



Testimony
Committee on Energy and Commerce
Subcommittee on Oversight and
Investigations
United States House of Representatives

**ATSDR's Activities at U.S. Marine Corps
Base Camp Lejeune**

Statement of
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Mr. Chairman and Members of the Subcommittee, I am pleased to provide testimony on behalf of the Agency for Toxic Substances and Disease Registry (ATSDR) regarding our activities at U.S. Marine Corps Base Camp Lejeune (Camp Lejeune) in North Carolina. I am Dr. Thomas Sinks, Deputy Director of ATSDR and of the National Center for Environmental Health (NCEH) at the Centers for Disease Control and Prevention (CDC).

I will briefly summarize ATSDR's mission and general experience in addressing trichloroethylene (TCE) and tetrachloroethylene (PCE) at Superfund sites, including contamination of drinking water sources and supplies. I then will focus on ATSDR's scientific activities in evaluating potential health effects of exposures to PCE and TCE contaminated drinking water at Camp Lejeune, including conducting health assessments and epidemiologic research, and convening panels to obtain input from experts outside the Agency and from other persons concerned about potential health effects of exposures at Camp Lejeune.

I must preface my remarks with an important point: Since ATSDR has not completed its current epidemiologic study, we have not yet determined whether there is an association between exposure to contaminated water and certain birth defects and cancers among children born between 1968 and 1985 to women who lived at Camp Lejeune during some portion of their pregnancy. However, I will discuss findings that were released earlier today concerning contamination of the drinking water supply at one of the three areas of family housing at the Base.

Background

ATSDR is a statutorily created Operating Division within the Department of Health and Human Services (HHS). Created by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), more commonly known as Superfund, ATSDR's role complements those of the Environmental Protection Agency (EPA) and other Federal agencies under Superfund, by focusing on the health of people and the communities in which they live. Our work is framed into four functional areas: protecting the public from hazardous exposures, increasing knowledge about toxic chemicals, delivering health education about toxic chemicals, and maintaining health registries.

ATSDR is required by law to conduct a public health assessment (PHA) or its equivalent at each site proposed or listed on EPA's National Priorities List of hazardous waste sites. In a PHA, ATSDR evaluates releases of hazardous substances into the environment to determine if people are being or have been exposed to hazardous substances and, if they are being exposed, whether those exposures are at levels likely to be a health hazard. The PHAs also provide recommendations for eliminating or reducing harmful exposures. A PHA may also identify factual or scientific data gaps and make recommendations for additional actions such as health education, epidemiological health studies, disease registries, surveillance studies, or research on specific hazardous substances.

Under the 1986 Superfund Amendments and Reauthorization Act, HHS and the Department of Defense (DOD) are required to enter into a memorandum of understanding (MOU) regarding the manner in which ATSDR will carry out its responsibilities at DOD sites, and to establish a manner to transfer funds from DOD to ATSDR to fund these activities. Under the MOU, ATSDR sends an Annual Plan of Work to DOD each year, identifying planned work and funding needed for that work for the coming year.

ATSDR's primary health concern at Camp Lejeune involves potential exposure to drinking-water supplies contaminated with two common volatile organic compounds (VOCs): TCE and PCE. TCE is a colorless liquid which is used as a solvent for cleaning metal parts. Occupational exposure to TCE may cause nervous system effects, kidney, liver and lung damage, abnormal heartbeat, coma, and possibly death. Occupational exposure to TCE also has been associated with adult cancers such as kidney cancer, liver and biliary cancer, and non-Hodgkin's lymphoma. TCE in drinking water has been associated with childhood leukemia in two studies and with specific birth defects such as neural tube defects and oral clefts in one study.

PCE is a manufactured chemical used for dry cleaning and metal degreasing. Occupational exposure to PCE can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and

death. Exposure to PCE-contaminated drinking water has been linked with adult cancers such as non-Hodgkin's lymphoma, leukemia, bladder cancer, and breast cancer.

Inhalation and ingestion are important routes of exposure for both TCE and PCE. Both chemicals are listed in the 11th Report on Carcinogens from the National Toxicology Program as reasonably anticipated to be human carcinogens. The United States Environmental Protection Agency (EPA) established Maximum Contaminant Levels for drinking water of 5 parts per billion (ppb) for PCE in 1991 and for TCE in 1987.

ATSDR has extensive experience related to TCE and PCE. The Agency has published *Toxicological Profiles* on both chemicals, and our *Profile* on TCE is included in our Case Studies for Environmental Medicine, a series of self-instructional publications designed to increase primary care providers' knowledge of hazardous substances in the environment and to aid in the evaluation of potentially exposed patients.

Camp Lejeune

Public Health Assessments:

In 1989, the EPA placed U.S. Marine Corps Base Camp Lejeune and ABC One-Hour Cleaners, which is located very close to the Base, on its National Priorities List. Releases of chemicals from both the ABC One-Hour Cleaners and activities

at Camp Lejeune contributed to contamination of the water supply system serving certain areas of housing at the Base. In August 1990, ATSDR completed a PHA addressing contamination from the ABC One-Hour Cleaners. This assessment found that PCE, detected in onsite and offsite wells, was the primary contaminant of concern. In 1997, ATSDR completed a PHA for contamination from the Camp Lejeune Base.

In these PHAs ATSDR determined that current conditions at the site did not present a current health hazard because the contaminated wells were no longer in use. However, ATSDR did identify three past public health hazards. Of those, the one we are focused on currently is the contamination of drinking water systems serving several areas of family housing on Base, referred to as Tarawa Terrace, Hadnot Point, and Holcomb Boulevard. Tarawa Terrace was contaminated primarily by PCE and Hadnot Point was contaminated primarily by TCE. ATSDR also reported that Holcomb Boulevard, the third major system, was not contaminated, except for during a two-week period in late January and early February 1985 when the Holcomb Boulevard system was down for repairs and the area was served by the Hadnot Point system.

In 1997, ATSDR concluded that likely exposures to PCE and TCE were significantly below levels shown to cause adverse health effects in animal and adult human studies and therefore not expected to result in cancer or other health effects in adults. However, because scientific data relating to the harmful

effects of VOCs on a child or a fetus were limited, ATSDR recommended conducting an epidemiological study to assess risk to infants and children from maternal exposure during pregnancy to the VOC-contaminated drinking water.

Health Studies:

Following up on the recommendations in the PHA, ATSDR has undertaken two related epidemiologic studies, both of which focused on the health of children born from 1968 through 1985 whose mothers were exposed to contaminated drinking water at Camp Lejeune during their pregnancies. These dates were selected because 1968 is the first year for which computerized birth certificates from North Carolina are available, and in early 1985 contaminated water-supply wells were removed from regular and continuous service.

First Study: ATSDR's first study, completed in 1998, was based on information collected from the birth certificates of 12,493 live births on base. Housing records for families who lived on base were used to determine mother's residence during pregnancy and to assign VOC exposure categories based on our knowledge of contamination across the three drinking water systems. We identified an association between women who drank PCE-contaminated drinking water from Tarawa Terrace during pregnancy and their babies being born small for gestational age. This association was limited to those mothers older than 35 years of age or who had experienced two or more fetal losses. An additional finding was that baby boys born to mothers who drank TCE-contaminated water

from Hadnot Point were also more likely than unexposed babies to be born small for gestational age.

Second Study: In its PHA ATSDR also identified as a priority the need to study the relationship between maternal exposures to TCE and PCE and the occurrence of several birth defects and childhood cancers, which would require information beyond that available in birth certificates. The current study began in the late 1990s and is ongoing. The study protocol for the study has been subjected to peer review by scientific experts outside of the Agency. The two primary components of the current study are to identify and confirm particular birth defects and cancers and to conduct water modeling to determine which housing units received contaminated water during what time period and the level or concentration of the contaminated water.

The study initially focused on neural tube defects (i.e., spina bifida and anencephaly), cleft lip and cleft palate, major heart defects, choanal atresia, and two forms of childhood cancers (all leukemias and non-Hodgkin's lymphoma). ATSDR contacted the parents of 12,598 children born during the period 1968-1985 to mothers who resided at the base anytime during their pregnancy to confirm mother's residence and determine if the child had one of the health conditions that are focused on in the study. Parents reported 35 children with neural tube defects, 42 with cleft lip and/or palate, 29 with leukemia or

lymphoma, no children with choanal atresia, and 3 with a major heart defect (this condition was dropped because of the small number of possible case-children).

Since the initial phone interview, ATSDR has collected medical records to confirm the diagnoses of the reported cases. Fifty-seven children confirmed as having a condition of interest include 17 children with a neural tube defect, 24 children with a cleft lip or palate, and 16 children with leukemia or non-Hodgkin's lymphoma. An additional 42 possible case children were either confirmed not to have the condition, refused to participate, or had no available medical records. The status for an additional 7 children is still pending. As noted earlier, the information on birth defects and cancer does not, by itself, tell us whether these conditions are associated with exposure to contaminated water.

To obtain estimates of historical concentrations of PCE at Tarawa Terrace and TCE at Hadnot Point, ATSDR is using water-modeling techniques and the process referred to as historical reconstruction. ATSDR began these analyses in 2003. The historical reconstruction process for Tarawa Terrace is complete. Water modeling activities for the other water system, the Hadnot Point system, are expected to be completed later this year.

ATSDR's goal is to estimate monthly levels of contaminants in these drinking water systems from the early 1950s until the contaminated wells were shut down in 1985. The effort involves extensive information gathering (e.g., geohydrology,

sources of contamination, drinking water well locations and pumping rates, contaminant transport and degradation byproducts, and water distribution system). The modeling effort also requires simulating the fate and transport of the contaminants from the pollution sources through the soil and into the ground water, to the drinking water wells, and finally to the water treatment plant and water distribution system that provides the water to the family housing units. After the historical reconstruction of both water systems is complete, the information on birth defects and cancers will be linked to the information concerning which housing units received contaminated water during what timeframes.

The historical reconstruction of the Tarawa Terrace system is summarized in an Executive Summary report we released earlier today. The results indicate that PCE-contaminated drinking water distributed to family housing units at Tarawa Terrace exceeded 5ppb, which in 1991 was established as the Maximum Contaminant Level, for the first time during the period October 1957 – August 1958, with the most likely date of first exceedance being November 1957. The maximum PCE concentration in drinking water delivered to family housing units was estimated at 183 ppb in March 1984. During the period November 1957 – January 1985, PCE levels in the finished water at the water treatment plant exceeded 5 ppb for every month except when the most contaminated well was offline twice for repairs (a total of 4 months). The contaminated wells were removed from regular service in February 1985. Effective today, former Camp

Lejeune Marines and their families can find out their estimated exposure levels to PCE and PCE degradation by-products, calculated through modeling, by visiting the ATSDR website (www.atsdr.cdc.gov/sites/lejeune) and entering the dates they lived in Tarawa Terrace housing. The executive summary of the analyses also is available at this website.

Once the historical reconstruction of both the Tarawa Terrace system and the Hadnot Point system have been completed, the monthly quantitative estimates of contaminant concentrations in each of these drinking water systems will be linked with the case-control interview data on birth defects and childhood cancers.

ATSDR will analyze the data to determine if exposures to the drinking water contaminants are associated with neural tube defects, cleft lip/cleft palate, or childhood leukemia/non-Hodgkin's lymphoma.

Update of First Study: During the work conducted for the historical exposure reconstruction, ATSDR discovered an error in the exposure classifications used in its first Camp Lejeune study, the 1998 study of adverse birth outcomes. This may have affected the results of this study. The error was the result of a lack of information on the date the Holcomb Boulevard Treatment Plant began operation. The study assumed that the plant was operating during the entire period of the study, 1968-1985. However, as a result of the historical exposure reconstruction, the Agency has learned that the Holcomb Boulevard Treatment Plant did not begin operation until June 1972. Prior to June 1972, the Hadnot

Point system provided drinking water to the Holcomb Boulevard service area. This means that many of the births during the period, January 1968 – May 1972 that were classified as unexposed in the 1998 study were actually exposed in utero to drinking water contaminated with TCE and other solvents. ATSDR regrets the error that was made in the 1998 study, and plans to reanalyze the 1998 study using the monthly contaminant estimates from the historical exposure reconstruction. Utilizing the more detailed estimates will considerably improve the quality of the 1998 study.

Community and Expert Input:

In response to public concerns that ATSDR's study was too narrowly focused since drinking water contamination may have caused adult cancers as well as non-cancer diseases among children and adults, ATSDR convened a scientific panel in February, 2005, to provide advice on whether additional epidemiological studies on the health effects of exposures to contaminated water at Camp Lejeune should be conducted. ATSDR accepted panel recommendations, including recommendations to establish a Community Assistance Panel for Camp Lejeune, and to assess the feasibility of conducting a mortality and cancer incidence study and additional potential studies by evaluating DOD databases.

ATSDR also convened a panel on its approach to historical reconstruction of groundwater and finished water contamination at the Base. On March 28–29, 2005, ATSDR held an "Expert Peer Review Panel on Water Modeling" to assess

and review water modeling approaches and activities at Tarawa Terrace, Hadnot Point, and Holcomb Boulevard. Panel members approved ATSDR's approach but made additional recommendations, which we adopted. They were unanimous in their recommendation that ATSDR conduct additional extensive data discovery to obtain all the information necessary to fully understand the historical operations of the water-supply systems. Panel members also recommended that the Agency undertake a rigorous uncertainty or probabilistic analysis and consider modeling PCE degradation by-products. Lastly, the panel recommended that a more simplified approach to water-distribution system modeling could be used (i.e., simple mixing model), unless we could definitively prove—using historical information and data—that there were lengthy periods (exceeding several months) when the Tarawa Terrace water-distribution system was interconnected with the Holcomb Boulevard water-distribution system. These recommendations were accepted by the Agency and were implemented.

Conclusion

In summary, ATSDR has an essential role in providing public health support to people and communities impacted by hazardous substances. ATSDR expects the study on the association between health effects and exposure to the drinking water contaminants to be completed in 2008. Our assessment of the feasibility of additional work is expected to be completed this year. On a personal note, my staff and I have truly enjoyed interacting with the former Marines who lived at

Camp Lejeune. As an Agency, we take very seriously the trust placed in our organization by members of the public like these former Marines.

At this time, I am happy to answer any questions you may have.