Center for Environmental Health
Center for Community Health
Information Sheet
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PUBLIC COMMENT DRAFT

Health Consultation
Health Outcomes Review:
Adverse Birth Outcomes and Cancer Incidence

Village of Liberty,
Sullivan County, New York

Public comment period ends March 30, 2012

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SUMMARY

A health outcomes review was conducted for the Village of Liberty because of concerns about health effects from methyl tert-butyl ether (MTBE) in the water supply system. A health outcomes review examines a particular group of people as a whole to see how it compares to a group not living in the area of concern. It cannot link an environmental exposure to a specific health effect and it cannot tell us anything about individual health problems.

This health review covered the time period between 1979 and 2005 and focused on the outcomes of low birthweight, premature births, birth defects and cancer for the population exposed in the past to MTBE. The purpose of this review was to compare the number of these health outcomes for people who lived in Liberty to people who lived in the rest of the state. This comparison showed nothing unusual for any of the birth outcomes or cancer in general. Looking specifically at 17 types of cancer in males and 19 types in females, two statistically significant elevations were noted:

- A higher than expected number (65 vs. 46) of lung and bronchial cancers among women 65-74. This type of cancer is not associated with exposure to MTBE in animals, but is associated with smoking history. A majority of the women who were diagnosed with lung cancer whose smoking history was known were current or former smokers.

- A higher than expected number (18 vs. 10) of leukemias diagnosed among men between 1990 and 2003. We do not know whether MTBE can cause cancer in humans, but leukemia is one type of cancer associated with MTBE exposure in animals. Although this is not a cause and effect link and may, in fact, be due to chance or other possible exposures, we recognize this may raise concerns among men and their families. Individuals who are concerned are encouraged to share this information with their health care providers.

Background

The New York State Department of Health (NYS DOH) conducted this health outcomes review because of concerns about health issues and contamination of the Village of Liberty water supply system with methyl tert-butyl ether (MTBE). This type of review looks at health outcomes among the population of a specific geographic area and provides residents with information about numbers of outcomes in their area compared with expected numbers based on statewide data. This type of review cannot link cause (exposure) and effect (health outcome) and cannot relate an individual's health problem to a specific environmental exposure.

In December 1992, contamination of water from the Village of Liberty's Elm Street well by the gasoline additive methyl tert-butyl ether (MTBE) was discovered at levels that exceeded the NYS DOH drinking water standard in effect at that time. Residents of the Village of Liberty and the Town of Liberty's Ferndale and Stevensville water districts were potentially exposed to MTBE at levels above the applicable NYS DOH drinking water standard for an undetermined amount of time, possibly from as early as 1979, when MTBE was first used as a gasoline additive, to January 1993 when the distribution system was flushed and the well was temporarily taken out of service. Village residents were potentially exposed to levels above the applicable standard again for the month of November 1993. Water testing data from 2004 through 2009 show no elevations in MTBE.

There are no data on the effects on people drinking water contaminated with MTBE. Animal studies suggest that drinking MTBE may cause gastrointestinal irritation, liver and kidney damage, and nervous system effects in rodents. Animal studies found that breathing high levels of MTBE for long periods may cause kidney or liver cancer in rodents (ATSDR, 1997; USDHHS, NTP, 1998) but it is not known whether MTBE can cause cancer in humans.

This health outcomes review focuses on adverse birth outcomes, including low birth weight and prematurity outcomes and birth defects, and cancer. This type of review is feasible because NYS DOH collects comprehensive data on these health outcomes for all NYS residents.

Adverse Birth Outcomes

The Village of Liberty and the Town of Liberty's Stevensville and Ferndale water district boundaries were used to define the exposure areas for the adverse birth outcomes analysis. To reflect multiple exposure areas and timeframes, the study analyses were conducted for five different exposure groups between 1979 and 2005.

No statistically significant elevations in adverse birth outcomes were observed for infants born to mothers who may have been exposed to elevated levels of MTBE from the Elm Street well. In the exposure group with the highest potential exposures to MTBE, there were more elevations for low birth weight outcomes than in the other MTBE exposure categories, but the elevations were not statistically significant. In this highest potential exposure group, the elevation for preterm births (62 observed, 45.6 expected) produced a rate ratio of 1.24 (CI: 0.97-1.59) that was, however, close to being statistically significant.

The analyses of low birth weight outcomes produced one statistically significant elevation, for term low birth weight, but this elevation occurred in the Liberty Water district from 2000 through 2005, when residents were not exposed to elevated levels of MTBE from the Elm Street well. This elevation for term low birth weight was just above the borderline for statistical significance (RR 1.77, 95% CI: 1.00 - 3.11).

All reportable birth defects were evaluated as well as specific subsets of defects considered to be appropriate to evaluate for VOC-exposed populations, based on current research findings.

Seventy birth defects were detected in the five exposure groups over the 22 year exposure period (1983-2004). A variety of defects were represented in the total, with musculoskeletal defects, heart defects and defects of the genitourinary system reported most frequently. After excluding births with incomplete information, a total of 66 defects were included in the analysis and 65.6 were expected. There were no statistically significant excesses (or deficits) of birth defects during the period when MTBE exposures are expected to have occurred or in the later, post-MTBE time period. There was nothing unusual noted about the pattern of birth defects.

Cancer Incidence

The study area for cancer incidence consisted of ZIP codes 12754 (Liberty) and 12768 (Parksville), Sullivan County. The time period for the investigation of cancer incidence was 1990 through 2003, the most recent period for which cancer reporting was considered complete for analysis within small geographic areas at the time work on the study was initiated. This review looked at 17 types of cancer in males and 19 types in females.

Overall, the actual number of men diagnosed with cancer was not statistically significantly different from the number expected (344 cases observed; 340 cases expected). Looking at specific types of cancer, a statistically significant excess was found in the number of men diagnosed with leukemia (18 cases observed; 10 cases expected). As is usually seen with leukemia, the majority of cases were found in people over the age of 65, and the most frequently diagnosed subtypes were acute myelogenous leukemia (AML) and chronic lymphocytic leukemia (CLL). A statistically significant deficit was found in the number of men diagnosed with multiple myeloma (0 cases observed; 4 cases expected). No other specific types of cancer showed a statistically significant excess or deficit.

Overall, the actual number of women diagnosed with cancer was not statistically significantly different from the number expected (369 cases observed; 336 cases expected). Looking at specific types of cancer, a statistically significant excess was found in the number of women with cancer of the lung and bronchus (65 cases observed; 46 cases expected). No other specific type of cancer showed a statistically significant excess and no specific type of cancer showed a statistically significant deficit.

Conclusions

No type of adverse birth outcome was statistically significantly elevated among infants whose mothers were classified as having been exposed to elevated levels of MTBE from the Elm Street well. When the exposure group with the highest potential exposures to MTBE was evaluated separately, there were more elevations than in the other MTBE exposure categories, but the lack of statistical significance indicates this finding is likely due to chance. There was one statistically significant elevation in the birth outcome analyses. This was for term low birth weight births in the Liberty water district from 2000-2005, when no exposures to elevated levels of MTBE from the Elm Street well were occurring (RR 1.77, 95% CI: 1.00 - 3.11). This elevation was just above the borderline for statistical significance.

Regarding the cancer findings, leukemia is the one type of cancer associated with MTBE exposures in animals that was statistically significantly elevated in this investigation and the elevation was only among men. The lack of an elevation of leukemia diagnoses in an earlier time period, 1980-1989, is consistent with the interpretation that a latency period, or time-lag, produced elevated leukemia incidence only during the more recent time period. The majority of the men diagnosed with leukemia lived in the area supplied by water from the Elm St. well, consistent with the population distribution. Only a small proportion of them had known individual risk factors. The pattern of age at diagnosis for the men with leukemia was not unusual. Given the number of individual types of cancer evaluated, it is possible that this statistically significant elevation occurred by chance. In addition, most cancers, including leukemia, have more than one possible cause, and this study did not have enough information available to identify and evaluate all other possible causes in this population.

This type of review cannot prove a link between cause and effect. Similarly, the findings, whether they show statistically significant elevations or no statistically significant elevations, do not tell us whether any specific health outcome may have been caused by an environmental exposure. The small numbers of outcomes for some rare types of outcomes, which include many types of cancer and birth defects, limit the strength of conclusions that can be drawn from this review.

Because of the shorter latency period for birth outcomes and the multivariate analyses performed to produce birth outcome findings that take account of other risk factors, these findings lend themselves to stronger interpretation than the cancer findings. While some of the low birth weight findings for the exposure group with the highest potential exposures are suggestive of a possible effect of MTBE, the findings were not statistically significant, which means no effect was detected.

In summary, for the Liberty area population exposed in the past to MTBE, there were no statistically significant findings for birth outcomes or overall, for cancer. There was a statistically significant excess of lung and bronchial cancer among women 65-74. This type of cancer is not associated with exposure to MTBE in animals, but is associated with smoking history. A majority of the women who were diagnosed with lung cancer whose smoking history was known were current or former smokers. There was also a statistically significant excess of leukemia among men in the later time period (1990-2003). Leukemia is one type of cancer associated with MTBE exposure in animals. Although this is not a cause and effect link and may, in fact, be due to chance or other possible exposures, we recognize this may raise concerns among men and their families. For anyone who is concerned, we recommend that they share this information with their health care provider and discuss their concerns. Health Department staff members are available as a resource to physicians and community members at 518-402-7950.

References:

Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs. 1997. Methyl *Tert*-butyl ether (MTBE) CAS #1634-04-4.

U.S. Department of Health and Human Services (USDHHS). National Toxicology Program (NTP). 1998. Report on Carcinogens. Background Document for Methyl tertiary-Butyl Ether.

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