

## Bladder Cancer and the Brave: Camp Lejeune

**Dr. Clapp:** I'm going to take off from what Dr. Mossanen has just said and talk about some other specific military occupations and some particular connections that exposures in those occupations have had with bladder cancer.

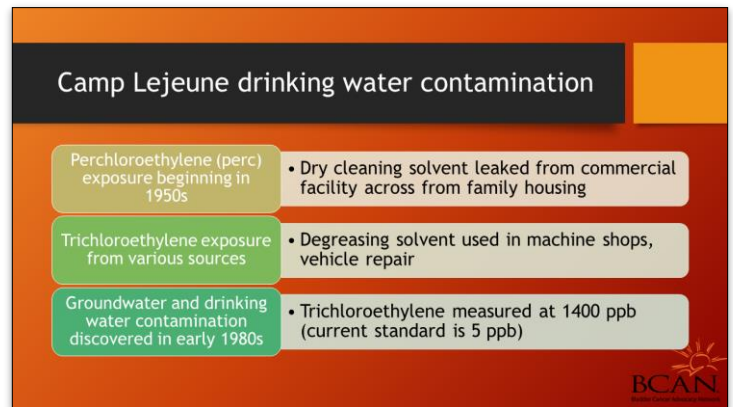
There are three things that I would propose to talk about. First is Camp Lejeune, North Carolina and the exposures that veterans there had, or servicemen there had, while stationed at Camp Lejeune and were drinking contaminated water, water contaminated with two chemical solvents that have been associated with bladder cancer. The next example I'll give is burn pit exposures. Those are in Iraq and Afghanistan primarily. There were some burn pit exposures in the first Gulf War in 1991, but for this presentation, limit the discussion to the Iraqi and Afghanistan burn pits and what's the status of follow-up of veterans exposed to those, and what might come down in the future. Third, I'm going to use a kind of parallel example of the World Trade Center first responders, who were exposed after the buildings came down and what they called the pile, working on the debris pile. Some of the same exposures occurred to the first responders in that category as had occurred previously in soldiers who were exposed to burn pits in Afghanistan and Iraq, so there's some overlap there between the exposures and the likely connection to bladder cancer. Next slide.

First, a little more about Camp Lejeune. As it says, it's the home of expeditionary forces in readiness. This is in Camp Lejeune, North Carolina, which is near the South Carolina/North Carolina border. It's the East Coast training center for the majority of marines. There is also a navy air base on the Camp Lejeune space, but it's primarily a training site for marines. There's an equivalent site in the West Coast that's in Camp Pendleton in California. As it turns out, there is an easy comparison to make, from an

epidemiologic point of view, between what diseases the Camp Lejeune veterans had compared to the Camp Pendleton veterans because they're all marines and they all had to go through the same induction process. They all were basically healthy men, to get into the marine service, but then there's some differences in the disease patterns that occurred many years after based on where people were based and where people got their training. I should say Camp Lejeune is both a training site and it's a residence for people who do the training, who actually live on Camp Lejeune. So, as you'll see, there'll be some comparisons of both those veterans that went through and those who were just working there. Next slide.

**Dr. Clapp:** The Camp Lejeune drinking water contamination, as I mentioned, was primarily due to two chemicals that were in the drinking water for different parts of the base. The base is like a small city. There are 40,000 people living there at any one time. Many of them are there just for short periods during their training. But, they have to get their uniforms cleaned, and if they had family members, they may go to a commercial dry cleaning facility that was located literally across the street from Camp Lejeune. The dry cleaning solvent, called perchlorethylene, that was detected in the drinking water was from both sources. It was both from dry cleaning that occurred on the base for the military uniforms and dry cleaning, especially, that occurred off base and then contaminated the groundwater and made its way into the wells that served especially the family housing that were closest to that part of Camp Lejeune.

The second important exposure was the chemical called trichlorethylene. Trichlorethylene is a degreasing solvent that is used to take, say for example, grease off of parts that had been machined on a lathe, or it's sometimes used to remove grease in the process of repairing vehicles. In this case, primarily military vehicles. That also was disposed of in a careless way, such that it got into groundwater on the base and then dissolved and went through the soil into the area that there were drinking water wells drawing water up from underground. There was additional exposure to benzene from a different source, but I'm going to talk primarily, because of the interest in bladder cancer with these two solvents, perchlorethylene and trichlorethylene. Incidentally, the trichlorethylene drinking water standard currently is five parts per billion, but when it was first discovered in the Camp Lejeune drinking water in the early 1980s, at least one source of the finished water was measured at 1,400 parts per billion. So, it was dramatically increased. The trichlorethylene especially was dramatically increased over what would be allowed in a drinking water supply currently. Next slide.



Because the marines themselves became aware of this pollution, they really actually led the charge, so to speak, for some health studies. There were marines who were based at Camp Lejeune, who were employed by the military to do training, and then there were family members of marines who were

## Marines campaign for health studies - 1990s to present

- CDC/Agency for Toxic Substances and Disease Registry studies completed to date
  - Increased cancer deaths in Camp Lejeune veterans compared to Camp Pendleton
  - Increased birth defects and blood cancers in children born on Camp Lejeune
  - Increased deaths due to kidney cancer in Camp Lejeune civilian employees



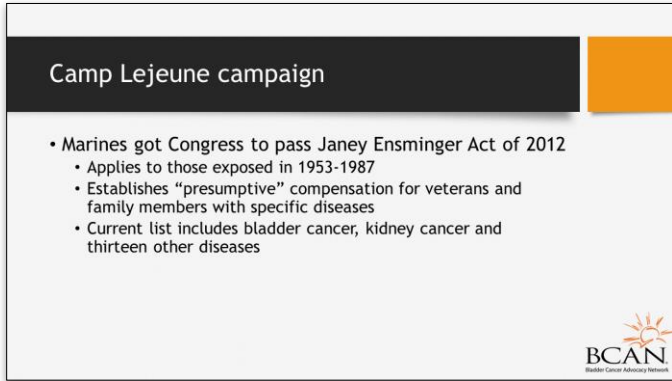
located on the base, and then there were veterans who just got their training at Camp Lejeune, who formed an advocacy group. They actually set up their own website, called "The Few, The Proud, The Forgotten", in which they asked for people who had been based or had gone through Camp Lejeune to report voluntarily what their health problems were. They started collecting this in their own website. I think it's still available if anybody wanted to see that. As a result of that, there was pressure

on the Centers for Disease Control and the Agency for Toxic Substances and Disease Registry to look into what were the health consequences of these exposures that were identified in the early 1980s and then became part of a federal designation of Camp Lejeune as a Superfund site in the 1990s. The veterans took that information, pressured CDC, pressured the elected officials from the state of North Carolina, the congress people, and the senators to do something to find out what had happened to the people who were exposed to this contaminated water. So there have been a series of health studies that were done.

There's a long story about how these health studies are done, but basically the roster of veterans who were based or went through Camp Lejeune was available in a federal database, I think it's called Defense Manpower Data Center, that could be linked to the National Death Index, which is maintained by the National Center for Health Statistics. That electronic linkage allowed a comparison of how many veterans who were associated or had lived at Camp Lejeune had died and what they had died of, and then a comparison to those veterans who went through Camp Pendleton in California and how many of those had died and what they had died of. This is a huge study. It was hundreds of thousands of veterans combining the two bases, Camp Lejeune and Camp Pendleton. Approximately half a million veterans had gone through Camp Lejeune, not all of whom could be identified on these databases because of the limitations of the years for which they were available, but it still allowed a so-called follow-up study of hundreds of thousands of veterans in the two bases. What they found was that comparing Camp Lejeune to Camp Pendleton, there was an overall statistically significant increase in deaths due to cancer. There were some specific subtypes of cancer that were also elevated but which didn't reach the level of what's sometimes called statistical significance, so the main finding was the increase in deaths overall.

There was also a study of children who were born while their parents were living on Camp Lejeune. There, that study followed up over 1,000 children that had been born on Camp Lejeune and found increased birth defects, especially what's called neural tube defects, which include spina bifida and blood cancers, leukemia and lymphoma primarily, in children who were born on Camp Lejeune compared to what would be expected in children elsewhere. That was published in peer-reviewed

scientific literature. And then, they did a third study. There are additional studies underway, but the third study that's been published already has to do with civilians who worked on Camp Lejeune but lived nearby, in North Carolina. They found in that group that there was increased deaths due to kidney cancer in the Camp Lejeune civilian employees, again compared to civilian employees in Camp Pendleton. Those findings are already in the published peer-reviewed literature.



The slide features a dark grey header with the text 'Camp Lejeune campaign' in white. Below the header is a white area containing a bulleted list of points. In the bottom right corner of the slide is the logo for BCAN (Bladder Cancer Action Network), which includes a stylized sun icon and the text 'BCAN Bladder Cancer Action Network'.

**Camp Lejeune campaign**

- Marines got Congress to pass Janey Ensminger Act of 2012
  - Applies to those exposed in 1953-1987
  - Establishes "presumptive" compensation for veterans and family members with specific diseases
  - Current list includes bladder cancer, kidney cancer and thirteen other diseases

BCAN  
Bladder Cancer Action Network

They led to legislation that was passed in 2012. It was called the Janey Ensminger Act. Janey Ensminger was the daughter of a marine who was based at Camp Lejeune. He was a sergeant and he trained marines that were coming through the base for their training, in addition to other jobs that he had prior to that. He was the father of, as he puts it, a young girl who was conceived, born, got leukemia, and died while living on Camp Lejeune. The Act that was passed by congress was basically to take recognition of that fact, that Janey, Jerry Ensminger's

daughter, had lost her life from the apparent exposures to chemical contaminants that she had while she was living there. The Act actually extends compensation for veterans and their families who were exposed during the years 1953 to 1987. Those are the years for which contaminated drinking water had been documented, up to the time of these studies.

Anybody who was exposed during those years then, on Camp Lejeune, had a presumptive cause of their disease for 15 different types of disease because of their exposure to contaminated drinking water. In other words, it was assumed that because they were there and they were exposed these diseases that are linked to the chemicals, and especially, as I said, the solvents trichlorethylene and perchlorethylene, they didn't have to prove that their exposure was due to some length of time that they lived there or some particular job that they had while they lived there, or their family member had, some specific exposure. All of it was assumed to be because of living there and having drunk the water. It's what's called a presumptive compensation scheme, which makes it much more automatic for the veterans and their families. That current list of presumptive diseases includes bladder cancer, kidney cancer, and 13 other diseases that, in the literature, have been linked to exposures to those solvents.

The evidence for bladder cancer was not so much from the studies of deaths due to the Camp Lejeune veterans as what's in the literature from workers exposed to perchlorethylene due to their employment in dry cleaning. Kidney cancer did show up, especially in the civilian employees at Camp Lejeune, and it's showed up in many other studies of people exposed, at work primarily, to trichlorethylene. That's the current list that does include bladder cancer because of the connection to solvents that were found in the drinking water at Camp Lejeune. The work is still going on. There's an ongoing cancer incident study that will look at not just the deaths due to cancer but diagnoses of cancers, and that's a much larger number. A lot more people get diagnosed with cancer than actually die of it. That study will take another few years to complete.

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