Camp Lejeune Health Studies

Birth Defects and Childhood Cancers Journal Article Study Design and Outcomes

Exposure to Contaminated Drinking Water and Specific Birth Defects and Childhood Cancers at Marine Corps Base Camp Lejeune, North Carolina

Study Purpose

The purpose of this study was to determine if maternal exposures to the drinking water contaminants at Camp Lejeune increased the risk of neural tube defects (NTDs), oral clefts, and childhood hematopoietic cancers. This study also examined whether children exposed to contaminated drinking water during the first year of life had an increased risk of childhood cancers. Drinking water at Camp Lejeune was contaminated with volatile organic compounds (VOCs) including trichloroethylene (TCE), tetrachloroethylene (PCE), benzene, 1,2-dichloroethylene (DCE) and vinyl chloride from the 1950s through 1985.

What Was Studied

The Agency for Toxic Substances and Disease Registry (ATSDR) surveyed the parents of 12,598 children during 1999-2002 to identify potential cases of birth defects and childhood cancers. ATSDR asked parents if their child had a birth defect or developed a childhood cancer. To be eligible for the survey, the mother had to reside on base some time during her pregnancy and children had to be born between 1968-1985.

The survey's participation rate was approximately 76% (ATSDR 2003). Survey participants reported 106 cases: 35 NTDs, 42 oral clefts, and 29 childhood hematopoietic cancers. ATSDR made extensive efforts to obtain medical information from health providers to confirm reported cases. ATSDR was able to confirm 15 NTDs, 24 oral clefts, and 13 cancers. Only confirmed cases from the survey were eligible for the study.

Based on the survey results, the study focused on NTDs (spina bifida and anencephaly), oral clefts (cleft lip and cleft palate), and childhood hematopoietic cancers (leukemia and non-Hodgkin's lymphoma [NHL]) diagnosed before 20 years of age.

Features of this Study

Due to the lack of exposure information, ATSDR used extensive water modeling to reconstruct exposures before 1987. This study is unique because it used this water modeling to thoroughly examine associations between monthly exposures to VOCs in drinking water at the residence and the risk of developing specific birth defects and childhood cancers. Most previous studies that have evaluated these associations have done so at the broad water system level versus drinking water at the residence.

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Conclusion and Key Results

ATSDR's study results suggested associations between TCE and benzene in Camp Lejeune drinking water and NTDs.

- In this study, these effects were seen in children born from 1968-1985 whose mothers were exposed to contaminated drinking water in their residences at Camp Lejeune.
- During the first trimester of pregnancy, the risk of a NTD increased with increasing levels of exposure to TCE.
    - This finding is consistent with a previous study conducted in New Jersey, which found similar risk of NTDs when exposed to TCE during the first trimester.
- Investigators observed an association between NTDs and first trimester exposure to benzene. ATSDR was unable to evaluate whether increasing levels of exposure to benzene were associated with increased risk of NTDs because of small numbers of exposed cases.

ATSDR's study results suggested weaker associations between 1st trimester exposure to PCE, vinyl chloride, and 1,2- DCE and childhood hematopoietic cancers such as leukemia.

- These associations are weaker than those found for NTDs.
- Researchers did not observe an increased risk for these cancers with increasing levels of exposure to the chemicals.

The study found no evidence suggesting any other associations between outcomes and exposures.

- For childhood cancers, ATSDR also looked at exposures during the second and third trimesters, the entire pregnancy as a whole, and exposures in the first year of life. The investigators did not see any associations between these chemicals with these time periods.
- Exposure to contaminants in Camp Lejeune drinking water did not increase the risk of oral clefts.