NEW YORK
state department of
HEALTH

FMC – Middleport, NY
Arsenic Soil Contamination - Frequently Asked Questions
February 2012

The New York State Department of Health (NYSDOH) is working with the New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) to address elevated levels of arsenic in soil in areas near the FMC facility in Middleport, New York. The following questions and answers are provided to help clarify the agencies' position on several issues pertaining to arsenic toxicity and the need to remediate the elevated arsenic levels in soil.

1) ***Why are the agencies concerned about elevated levels of arsenic in Middleport soil?***

Exposure to arsenic is known to cause cancer in humans. There is convincing evidence from a large number of scientific studies of people who have been exposed to high levels of arsenic in drinking water that ingestion (i.e., swallowing) of inorganic arsenic increases the risk for skin, lung and bladder cancer (ATSDR 2007; NRC, 2001; NTP, 2005). In addition, recent evidence from studies of people and animals suggests that the very young may be more sensitive to the carcinogenic effects of arsenic than adults (Ahlborn et al., 2009; Marshall et al., 2007; Smith et al., 2006; Tokar et al., 2011; Waalkes et al., 2003, 2006, 2007, 2009). Arsenic also causes noncancer health effects such as stomach irritation, and effects on the nervous system, heart, blood vessels and skin (ATSDR 2007). Since arsenic can cause adverse health effects in humans after high levels of exposure, lower levels of arsenic exposure in soil over long periods of time can also pose an increased risk for arsenic-related health effects.

2) ***The studies show arsenic causes cancer in humans based on exposure in drinking water. How is this relevant to exposure to arsenic in soil?***

Whether arsenic is ingested from water or from soil, it can be absorbed into the body. Once in the body, the arsenic (regardless of where it came from) poses an increased risk for arsenic-related health effects. Many different factors (for example, the form and amount of arsenic, the characteristics of the soil, the presence of other contaminants, the age of the person ingesting the soil, and whether or not their stomach contains food) can influence how much arsenic is absorbed into the body when soil is ingested. How these factors influence arsenic absorption is difficult to quantify. In light of these uncertainties, the agencies consider the absorption of arsenic from soil to be the same as that from water.

3) ***Why is the remediation of the soils needed if there is no evidence of increased health problems among Middleport residents from arsenic in soil?***

The absence of evidence suggesting increased health problems does not mean that exposures to arsenic in Middleport soils are without risk. Increased numbers of cancer cases or other health problems are difficult, if not impossible to detect in a population the size of Middleport's. In addition, certain health problems such as cancer can take a long time to develop, and may occur only after long-term exposure. The elevated arsenic levels in soil resulting from historic releases from the FMC facility warrant actions to minimize the potential for long term human exposure. Remediating arsenic in Middleport soils to levels consistent with local background levels is a practical means to accomplish this important public health goal.

4) ***The NYSDOH health-based soil cleanup objectives (SCOs) for arsenic are below background concentrations of arsenic in soil. Does this mean that all soils with typical arsenic concentrations constitute a risk?***

Arsenic is a natural component of soils, and there is some level of risk associated with exposure to arsenic even at natural concentrations (i.e., background concentrations). Since it is not practical to set remedial goals for arsenic at levels below typical background concentrations, background concentrations are used as practical remedial goals. Taking reasonable, prudent and practical measures to reduce contaminant concentrations to background levels means that current and future users of the properties contaminated by the FMC facility will not have risks that are greater than those posed by typical soils.

5) ***Why does the NYSDOH consider exposure through home grown produce (i.e., fruits and vegetables) when evaluating arsenic risks in soil?***

Fruits and vegetables grown in arsenic-contaminated soil can take up arsenic (Meharg and Hartley-Whitaker, 2002; Zhao et al., 2008). Consumption of these homegrown fruits and vegetables can contribute to arsenic exposure. Therefore, we considered this exposure pathway, in addition to the soil ingestion pathway, when we evaluated the risk from exposure to arsenic in soil.

6) ***Why were the 1987 NYSDOH biological monitoring study and the 2003/2004 FMC-sponsored biological monitoring study (Exponent Study) not considered in the decision to remediate the soils?***

The agencies considered the results of both studies. The NYSDOH 1987 biological monitoring study (NYS DOH, 1987a) compared urinary arsenic levels and hair arsenic levels in Middleport Elementary and Royalton-Hartland Junior/Senior High School students to those at a control school in Rensselaer County, New York (i.e., a school not near an obvious source of arsenic contamination). The study concluded that there was no statistical difference in either measure of arsenic exposure between the students of the two schools. The biological monitoring study by Exponent (FMC's consultant) (Tsuji et al., 2005) measured arsenic levels in the urine and toenails of certain Middleport residents. Exponent concluded that the levels of arsenic in urine and toenails were not elevated compared to control populations.

Both biological monitoring studies were well-conducted and offer useful information on whether or not the study participants may have recently been exposed to arsenic at levels higher than control populations. Measurements of arsenic levels in urine provide information on arsenic exposures that may have occurred up to several days prior to the test. Arsenic levels in hair or nails provide information on exposures during the previous several months. The studies only provide evidence of whether any of the study participants had elevated arsenic exposure during these limited periods of time. However, an important limitation of both studies is that the study participants were not chosen to be representative of the entire range of activities that may result in people being exposed to arsenic in the community. For example, people who garden or toddlers who play in soil could potentially have higher arsenic exposure than study participants. The study participants are also not necessarily adequately representative of people who may be particularly sensitive to the health effects of arsenic such as infants or very young children. A further limitation of the studies is that arsenic levels in urine, hair or nails cannot provide information about peak exposures (those occurring months before the samples were collected, or which could occur in the future) that may increase the risk for long-term health effects. Lastly, the study results do not guarantee that if no remedial action is taken that arsenic exposures will not increase in the future because of environmental changes or behavioral changers of the residents. In short, the results cannot be used to predict how arsenic exposures might change (e.g., increase or decrease) over longer periods of time.

The agencies are charged with protecting public health for all members of the community, and must consider the possibility of current and future exposures to arsenic in soil, both on a short and long-term basis. While the results of the studies are encouraging in that they do not suggest increased levels of arsenic exposure during the days and months prior to sample collection, they were not designed to comprehensively address past long-term exposures and future exposures. In addition, given the potential variability in exposure, the relationship between arsenic levels in urine, hair and nails at a single point in time and the likelihood of health effects is uncertain. All of these considerations are important in the protection of public health, and thus remedial decisions cannot be made solely on the basis of the biological monitoring studies.

7) ***Did the agencies consider the 1987 NYSDOH cancer incidence study when evaluating the risks of arsenic in Middleport soil?***

Yes. The NYS DOH 1987 cancer incidence study (NYS DOH, 1987b) examined the number of cancers in Middleport from 1976 to 1984. The study concluded that the number of all cancers in Middleport during this period was similar to the total number of cancers expected. The study also concluded that the number of specific types of cancer (e.g., lung, colon, bladder and others) in men and women was not significantly different from what would be expected. An important limitation of the study is that it was conducted 24 years ago and cannot account for any cancers that may appear after the study was completed. The latency period, or the amount of time it takes cancer to develop, is about 10 to 40 years for most types of cancer. Thus, this study alone cannot be used to make remedial decisions or final conclusions about the increased risk for cancer posed by the elevated levels of arsenic in Middleport soils.

8) ***How was the 20 part per million local arsenic background concentration determined by the Agencies?***

FMC conducted a background study in the neighboring town of Gasport during 2003. Results of that study indicated 20 parts per million (ppm) to be the upper limit (95 percentile) of the local background range for arsenic in soil. This concentration (20 ppm) was then used by the agencies as a tool to help determine where arsenic is likely present due to historic FMC releases rather than due to natural background or other sources. Further information about the 2003 FMC Background Study can be found in the report titled, 2001-2003 Gasport Area Background Study, which is available for review in the document repository.

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