To date, 573 veteran ground soldiers from four battalions operating in the III Corps region have visited the Lovelace Foundation Medical Clinic in Albuquerque, New Mexico, to have their blood drawn. Of the Vietnam veterans screened, 25% told CDC they had either been present during spraying of Agent Orange or handled spraying equipment. Another 70% of the Vietnam veterans said they had been indirectly exposed to Agent Orange—by marching through a defoliated jungle, for example. A control group of 88 veterans who did not serve in Vietnam, but were on duty in 1967 and 1968, have also been tested. Only 6% of these men reported exposure to the herbicide.

The results: both groups' median dioxin levels were 3.8 parts per trillion, which is about the ambient level of dioxin one would expect to find in citizens of industrialized countries. In addition, there was no association between a veteran's self-assessment of exposure to the herbicide and elevated levels of dioxin in his serum.

Originally CDC's team feared that it would not be able to find enough Vietnam veterans with low exposure to dioxin to serve as a control group. What they appear to have found is the exact opposite: though spraying of Agent Orange was apparently widespread in Vietnam, it is extremely difficult to find substantial numbers of veterans with high exposure.

What happens now? Says Vernon Houk, director of the Center for Environmental Health at CDC: "I don't think you need a road map to get to the position where you conclude that you can't do a scientifically valid study." According to CDC's Worth, his group is at a loss to design a more valid protocol. "We took our best shot," he says.

The advisory panels appear to agree that a broad-based epidemiological study may not be possible. "I'll say it again: We need to abandon this craziness of trying to do these huge longitudinal studies based on military records or the self-perceptions of vets," says Lewis Kuller, an epidemiologist at the University of Pittsburgh and a member of OTA's advisory panel. Neal Castagnoli, a toxicologist at the University of California at San Francisco and also a member of OTA's Agent Orange panel, says, "TCDD was something for the veterans to grab hold of. It is so toxic for some lab animals. But we're just not seeing the problems we might have expected. And we're not seeing the huge levels of exposure, either. Did we make a mistake focusing on TCDD and not some other materials?"

Other studies on the health effects of the Vietnam war are in progress. The CDC is looking at selected cancers of veterans and is

"We need to abandon this craziness of trying to do these [kinds of] longitudinal studies."

continuing its large Vietnam Experience Study, which has shown greater mortality rates for Vietnam veterans in the first 5 years after service, deaths due mainly to automobile accidents, suicides, homicides, and drug poisonings. The Air Force continues to track its Ranch Handers, the teams that sprayed Agent Orange from aircraft. The National Institute for Occupational Safety and Health is looking at civilians exposed to dioxin during its manufacture. On 3 September the VA released details of a sweeping mortality report that found Marine ground troops had a 58% higher rate of death from lung cancer than expected and a 110% higher rate of death from non-Hodgkin's lymphomas. Similar rates of cancer death, though, were not found for Army veterans. The VA report stated that although Agent Orange exposure may be a suspect, the study did not investigate possible etiological factors, which could also include antimalarial drugs, viruses, cigarette smoking, and other herbicides besides Agent Orange.

Whether these studies are enough to satisfy the veterans is doubtful. Frustrated with CDC's efforts, the New Jersey State Agent Orange Commission is working with Peter Kahn, a biochemist from Rutgers University in New Brunswick, New Jersey, who believes the problem with the CDC study lies in the pool of veterans examined. Kahn is now gathering a small group of veterans who served in the III Corps region. He believes that if epidemiologists ask the right questions, they can find veterans who experienced high levels of exposure. His study, though, has only just begun.

Wayne Wilson, the director of the New Jersey commission and a veteran who saw two tours of duty in Vietnam, expressed the frustration felt by many of his peers: "I don't know much about all the scientific mumbo-jumbo, but you're not going to tell me these guys can't find vets who've been exposed to Agent Orange." At present, that is exactly what CDC is telling veterans like Wayne Wilson. ■ **WILLIAM BOOTH**

MSU Faults Strobel for Dutch Elm Test

A Montana State University committee has concluded that the bacterial strain Gary Strobel released in his controversial field test is not a recombinant DNA product and thus National Institutes of Health (NIH) guidelines "likely do not apply." However, Strobel clearly violated Environmental Protection Agency (EPA) regulations by testing a genetically modified microbial pesticide without prior approval, the committee found. In response, MSU president William Tietz reprimanded Strobel on 2 September and required that his future field experiments be reviewed by the department and his university's biosafety committee.

Since Strobel injected 14 elm trees on campus with a modified strain of *Pseudomonas syringae* designed to prevent Dutch elm disease, the question of whether this is a recombinant organism—and which regulations he violated—has been the subject of considerable debate (*Science*, 4 September, p. 1097). NIH guidelines apply only to recombinant DNA products; EPA rules cover a broader class of genetically modified products. Strobel maintains that because this is not a recombinant organism, he did not need NIH or biosafety committee approval. He admits to knowingly violating EPA regulations—EPA has imposed mild sanctions on him—but claims that federal regulations are confusing and inconsistent.

The committee faulted Strobel for his ignorance of federal regulations, claiming that it "constituted material failure to comply with university policy." Without addressing whether biosafety committee approval was required, Tietz said, "If there is *any* question of applicability of rules and guidelines . . . prudent action directs faculty members to the committee." But Tietz also expressed hope that the incident will increase "awareness of the tangled interpretations, definitions, procedures, exceptions, inclusions and classifications that dominate today's biotechnological research."

The university's biosafety commitee is now investigating another field test of a genetically modified bacterium that Strobel conducted in California, Montana, South Dakota, and Nebraska in 1983 and 1984. Preliminary information suggests that this strain of *Rhizobium meliloti* is not a recombinant DNA product, says Clifford Bond of the biosafety committee. EPA is not investigating the test because it occurred before the agency adopted its biotechnology policy in 1986. Meanwhile, on 3 September, in what he hopes will be the final episode in this saga, Strobel cut down the 14 elm trees. He leaves next week for several months in Europe. ■ **LESLIE ROBERTS**