area participated. A total of 362 older children and adults also participated.

Why was this study conducted?

The community advisory panel (CAP) of Middleport asked FMC to conduct a biomonitoring study of the Middleport community.

Who paid for the project?

FMC Corporation funded this study. The study was conducted by Exponent, an independent contractor, with outside review by a panel of health experts from universities, research institutes, and the Centers for Disease Control and Prevention (CDC).

What samples were collected?

Participants were asked to provide urine samples collected in the morning on two consecutive days. Toenail samples were collected and analyzed for arsenic only upon request.

Professional field staff collected soil and interior house dust samples from participating residential properties that had owner consent. Homegrown produce was sampled at the request of homeowners.

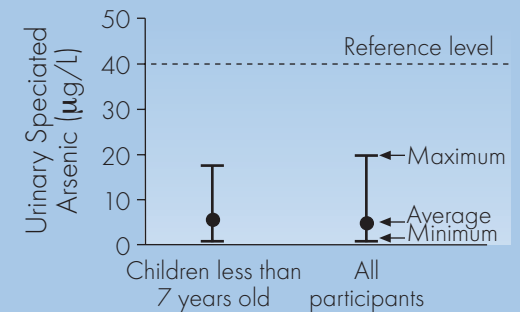
Where were the samples analyzed?

Samples were shipped to federally accredited laboratories including the Centers for Disease Control and Prevention where they were measured for arsenic levels.

What did the study find?

There is no clear evidence of elevated exposure from arsenic in soil for participants in this investigation.

1. Urinary arsenic levels of individual participants were overall much lower than the reference level for elevated arsenic exposure. Toenail arsenic levels were also below the CDC reference level for normal exposure.



2. There was no evidence that exposure to arsenic in soil or house dust increased speciated arsenic in urine in children less than 7 years old. Expanding the analysis to include older ages had the same result.
3. Eating garden vegetables, playing in creeks, or soil-related behaviors were not associated with increased urinary arsenic levels.
4. Sources of inorganic arsenic other than soil (likely background levels in water and diet) are the primary contributors to inorganic arsenic exposure in this community.