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Report to the Committee on Veterans' Affairs, U.S. Senate

January 2000

VETERANS' BENEFITS

Independent Review Could Improve Credibility of Radiation Exposure Estimates

GAO/HEHS-00-32

Contents

Abbreviations

DOD	Department of Defense
VA	Department of Veterans Affairs
VBA	Veterans' Benefits Administration
VHA	Veterans' Health Administration

GAO
Accountability * Integrity * Reliability

United States General Accounting Office
Washington, D.C. 20548

Health, Education, and
Human Services

B-282605

January 28, 2000

The Honorable Arlen Specter
Chairman
The Honorable John D. Rockefeller IV
Ranking Minority Member
Committee on Veterans' Affairs
United States Senate

Between 1945 and 1962, about 200,000 active military personnel participated in atmospheric nuclear tests, and some were exposed to potentially harmful doses of radiation.[1] Over the past 2 decades, veterans with diseases they believe have been caused by radiation exposure have filed claims for monetary compensation with the Department of Veterans Affairs (VA). For 16 types of cancer, veterans can receive compensation without documenting the radiation dose because VA presumes these cancers to be directly linked to the veterans' exposures. For other cancers and certain nonmalignant ailments, the Department of Defense (DOD) estimates, or "reconstructs," the radiation dose using information such as the duties and locations of veterans and their units during the atmospheric testing, the type and quantity of radioactivity released from the explosions, and readings from film badges worn by the veterans and from other devices that measure radiation dose in the vicinity. The results of these dose reconstructions are used by VA to decide compensation claims.

Because there has been significant controversy surrounding the way radiation doses are estimated, you asked us to review the validity of dose reconstruction as a tool for determining veterans' eligibility for benefits. Specifically, we (1) reviewed studies that assessed the validity of dose reconstruction for estimating veterans' radiation exposure and discussed the issue with experts in the field and other knowledgeable individuals, (2) determined what activities are in place to oversee the dose reconstruction process, and (3) examined alternatives for deciding veterans' claims for compensation related to radiation exposure.

[1]In addition to those veterans who participated in atmospheric tests, approximately another 200,000 were potentially exposed to radiation as a result of their presence in Japan after World War II. These veterans were excluded from our review because a single dose reconstruction was done for all.

To address these issues, we interviewed VA and DOD officials and contractors at headquarters and field locations and reviewed applicable government policies and procedures. We also interviewed radiation and dose reconstruction experts in private industry, educational institutions, and government agencies as well as veterans' service organization representatives. In addition, we reviewed relevant studies and literature related to dose reconstruction and the health effects of radiation, including those by the National Research Council and the Institute of Medicine. (For the details of our methodology, see app. I.) We performed our review between November 1998 and October 1999 in accordance with generally accepted government auditing standards.

Results in Brief

Some veterans, veterans' organizations, and experts we talked with do not have confidence in DOD's dose reconstruction program. They question the completeness of DOD's data and methodology and believe that DOD's involvement in estimating radiation doses from exposure to tests for which it was responsible presents a conflict of interest. However, independent studies by the National Research Council and the Institute of Medicine have validated the dose reconstruction process that DOD uses for deciding radiation claims. These studies point out that DOD's reconstruction process tends to overestimate both external and internal doses—an outcome that would increase the likelihood that a claim would be decided in a veteran's favor. DOD conducted separate studies to determine the accuracy of dose reconstruction and found that the external radiation dose estimates obtained through reconstruction methods were about the same as the readings directly measured by film badges worn by other participants at the same tests. Some experts we interviewed, including Health Physics Society representatives, also support the use of dose reconstruction for claims decisions.[2]

Although studies appear to validate DOD's dose reconstruction program for deciding claims, the agency is not providing for independent oversight of the program. The Institute of Medicine has been critical of the program's

[2]The Health Physics Society is a nonprofit scientific organization composed of 6,800 scientists, physicians, engineers, lawyers, and other professionals representing academia, industry, government, national laboratories, trade unions, and other organizations. The society promotes the practice of radiation safety and attempts to ensure that health physicists have information and capabilities to control the beneficial use of radiation in medical, research, and power generation activities to protect workers and the public from potential hazards.

lack of quality control, including the lack of a peer review process. The National Research Council has also suggested that dose reconstruction be reviewed, or subjected to peer review, by outside independent scientists. It has reported that such review could result in greater public confidence in dose reconstruction. Given the controversy surrounding the program, independent review could help resolve concerns about the integrity of the program. A VA official told us it was not VA's responsibility to establish a process to oversee a DOD program. A DOD official explained that there had been no direct recommendation to DOD for a peer review process and that the program did not include this feature when it was designed. We therefore recommend that DOD establish a process for independent review of its dose reconstructions.

Finally, we did not identify any better alternatives currently available for deciding claims than dose reconstruction. For example, although some suggest expanding the list of presumptive diseases as an alternative to dose reconstruction, deciding which cancers to add to the presumptive list is controversial. Some advocate a restricted approach, such as adding only those cancers that statistically occur more frequently in the exposed veteran population than in other similar groups of nonexposed people. Such an approach would result in the addition of few, if any, cancers or ailments to the presumptive list because few cancers have been shown to be more prevalent among nuclear test participants than among nonparticipants. Others favor adding all human cancers to the list, but some experts, including officials at the National Cancer Institute, find little or no evidence that would link many cancers to relatively low levels of radiation, such as those levels to which most veterans were exposed.

Background

Between 1945 and 1962, the United States conducted atmospheric tests of nuclear weapons—primarily at the Pacific Proving Grounds in the Marshall Islands and at the Nevada Test Site in southern Nevada. The tests were conducted for several reasons, including to determine the effects of atomic bombs on military installations and equipment and to provide training to crews in military tactics for using atomic bombs. Some veterans who participated in these tests were exposed to varying doses of radiation, and some subsequently developed a cancer or nonmalignant ailment. All veterans who have participated in a nuclear test can receive health care for conditions recognized by VA as potentially caused by radiation, including all forms of cancer. These veterans may also be eligible for disability compensation if their conditions are determined to be service-connected.

For example, a veteran without a spouse or dependents could generally receive from $98 to $2,036 a month, depending on the extent of disability.

Veterans who seek compensation can file a claim with VA's Veterans' Benefits Administration (VBA). To resolve these claims, VBA uses one of two processes, depending on the veteran's cancer or ailment. If the veteran was a participant at an atmospheric test and has any one of 16 specific cancers, the veteran can be compensated, under 38 C.F.R. § 3.309(d), without further proof that the cancer was caused by radiation exposure. These 16 cancers are presumed, under 38 U.S.C. § 1112(c)(2), to have been caused by radiation that the veterans were exposed to as test participants.[3]

The second claims process, under 38 C.F.R. § 3.311, is used for veterans with all other cancers and certain nonmalignant ailments: tumors of the brain and central nervous system, nonmalignant thyroid nodular disease, posterior subcapsular cataracts, and parathyroid adenoma. This second claims process relies on dose reconstruction to decide the claim. Specifically, DOD, under an agreement with VA, uses scientific and personnel data to estimate the amount of radiation the veteran received during the atmospheric tests. Both external doses and internal doses—those associated with inhalation or ingestion of radioactive material—can be estimated. For example, external radiation can be estimated from available radiation measurement devices or through calculations based on the proximity of personnel to radiation sources. Internal radiation can be estimated on the basis of the airborne concentration of radioactivity, the duration of exposure to airborne fallout or suspended particles in contaminated areas, and how the radioactivity enters and is transported through the body. When historical records documenting the exact radiation dose are incomplete, inaccurate, or missing, dose reconstruction is used to either complement or substitute for dose records.

[3]In 1988, 13 cancers—leukemia (except chronic lymphocytic leukemia); multiple myeloma; lymphomas (except Hodgkin's disease); primary liver cancer; and cancers of the thyroid, breast, pharynx, esophagus, stomach, small intestine, pancreas, bile ducts, and gall bladder—were legislatively deemed to be service-connected for veterans who participated in an atmospheric nuclear test. In 1992, two additional cancers—cancers of the salivary gland and urinary tract—were added to the list, and in 1999 bronchiolo-alveolar carcinoma was added.

VA's Veterans' Health Administration (VHA) then compares the reconstructed doses with reports showing dose levels that have at least a small reasonable possibility of being as likely as not to have caused the cancer.[4] For example, one report shows that exposure to 17 rads of radiation at age 20 or to 33.1 rads of radiation at age 30 would have at least a 1-percent chance of being as likely as not to cause colon cancer.[5] In another example, exposure of a 20-year-old nonsmoker to 4.3 rads of radiation would have at least a 1-percent chance of being as likely as not to cause lung cancer. VHA's medical opinions are considered by VBA in making decisions on benefit awards.

Since 1977, about 9,200 of the 200,000 nuclear test participants have filed claims with VA for compensation for illnesses that they believe were caused by exposure to radiation during atmospheric nuclear tests.[6] Not all of these veterans, however, have had dose reconstructions. For example, those with cancers on the presumptive list would not need a dose estimate. The applications for compensation of others may have lacked evidence of an ailment or appropriate military service. In all, DOD has used historical records to conduct dose reconstructions for about 2,900 veterans.[7] Although VA does not keep data on the disposition of claims involving dose reconstructions, it estimated that there have been relatively few awards. According to VA officials, the agency denied the majority of claims because the radiation doses to which the veterans were exposed were too low to have been likely to cause their cancer or ailment.

[4]Dose levels have historically been developed by groups such as the National Research Council and the Committee on Interagency Radiation Research and Policy Coordination, which was chartered through the Federal Coordinating Council for Science, Engineering and Technology, Office of Science andTechnology Policy, Executive Office of the President. The National Cancer Institute recently began an effort to update the dose levels.

[5]Doses from this report are based on a 99-percent lower credibility or confidence limit that has a probability of causation of 50 percent. A rad, or radiation absorbed dose, is a measurement of ionizing radiation energy that is absorbed. When DOD estimates a range of potential exposures for a veteran, VHA will use the upper limit.

[6]On the basis of statistics from recent mortality studies, a DOD official told us that an estimated 70 to 75 percent of the 200,000 exposed veterans are presumed alive. In addition to compensating veterans for radiation-related claims, VA may also compensate the survivors of deceased veterans.

[7]According to a DOD official, the 2,900 dose reconstructions may include some that were done at the request of individual veterans who might not have filed claims with VA.

Dose Reconstruction Is Considered Valid for Deciding Claims

Veterans and veterans' service organizations have expressed concern over the completeness of data used by DOD and the methodology it uses to estimate doses, particularly doses from inhaled or ingested radioactive particles. Some are also skeptical about DOD's ability to be unbiased in the dose reconstruction process, since DOD was responsible for the atmospheric testing that exposed the veterans to radiation.

However, studies conducted by DOD, the National Research Council, and the Institute of Medicine have generally shown that DOD's dose reconstruction approach is valid for providing dose estimates for VBA to use in deciding claims. DOD has studied the validity of dose reconstruction by using the process to estimate doses for cases in which the actual dose is well documented. In such studies, DOD has found, for example, that reconstructed doses are similar to doses recorded on film badges, or radiation measurement devices, worn or used by some nuclear test participants. Independent reviews conducted by the National Research Council in 1985 and by the Institute of Medicine in 1995 showed that DOD's reconstructed estimates are typically high, which would generally favor veterans in the claims process. In addition, representatives from the Health Physics Society and other experts express confidence that dose reconstruction is capable of producing dose estimates that are adequate for claims decision purposes.

Some Question the Reliability of Dose Reconstruction

A number of veterans and representatives of veterans' service organizations told us that they do not have confidence in the process DOD uses to estimate radiation exposure. Specifically, they question the completeness of the data used and certain assumptions used to estimate doses.

Several veterans and veterans' organizations we interviewed were skeptical about DOD's knowledge of personnel activities and locations. For example, a veterans' service organization official told us that military personnel swam in a lagoon contaminated by radiation shortly after a nuclear test, but that he doubted that such information would be recorded in documents available to DOD. Yet a DOD official told us that veterans are expected to include these types of assertions in their claims, and regulations require DOD to accept these assertions as fact unless DOD can prove them incorrect.

Some veterans and veterans' organizations also questioned the assumptions that DOD makes when information on a veteran's exposure is incomplete or missing. These individuals believe that if DOD had more specific facts about veterans' duties, dose estimates could be higher. For example, for one dose reconstruction for a veteran who washed contaminated aircraft, DOD estimated the radiation dose to the veteran's skin on the basis of assumptions about the distance between the veteran and the aircraft. DOD officials told us that they believe assumptions that they are required to make are reasonable because specific evidence of exact activities does not always exist and that any inaccuracies in these assumptions generally do not significantly alter the dose estimates.

Some veterans also questioned DOD's methodology for estimating internal radiation from inhaled or ingested radioactive particles. According to an expert at Oak Ridge National Laboratory, internal radiation doses are typically much smaller than external doses and are also very difficult to accurately estimate. In addition, a former health physicist from the Nevada Test Site believes that internal doses have been underestimated because particles in the soil from previous tests at the Nevada site could have been suspended in the air by subsequent nuclear detonations without corresponding indications of this radiation from previous tests appearing on film badges or other measuring devices. According to an official in DOD's dose reconstruction program and to written dose reconstruction procedures, however, fallout from prior nuclear tests is factored into dose reconstructions.

Evidence From Scientific Studies Supports DOD's Dose Reconstruction

We identified five studies conducted since 1979 that assessed the validity of dose reconstruction in estimating radiation exposure. Three of these studies were conducted by the DOD contractor responsible for performing dose reconstructions. To determine the process' validity, the contractor compared known doses recorded on film badges with estimated doses determined through the dose reconstruction process.[8] The DOD contractor reported in 1979, 1980, and 1981 that reconstructed doses were similar to those found on film badges for external doses.[9] For example, in 1981, the contractor prepared an analysis of nuclear radiation exposure of personnel in a Marine brigade during their participation in Exercise Desert Rock VII, Operation Plumbbob, at the Nevada Test Site in 1957. The report notes that "film badge dosimetry and other records of activity are sufficient to identify the personnel who had the greatest potential for exposure and to determine their specific activities." Further, the report concludes that dosimetry data, or data from radiation measurement devices, "correlate well with calculated doses, thus providing the necessary confidence in the calculated doses, and group activities, for those personnel with no dosimetry records."

[8]In 1989, the National Research Council studied the reliability of film badges that were available for some participants in nuclear tests and found that film badge data were generally reliable. See National Research Council, Committee on Film Badge Dosimetry in Atmospheric Nuclear Tests, Energy Engineering Board, Commission on Engineering and Technical Systems, *Film Badge Dosimetry in Atmospheric Nuclear Tests* (Washington, D.C.: National Academy Press, 1989).

[9]Science Applications, Inc., *Analysis of Radiation Exposure for Task Force Warrior—Shot Smoky—Exercise Desert Rock VII–VIII Operation Plumbbob,* DNA 4747F (1979); *Analysis of Radiation Exposure for Task Force Big Bang, Shot Galileo, Exercise Desert Rock VII–VIII Operation Plumbbob*, DNA 4772F (1980); and *Analysis of Radiation Exposure, 4th Marine Corps Provisional Atomic Exercise Brigade, Exercise Desert Rock VII, Operation Plumbbob*, DNA 5774F (1981).

Studies by the National Research Council and by the Institute of Medicine have shown that dose reconstruction is a valid process for estimating radiation doses for VBA to use in deciding claims because dose reconstruction tends to overestimate doses, giving the benefit of the doubt to the veteran. In turn, this favors veterans in the claims process. Specifically, the National Research Council issued a report in 1985 on the comprehensiveness and scientific validity of the methods and procedures DOD's Nuclear Test Personnel Review organization uses to estimate internal and external doses of radiation.[10] The report concluded that "the methods used by the [Nuclear Test Personnel Review] team to assign external . . . doses are generally reasonable and make appropriate use of available data." Although the National Research Council found that the methods used to estimate internal doses were based on unsupported assumptions, it nevertheless found that internal doses are relatively insignificant when compared with external doses, regardless of the estimate. The National Research Council also reported that if any bias exists in the estimates, it is probably a tendency to overestimate doses, especially internal doses. Similarly, the Institute of Medicine noted in a 1995 letter to the Nuclear Test Personnel Review organization that DOD has resolved uncertainties in dose reconstructions by assigning veterans higher rather than lower doses.[11]

According to the Health Physics Society, dose reconstruction is a standard practice for estimating the amount of radiation exposure when more direct evidence, such as film badge readings, is not available. Other health physicists and experts with whom we spoke shared this view.

[10]National Research Council, Committee on Dose Assignment and Reconstruction for Service Personnel at Nuclear Weapons Tests, Board on Radiation Effects Research, Commission on Life Sciences, *Review of the Methods Used to Assign Radiation Doses to Service Personnel at Nuclear Weapons Tests* (Washington, D.C.: National Academy Press, 1985).

[11]National Academy of Sciences, Institute of Medicine, *A Review of the Dosimetry Data Available in the Nuclear Test Personnel Review (NTPR) Program, An Interim Letter Report of the Committee to Study the Mortality of Military Personnel Present at Atmospheric Tests of Nuclear Weapons to the Defense Nuclear Agency* (Washington, D.C.: Institute of Medicine, May 15, 1995).

Independent Review Could Enhance Confidence in the Program

Public and veteran confidence in dose reconstruction as a tool to decide compensation claims could be improved through independent oversight and validation of dose reconstruction results. However, ongoing independent reviews are currently not being conducted to validate program results. Biological testing to verify dose reconstructions is currently being investigated by the scientific community, and some scientists believe that this approach may be useful in the future.

DOD's Dose Reconstruction Program Is Not Independently Reviewed

Some individuals we interviewed believe that DOD's involvement in dose reconstruction poses a conflict of interest, since DOD was responsible for the atmospheric tests that exposed the veterans to radiation. In addition, one expert told us that DOD did not sufficiently monitor the nuclear tests and misled participants about the potential health effects of radiation. Allegations from veterans that data from nuclear tests are inaccurate and that DOD's estimates of exposure are too low further reflect veterans' distrust. Independent reviews of DOD's dose reconstruction program could help mitigate some of these criticisms.

According to VA regulations, a veteran who disagrees with the dose estimate provided by DOD can obtain, at the veteran's expense, an independent estimate from a reliable source. If the independent estimate is at least twice as large as the DOD estimate, VA contracts with a third party to reconcile the two estimates and uses the reconciled estimate to make compensation decisions. Officials in VBA's Compensation and Pension Office told us that they could not remember an instance during the last 5 years when any veteran presented an independent estimate. A dosimetry expert selected by VA to reconcile DOD dose estimates with veterans' independent estimates told us that he completed four such reconciliations in the early 1990s. For one of the reconciliations, his estimate was higher than the DOD estimate but lower than that provided by the veteran; he generally agreed with DOD's estimates for the other three reconciliations.

In a 1995 letter to the Nuclear Test Personnel Review organization, the Institute of Medicine criticized DOD's quality assurance program for dose reconstruction as limited and noted that there has been little peer review of the methods used and of the actual dose estimates. The Institute also noted that no evidence exists that dose estimates were verified by an independent source other than by the National Research Council in the 1980s. According to 1995 National Research Council guidance on dose reconstruction for epidemiological uses, dose reconstructions should undergo peer review if they are to be viewed as credible.[12] The guidance is primarily directed at epidemiological studies of populations located near nuclear weapons plants. It suggests that all dose reconstruction studies be reviewed by groups of scientists and public health officials who are not directly involved in the study, either as participants or as advisors, and that time and resources be allocated for resolving any discrepancies in the results. Applying the same principle, independent validations of a sample of individual dose reconstructions could enhance confidence in the DOD program.

VA officials told us that they did not think it was VA's responsibility to establish a dose reconstruction review program; if a program were to be established, they said it would be DOD's responsibility to establish it. An official in DOD's dose reconstruction program told us that there is no requirement for peer review of the program. In addition, he noted that the program was examined by the National Research Council in 1985 and the Institute of Medicine in 1995 and that there had been no direct recommendation to DOD for a peer review process. The DOD official also told us that a peer review program would not likely be acceptable to veterans if DOD had any involvement in the process.

Biological Technology Has Potential for Validating Dose Reconstruction Results in the Future

Some scientists believe biological measurement techniques could be useful in estimating radiation exposure and validating the results of dose reconstruction techniques. Once biological techniques are fully studied and tested, it is conceivable that they might eventually be used as a substitute for dose reconstruction. Unlike DOD's reconstruction process and other dosimetric methods, biological techniques do not depend on the availability of data on military activities, locations, and atmospheric

[12]National Research Council, Committee on an Assessment of CDC Radiation Studies, Board of Radiation Effects Research, Commission on Life Sciences, *Radiation Dose Reconstruction for Epidemiologic Uses* (Washington, D.C.: National Academy Press, 1995).

conditions. Instead, biological techniques essentially use the body as a dosimeter and may, for example, measure chromosomal aberrations in the blood or the effects of radiation on teeth. In 1985, the National Research Council suggested that biological techniques be used in the dose reconstruction program and that biological testing be used to measure the presence of plutonium and strontium in veterans' urine.

As suggested by the National Research Council, DOD recently started a program to test for veteran exposure to plutonium, a radioactive element found in fallout from atmospheric nuclear testing. Under the program, 100 veterans who participated in nuclear tests volunteered to provide urine specimens that have been tested for plutonium by a national laboratory. Test results are being analyzed, and final results will be reported early in 2000. According to a DOD fact sheet, results from DOD's dose reconstruction program will be reevaluated for any veterans whose plutonium levels are found through urine testing to be significantly elevated. However, no reconstructed doses will be lowered as a result of biological testing. According to a DOD official, waiting for the results of separate feasibility studies by the National Institutes of Health, refining the testing technique, and obtaining funding have contributed to the delay in implementing the National Research Council suggestion.

Other biological measurement techniques for identifying radiation exposure include blood tests for aberrant chromosomes. Although the National Research Council's 1995 guidance on conducting dose reconstruction studies cited this technique as promising for measuring past radiation exposure, it also reported that such testing was more accurate at higher rather than lower levels of radiation exposure. Scientists also suggested that determining the extent of radiation exposure in the teeth of test participants might be used to validate dose reconstructions. These biological measurement techniques, however, are still in the developmental stage.

Better Alternatives to Dose Reconstruction Are Not Currently Available

We identified no better alternatives for deciding claims than dose reconstruction. Veterans and veterans' service organizations advocate expanding the presumptive list of 16 cancers. However, the experts with whom we spoke do not agree on which additional cancers or ailments, if any, are caused by various levels of radiation exposure.

Some experts have recommended adding to the presumptive list those cancers that occur more frequently in veterans who have been exposed to radiation than in similar groups that have not been exposed. This type of comparison is made in mortality studies. Theoretically, basing compensation on the results of these studies could potentially increase confidence that the cancers added to the presumptive list were statistically correlated with participation in atmospheric testing. But, in fact, the statistically significant health effects found by mortality studies vary. For example, many findings in a recent study by the Institute of Medicine comparing the mortality of about 70,000 individuals who participated in one of five nuclear tests with the mortality of about 65,000 nonparticipants[13] differed from the results of prior studies conducted by other researchers. The Institute of Medicine study found, for example, that the increased mortality from leukemia among test participants was not statistically significant, while other mortality studies found increases in mortality from leukemia that were significant. Leukemia is on VA's presumptive list. Conversely, the Institute of Medicine study found statistically significant increases in mortality from nasal and prostate cancers. Other mortality studies have not found statistical elevations in mortality from these cancers, and they are not on the current presumptive list.[14]

Other experts advocate including all known cancers on the presumptive list, arguing that the science is not clear-cut on radiation-induced cancer or exposure levels that cause disease. For example, a professor of molecular and cell biology—who is also an expert in nuclear and physical chemistry—told us that there is no evidence showing that radiation is safe at any level. Other experts, including officials from the National Cancer Institute, contend that the relationship between radiation and cancer is indeed well understood and that there is no evidence that links low levels of radiation to many cancers.

[13]Medical Follow-up Agency, Institute of Medicine, *The Five Series Study: Mortality of Military Participants in U.S. Nuclear Weapons Tests* (Washington, D.C.: National Academy Press, 1999).

[14]The Institute of Medicine study reported that its finding about nasal and prostate cancers has not been reported in other mortality studies or in studies of Japanese atomic bomb survivors. Furthermore, the Institute study explained the divergent findings on prostate cancer—which it acknowledges is generally not linked to radiation exposure—as possibly the result of veterans' concerns about cancers caused by exposure. Such concerns may have led to more identifications of prostate cancer and a subsequent increase in reported deaths due to prostate cancer.

Conclusions

Available scientific studies indicate that dose reconstruction is a valid method for estimating veterans' radiation exposure to decide disability claims, and we have not identified a better alternative. However, the dose reconstruction program lacks an independent review process. According to a DOD official, there has not been a direct recommendation for DOD to establish such a process and peer review was not included as part of the dose reconstruction program when it was established. Given the controversy surrounding the program, an independent review process for validating DOD's dose reconstruction methods and estimates could mitigate concerns about the integrity of the program. In the future, DOD may be able to validate its dose reconstruction program by biological measurement methods, such as counting chromosomal aberrations or measuring radiation exposure in teeth, although such methods are still in the early stages of development.

Recommendation

We recommend that the Secretary of Defense establish an independent review process for the dose reconstruction program under which independent verifications of a sample of individual dose reconstructions are made.

Agency Comments

We provided a draft copy of this report to DOD and VA. Both agencies provided technical comments, which we incorporated where appropriate. The agencies' comments concerning our recommendation and our response follow. DOD's and VA's comments appear in appendixes II and III, respectively.

Defense Threat Reduction Agency

The Director of the Defense Threat Reduction Agency agreed in principle with our recommendation. However, he stated that an organization separate from DOD, such as the National Institutes of Health, should support and direct the independent review process to avoid any appearance of conflict of interest and to build veterans' confidence in the review process. We believe that DOD, as program manager, should maintain responsibility for program integrity, including establishing a review program. DOD could arrange for an independent entity, such as the National Institutes of Health, to conduct a peer review program and ensure the entity chooses a methodology that is independent of DOD influence. We would expect that DOD and any independent entity would consider the

views of others, including veterans and veterans' organizations, on how the program would be set up in order to enhance their confidence in the program.

Department of Veterans Affairs

The Assistant Secretary for Planning and Analysis agreed with our recommendation that the Secretary of Defense establish an independent review process for the dose reconstruction program and said that VA would not be the appropriate organization to perform such reviews.

We are sending copies of this report to the Honorable William S. Cohen, Secretary of Defense; the Honorable Togo D. West, Jr., Secretary of Veterans Affairs; appropriate congressional committees; and other interested parties. We will also make copies available to others upon request.

Please contact me on (202) 512-7111 if you or your staff have any questions. Another GAO contact and other staff who made major contributions to this report are listed in appendix IV.

Stephen P. Backhus
Director, Veterans' Affairs and
Military Health Care Issues

Scope and Methodology

To review assessments of the validity of dose reconstruction as a method for estimating radiation exposure, we relied on various studies and the expertise of scientists in this area. We conducted literature searches for journal articles, scholarly papers, and other similar materials related to estimating radiation exposure. In particular, we reviewed empirical studies that investigated the degree to which reconstructed dose estimates correlate with actual known doses. We also reviewed reports from those who have specifically critiqued the Department of Defense's (DOD) dose reconstruction program. In addition, we reviewed statements from witnesses who testified at the 1998 hearing on ionizing radiation, veterans' health care, and related issues before the Senate Committee on Veterans' Affairs. We then contacted experts associated with scientific organizations, including the National Academy of Sciences, the National Research Council, the National Cancer Institute, and the Health Physics Society, who were knowledgeable about radiation exposure to get other expert opinions and to discuss conflicting views on the topic. In addition, we obtained the views of representatives from veterans' groups, such as the National Association of Atomic Veterans, and veterans' service organizations, including the American Legion, Disabled American Veterans, and Veterans of Foreign Wars.

To determine the oversight activities associated with the dose reconstruction program, we spoke with DOD officials responsible for such activities, including officials in the Defense Threat Reduction Agency, the DOD agency with responsibility for the program, as well as the contractor who actually performs the dose reconstructions. In evaluating the strength of DOD's oversight activities, we reviewed National Research Council guidance on conducting dose reconstructions and compared DOD's processes with this guidance. Additionally, we considered comments by the Institute of Medicine on DOD's procedures.

In researching alternatives to dose reconstruction for deciding claims, we relied on existing scientific studies and the knowledge of the scientific community. In particular, when considering the use of presumptive lists, we reviewed studies of the health effects of radiation exposure, such as those prepared by the Committee on Interagency Radiation Research and Policy Coordination, the National Institutes of Health, and the National Research Council. We also reviewed studies that evaluated increases in mortality for radiogenic diseases for nuclear test participants. We also obtained the views of veterans' organizations on using presumptive lists for deciding claims.

Comments From the Defense Threat Reduction Agency

Defense Threat Reduction Agency
45045 Aviation Drive
Dulles, VA 20166-7517

4 January 2000

Mr. Stephen P. Backhus
Director, Veterans' Affairs and Military Health Care Issues
Health, Education, and Human Services Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Backhus;

The attached enclosure provides the Department of Defense (DoD) formal agency comments to the GAO draft report, "VETERANS' BENEFITS: Independent Review Could Improve Credibility of Radiation Exposure Estimate," dated December 9, 1999 (GAO Code 105771/OSD Case 1923).

For further questions regarding our comments, please contact Mr. Mike Schaeffer at (703)325-2407.

Sincerely,

Richard L. Roomer
for Jay Davis
Director

Enclosure:
DoD Response to GAO Proposed Recommendation dated Dec 99

GAO DRAFT REPORT DATED DECEMBER 9, 1999
GAO CODE 105771 OSD CASE 1923

"VETERANS' BENEFITS: INDEPENDENT REVIEW COULD IMPROVE CREDIBILITY OF RADIATION EXPOSURE ESTIMATE"

DEPARTMENT OF DEFENSE RESPONSE TO THE GAO RECOMMENDATION

Now on p. 16.

GAO RECOMMENDATION: The Secretary of Defense establish an independent review process for the dose reconstruction program under which independent verifications of a sample of individual dose reconstructions are made. (p. 14/GAO Draft Report)

DoD RESPONSE: The Department of Defense (DoD) agrees in principle with the recommendation that an independent review process be established to validate samples of the Nuclear Test Personnel Review (NTPR) Program's dose reconstructions. Since the Department of Energy (DOE) controls and maintains original dose records for U.S. atmospheric nuclear test participants, it would be an unlikely candidate organization. Neither the DoD nor the DOE should be involved with the conduct of the review to avoid the appearance of a conflict of interest and to build veterans' confidence in the review process. An independent organization, such as the National Institute of Health (NIH), should be assigned the responsibility to support and direct the conduct of this independent dose review process.

Comments From the Department of Veterans Affairs

DEPARTMENT OF VETERANS AFFAIRS
WASHINGTON DC 20420

JAN 3 2000

Mr. Stephen P. Backhus, Director
Veterans' Affairs and Military Health
Care Issues
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Backhus:

We have reviewed your draft report, ***VETERANS' BENEFITS: Independent Review Could Improve Credibility of Radiation Exposure***, GAO/HEHS-00-32, per your request, and submit the following technical changes and comments.

Throughout the draft report, the word "settle" is used to discuss VA's claims process. VA does not settle claims, it instead decides claims. Please substitute the word "settle" with the word "decide".

Now on p. 12.

On page 10, you state that according to VA regulations, a veteran who disagrees with the DOD dose estimate can obtain, at his/her expense, an independent estimate from a reliable source. VA will consider routine ways to inform veterans as to when they can seek an independent dose estimate.

We agree with the recommendation that the Secretary of Defense establish an independent review process for the dose reconstruction program under which independent verifications of samples of individual dose reconstructions are made. VA should not be the organization that performs this review of DOD's program.

Thank you for the opportunity to comment on the draft report.

Sincerely yours,

Dennis Duffy
Assistant Secretary for
Planning and Analysis

GAO Contact and Staff Acknowledgments

GAO Contact

Ronald J. Guthrie, (303) 572-7332

Staff Acknowledgments

John A. Borrelli, Joseph J. Buschy, Nancy L. Crothers, Deborah L. Edwards, Chariti E. Gent, George L. Lorenzen, B. Behn Miller, and Karen M. Sloan also made key contributions to this report.

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