NATURAL RESOURCES DEFENSE COUNCIL
THE EARTH'S BEST DEFENSE

July 23, 2009

Howard Frumkin, MD, MPH, DrPH
Director, National Center for Environmental Health, ATSDR

Thomas Sinks, PhD
Deputy Director, National Center for Environmental Health/ATSDR

Re: Request to continue study of the Camp Lejeune exposure and health outcomes

Dear Drs. Frumkin and Sinks,

We are writing to ask that you continue your important investigations of potential link between historical exposure to contaminated drinking water and adverse health outcomes among the residents of Camp Lejeune, North Carolina.

In response to a request from the U.S. Navy, in 2007, a committee of the National Research Council (NRC) first met to review the scientific evidence on associations between adverse health effects and historical data on prenatal, childhood, and adult exposures to contaminated drinking water at Camp Lejeune, North Carolina. According to the NRC website the committee was asked to assess the strength of evidence in establishing a link or association between exposure to trichloroethylene, tetrachloroethylene, and other drinking water contaminants and each adverse health effect suspected to be associated with such exposure.[1] In the spring of 2009, the committee issued its report, *Contaminated Water Supplies at Camp Lejeune: Assessing Potential Health Effects*, hereafter known as NRC, 2009.

Unfortunately, the report failed to make any definitive statements about the potential link between the highly contaminated drinking water and the diseases reported to be in the Lejeune population, citing "data shortcomings and methodological limitations" (NRC, 2009). Moreover, its hazard evaluation did not take into account that benzene and vinyl chloride were contaminants in the drinking water at Hadnot Point and Tarawa Terrace. Nonetheless, it recommended that the Navy and Marine Corps proceed with decisions about "how to follow up on the evident solvent exposures on the base and their possible health consequences" without waiting for additional study (NRC, 2009). However, without a strong scientific statement of plausibility by the NRC, we are concerned that even the current studies of water contamination and health effects now underway will be cut.

In this letter, we make three main points: First, that the water-modeling efforts by the Centers for Disease Control and Prevention (CDC), and the Agency for Toxic Substances and Disease Registry (ATSDR) are promising and should be continued to completion; second, that further epidemiology can be enlightening particularly if it is done to stratify exposures; third, that

the prevalence of male breast cancer among former and current Camp Lejeune residents should be given particular attention because of its rarity in the general population.

Camp Lejeune water-modeling efforts by ATSDR are promising and should be continued to completion

The NRC report cites a number of barriers to drawing conclusions, including uncertainties in the past exposures, uncertainties in the water models, and gaps in the water monitoring data. However, the report appears to have failed to estimate bounds on these uncertainties, which is a common practice, instead treating them as if they were limitless and therefore insurmountable.

The report also rejects the Lejeune water modeling efforts of the ATSDR, arguing that its models are "cutting edge" and thus not validated, and that its models failed to account for dense nonaqueous-phase liquids (DNAPLs) in the water. However, according to the ATSDR water-modeling team, no one that has studied the contaminated site has reported the presence of DNAPLs at Tarawa Terrace. [2] Oddly, the NRC report failed to provide any evidence of their existence as well, except to say that the geology of the area makes it probable that they exist. The importance of the postulated, but unproved, existence of DNAPLs is that if they exist, then the pump-and-treat remediation currently underway would be inadequate because the DNAPLs are so dense that they would tend to sink deep into aquifers and get trapped in soil. A member of the ATSDR water-modeling team, Professor Mustafa Aral of Georgia Institute of Technology, wrote a 24-page memorandum criticizing the NRC report for this and other technical reasons, and also for dismissing the ATSDR modeling methods as not validated. In fact, the methods used were cutting edge and rigorously scientifically, tailored specifically to the Camp Lejeune site.[3] The reliability of the model's monthly contamination estimates was established by its ability to make predictions that fit the real-world observations in the drinking water system, with an uncertainty that was mathematically described.

For these reasons, we request that ATSDR continue its water-modeling efforts at Camp Lejeune through to completion.

Further epidemiology can be enlightening particularly if it is done to stratify exposures

In a highly unusual event, the NRC report was strongly and publicly criticized by five prominent scientists who have all served as advisors to ATSDR regarding the Camp Lejeune health and contamination issues.[4] Excerpts of their public letter of criticism are here:

- It is our view that the Marines and their families who were exposed to dangerous chemicals in the Camp Lejeune drinking water over several decades deserve to know if this exposure has had an effect on their health. The most direct way to assess this is to conduct valid epidemiologic studies of those who lived or worked there, and we urge ATSDR to continue their efforts to carry these to conclusion.
- We view the water modeling undertaken by ATSDR and its consultants as "state-of-the-art" and worth carrying through to completion so that it can be used in the on-going and proposed health studies. There may be uncertainties about specific levels of exposure for individual households or people, but these can be described in the study results.
- We also agree with the National Toxicology Program that TCE and PCE are "reasonably anticipated to be human carcinogens" and reject the characterization of the evidence as "limited/suggestive" as presented in the NRC report.

- Finally, we disagree with the thrust of the NRC report that it is unlikely that scientifically informative epidemiologic studies of the Camp Lejeune population can be done. The NRC doubts that "definitive" answers can come from any study, but this sets the bar too high – no one study can provide definitive answers, and all studies must be considered in the light of other scientific evidence.

Among the five scientists who signed this letter are some of the most prominent epidemiologists and solvent experts in the world. All are scholars and academics at top-ranked institutes. Dr. Clapp, Boston University, has over thirty years of experience in public health epidemiology and dozens of published scientific articles. Dr. Wartenberg, Robert Wood Johnson Medical School, is one of the nation's foremost experts on TCE epidemiology. Dr. Ozonoff, Boston University, has been the principal investigator of several major studies of waste sites, and is Director of the Superfund Basic Research Program. Drs. Aschengrau and Steingraber are notable scientists with expertise in early life susceptibility to hazardous chemicals. Their criticisms and recommendations should not be dismissed.

We support the recommendation of the above epidemiologists that ATSDR continue its epidemiologic assessment of the health impacts that may be associated with the historical contamination of the drinking and washing water at Camp Lejeune. Specifically, ATSDR should complete the current case-control study of specific birth defects and childhood cancers, complete the reanalysis of the adverse pregnancy outcome study, conduct the mortality study, and conduct the health survey study. By conducting these studies, ATSDR can complete the task that had been asked of the NRC committee: to assess the strength of evidence in establishing a link or association between exposures to trichloroethylene, tetrachloroethylene, and other drinking water contaminants and each adverse health effect suspected to be associated with such exposure.

We suggest that the epidemiology be conducted by stratifying the exposures into several categories, e.g. as high, medium, and low. This should be done based on the monthly estimates of contaminant levels in the Tarawa Terrace and Hadnot Point drinking water systems as well as on the number of years living in Camp Lejeune (i.e. evaluating exposure intensity, exposure duration, and cumulative exposure), and also considering age during exposure period, latency (time from exposure to disease), and age at onset of disease. These data should be easy to collect and would provide discrete numerical values. We further suggest that the study assess the chemical contaminants as a mixture and evaluate whether the contaminants act in a synergistic fashion to increase the risk of disease, and not be limited to trying to discern the contribution of specific single chemicals on the burden of disease. The reasons for our suggestions are as follows: failing to stratify exposure histories will pool the low and high exposure groups and dilute out effects that may only be statistically significant in the high exposure group; and, assessing the water contaminants as a mixture whose constituents may act in a synergistic fashion will avoid the possibility that individual contaminants are small contributors to disease and therefore statistically difficult to distinguish from the baseline exposures to the highly contaminated water.

The prevalence of male breast cancer among former and current Lejeune residents should be given particular attention because of its rarity in the general population

As a result of the tremendous personal effort of Mr. Michael Partain, a former Camp Lejeune resident during his youth, an astounding number of former residents with male breast cancer have been identified. Mr. Partain has reported to me that he has contacted 20 men with male breast cancer who lived, worked, or served at Camp Lejeune. The cluster includes one *in utero*/infant exposure, one child exposure and 18 Marine servicemen. The youngest in the cluster was diagnosed with precancerous tumors in his breast at the age of 38. Mr. Partain was diagnosed at 39. The bulk of the cases were diagnosed between the ages of 47 and 65. The 18 Marines who

were exposed spent anywhere from 3 months to several years at the base. The vast majority of the cases served/lived on the base between the mid-1950's thru the 1960's. Among this cluster, there are only 2-3 men who were on the base and exposed after 1970. Two of the men were over the age of 70 at the time of diagnosis. Most do not have a history of breast cancer in their families. Three of the men with breast cancer report having tested negative for the BRCA gene. Mr. Partain is also tracking three men who have reported breast lumps but have not been diagnosed with anything at this point; they are not included the above count.

We have learned that Dr. Devra Davis has initiated a review of the male breast cancer cases described above, and will conduct an epidemiologic assessment of the likelihood that it is a result of historical exposures to Camp Lejeune drinking water. The prevalence of male breast cancer in the U.S. population is extremely rare, less than 2000 cases per year; only 1% of breast cancer cases overall. The rarity of this disease among the general population, coupled with the unusually large number of cases identified by Mr. Partain in former Camp Lejeune residents, means that this study is very likely to have the statistical power necessary to detect an association with water exposures if one exists. Dr. Davis is the Director of the Center for Environmental Oncology and Professor of Epidemiology at the University of Pittsburgh. Her work is widely recognized and respected. We are eagerly awaiting the findings of Dr. Davis, and recommend that the ATSDR and other involved parties also consider her findings and recommendations when they are made public.

Thank you for your consideration of these comments,

Jennifer Sass, Ph.D.
Senior Scientist, NRDC

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[1] National Research Council. Contaminated Drinking Water at Camp Lejeune. BEST-K-06-08-A. http://www8.nationalacademies.org/cp/ProjectView.aspx?key=BEST-K-06-08-A

[2] Memorandum from Professor Mustafa Aral to Morris Maslia, Project Manager, Exposure-Dose Reconstruction Program, ATSDR, CDC. Response to comments of the NRC report on ATSDR water modeling study. June 30, 2009.

[3] Memorandum from Professor Mustafa Aral to Morris Maslia, Project Manager, Exposure-Dose Reconstruction Program, ATSDR, CDC. Response to comments of the NRC report on ATSDR water modeling study. June 30, 2009.

[4] Scientists fault report on Camp Lejeune contamination. The Pump Handle, June 18, 2009. http://thepumphandle.wordpress.com/2009/06/18/scientists-fault-report-on-camp-lejeune-contamination/