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"Oversight Hearing to Receive Testimony on Agent Orange"

Hearing before the Subcom on Medical Facilities and Benefits of the Comm on Veterans' Affairs House of Rep
96 Cong 2d sess 25 Feb 1980

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Good REVIEW of studies & problem.

Hearings "Oversight ... Orange."
Feb 25, 1980

I am prepared to answer your questions.

Chairman SATTERFIELD. Thank you.

General AUGERSON. And by the way, sir, I have submitted a rather long formal statement.

Chairman SATTERFIELD. Without objection, your full statement as well as the statements of all of the other members of the panel will be admitted to this record.

[Material follows:]

STATEMENT OF MAJOR GENERAL WILLIAM S. AUGERSON, DEPUTY ASSISTANT SECRETARY OF DEFENSE (HEALTH RESOURCES AND PROGRAMS), BEFORE THE SUBCOMMITTEE ON MEDICAL FACILITIES AND BENEFITS, COMMITTEE VETERANS' AFFAIRS, HOUSE OF REPRESENTATIVES

Mr. Chairman, Gentlemen and Ladies: It is a pleasure to appear before the Committee to discuss the Department of Defense's use of the mixture of herbicides known as "Orange". Our discussion will include: its application in Vietnam; the controls which were utilized in the operational missions; and the evolution of the state of knowledge concerning the possibility of toxic responses due to a small concentration of a contaminating substance known as 2, 3, 7, 8-tetrachlorodibenzo-para-dioxin, usually referred to as either TCDD or simply dioxin; subsequent curtailment of herbicide operations; and the eventual destruction of all remaining stocks of the herbicide. I recognize your concern about possible health effects in Vietnam service personnel. The Air Force presentation will cover our effort to evalute possible health effects in a group known to be exposed.

We, in the Department of Defense, prefer to refer to the equal mixture of 2, 4–D and 2, 4, 5–T as *Herbicide* Orange, rather than as it has been referred to in other publications as "Agent Orange". The action of these substances, as was first and widely demonstrated in commercial agricultural applications here in the United States and in other countries, was to selectively destroy or defoliate brush and other woody plants. Their combined action was selective, and in the true sense they are herbicides. The use of the word "agent" has the connotation that the substance has an anti-personnel or anti-animal effect and is deliberately employed against such targets. This was not the case. When the initial selection and decision to use these herbicides in defoliation and selective crop applications was made, both substances were considered to have no human toxicity.

Herbicide Orange and the other herbicidal compounds utilized in Vietnam derived their names from the use of a 3-inch, color-coded band which was painted around the center of the ICC 17C 55-gallon, 18-gauge, steel drums, used for shipment of the compound from the manufacturing plant in the United States to the operational utilization points in Vietnam. Other herbicide formulations had containers which were marked with white, blue, pink, purple and green bands for easy identification.

The initial decision to use herbicides in Vietnam was made by the President of the United States at the request of the Republic of Vietnam. Approval of initial targets was the subject of inter-agency review, and early research and development efforts in 1962 were restricted to remote areas in the Ca Mau peninsula and along Route 15, northwest of Saigon. These missions were accompanied by information leaflets, loudspeaker warnings and avoided all populated areas. Following these tests, extensive evaluation of effectiveness was made by a technical team. In fact, over the period from 1963 to 1968, there were at least eight major evaluation programs and reports. A list is included as Appendix 1. Few of these considered the health effects, since information available at that time did not indicate high toxicity, mutagenicity or any significant human health effects. Only in October 1969, as a result of a Department of Health, Education and Welfare study performed by Litton Bionetics, did concerns arise. These were, of course, evaluated in the later contract effort with the National Academy of Sciences, complete reports of which were submitted to the Congress in February 1974.

Herbicide Orange, the defoliant in question, consists of a 50:50 mixture of the n-butyl esters of 2, 4–D ((2, 4–dichlorophenoxy) acetic acid) and 2, 4, 5–T ((2, 4, 5–trichlorophenoxy) acetic acid). Each gallon of Orange contains 4 pounds of 2, 4–D and 4.6 pounds of 2, 4, 5–T on an acid-equivalent basis. Each of these herbicides was registered by the EPA, and have been in commercial use in U.S. agriculture since the mid-1940's. The outstanding effectiveness of these two herbicides in

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parently low mammalian toxicity and low application rates, resulted in their rapid acceptance and spread in world agriculture. As a result, 2, 4–D production went from 14,000 pounds in 1950 to 36 million pounds by 1960. During the 1960's, approximately 78 million pounds of 2, 4, 5–T was applied within the United States for agricultural purposes.

I would like to describe now how Herbicide Orange was used in Vietnam. Defoliation operational approval consisted of a rigorous process which required approval by both Republic of Vietnam officials and U.S. officials, even up to the U.S. Ambassador. This dual-approval chain operated regardless of whether the request was initiated by Republic of Vietnam (RVN) or U.S. Force commanders. On the RVN side of the chain, authorization review and approval for missions started with the Province Chief and was then sent through the Regional Vietnamese Army Commander to the RVN Armed Forces General Staff to what was called the "202 Committee;" the request was also sent to the American Division Commander for the area in which the province was located, and then on to the Senior Advisor of the Military Region and to the U.S. Mission to the "203 Committee". In this approval process, the Vietnamese Province Chief was required to provide an analysis of the target area, which included intelligence, civic affairs evaluation, including number of people in and near the target areas, the creation of refugees, and the psychological-warfare aspects of the operation. The Province Chief also had to guarantee a pledge of indemnification for damage to "friendly" crops. On the American side of the approval process, the Senior Advisor had to consider the same factors as the Vietnamese Province Chief, plus other problem areas, such as the effects on pacification operations, community development and economic effects, in consultation with other specialized advisors such as the Agricultural Advisor.

Proceeding up the American line of approval, the "203 Committee" considered the proposal from the standpoint of intelligence, planning, USAID aspects and the American Embassy. If all of the lower authorities had granted approval, the proposal for a spraying operation was then forwarded to the MACV Commander and the American Ambassador. Disapproval by either the RVN or American chain of commands stopped the proposed mission. As a further precaution, forty-eight hours before each flight mission, final approval had to be sought from the Province Chief and from all ground commanders having a responsibility in the target area to be sprayed. These involved approval procedures were mandatory for all operations involving destruction of crops and for all fixed-wing, aircraft defoliation missions. Defoliation missions conducted by helicopter or on-the-ground spraying were delegated for approval to the Mulitary Region Commander on the part of the RVN and the American Forces.

Post-mission reports had to be submitted to MACV Headquarters. These reports had to include: project and target number, date of mission, number of sorties scheduled and number accomplished, reasons for non-successful sorties, number of gallons of agent used, and type of mission (defoliant or crop destruction), hits from ground fire received by aircraft, and map coordinates of actual spray run.

We now have in the Department a computer listing of all such spray missions for the period from 1965 to the end of spraying in 1971, which is believed to be complete. This print-out shows the date, time, agent used, gallons of agent dispensed, the map coordinates and the area covered by the mission. A detailed computer presentation is not available for the period before 1965. Very recently, another computer report has been obtained which provides information on post-1965 spray missions in each of the provinces of Vietnam, and provides the same mission profile data as described earlier.

In order to verify that these review and approval procedures were being followed with respect to all fixed-wing aircraft spray missions, a special task force from MACV and the American Embassy reviewed the project and mission files and issued a report in May of 1968. In general, the report found that policies and procedures were followed; however, it noted that there had been serious damage to "friendly" crops. Steps were outlined to further improve the management of herbicide operations. One major report recommendation was, in accordance with the wishes of the RVN government, to limit further operations to "low population density" areas, defined as those areas with no more than 7 persons per square kilometer.

It should be mentioned that from August 1965 through February 1971, 90 percent of all of the Herbicide Orange disseminated over South Vietnam was for forest defoliation. Crop destruction missions, during the same time period, accounted for 8 percent of amount sprayed; and the remaining 2 percent was used around base perimeters, cache sites, waterways and communications lines.

Much of this protective perimeter spraying was done by ground vehicles or by the use of small helicopters with limited capacity tanks. These perimeter defoliation operations helped to maintain clear fields of fire and protected our troops from infiltration through the dense cover. Areas around our fire bases and camps were also routinely sprayed with insecticides both from the air and by ground dissemination methods to reudce mosquitos and thus help to control malaria. Some of these numerous insecticide control flights by helicopters may have been mistaken as defoliation runs. The insecticide most commonly used was malathion, which is commonly used here in the States.

The primary purpose of defoliants in South Vietnam was to deny the Viet Cong the advantages of the dense, jungle-foliage cover which enabled them to ambush cur forces with sometimes disasterous results and high casualties. The dense, tri-level jungle growth also permitted the enemy forces to assemble large forces, develop supply dumps and operate with relative immunity from aerial observation and strikes. Therefore, the aerial spraying operations using various herbicides were initiated to reduce casualties among our forces, and hence were directed at enemy-controlled territory. From an area standpoint, herbicides were sprayed on approximately 10.3 percent of the inland forests of South Vietnam, 36.1 percent of the mangrove forests, and 3 percent of the cultivated lands. Total area estimates sprayed for all of South Vietnam range from 8.6 percent to approximately 10 percent of the land mass. During the period from January 1962 through December 1964, when relatively few American forces were in the field in South Vietnam, approximately 281,200 gallons of defoliants were sprayed on hostile areas. At the end of 1962, approximately 12,000 personnel were assigned. By January 1965, this number had increased to 23,000 and by the end of 1965, approximately 181,000 personnel were present in South Vietnam. In the period from January 1965 to February 1971 when American forces were augmented, approximately 11.3 million gallons of Herbicide Orange were sprayed. Much of the herbicide was deposited on the dense jungle canopy in remote areas occupied by enemy forces. The typical spraying mission was flown at an altitude of 150 feet and released the herbicide at the rate of 3 gallons per acre, with a flight speed of 130 knots. The spraying time was about 3.5 to 4 minutes in a spray line 14 kilometers long (8.7 miles) by 260 to 280 feet wide.

In canopy penetration studies with phenoxy herbicide formulations similar to Orange, it was found that, on the average, only 21 percent of the spray penetrated the top canopy of the dense forest growth and only about 6 percent penetrated to the ground level. As would be expected, the percent spray penetration through forest canopies was inversely related to the canopy density. In a typical, initial spray mission, nominally 1,000 gallons of Herbicide Orange would be applied over 346 acres of forest, thus 94 percent or 940 gallons would come to rest on the forest canopy and be trapped and absorbed in the foliage. The remaining 60 gallons would penetrate to the ground level and be deposited either on the soil or the underbrush. The actual ground-level deposit rate would likely be about .17 gallon per acre or 1.4 pounds of 2,4–D/2,4,5–T mixture per acre. In comparison, mixtures of such herbicides have been routinely applied in the United States at the rate of 2.0 pounds per acre. Our military forces moving through Orange-treated forests would have encountered the same amount of phenoxy herbicides as a person would encounter in walking through defoliated brush-infested ranch land here in the United States.

Going back to the total amount of 2,4,5–T sprayed over all of South Vietnam from January 1962 through February 1971, it amounted to 44 million pounds or 41 percent of the total weight of 2,4–D and 2,4,5–T. It has been estimated the herbicide contained 368 pounds of the contaminant dioxin. Ninety-six percent of all 2,4,5–T was contained in Herbicide Orange; the remaining 4 percent in Herbicides Green, Pink and Purple. However, the Herbicides Green, Pink and Purple contained approximately 40 percent of the estimated amount of dioxin sprayed in South Vietnam. Herbicides Green, Pink, and Purple were sprayed as defoliants on less than 90,000 acreas from 1962 through 1964, when we had only a small force of our military personnel in South Vietnam. Therefore, we have remaining an estimated 203 pounds of dioxin in a total of 38.3 million pounds of 2,4,5–T which was sprayed over 2.9 million acres of inland forests and mangrove forests. Thus, we find that each acre of jungle forest (43,560 sq. ft.) would receive, assuming uniform distribution, 7/100,000 of a pound of dioxin. However, this is distributed over the top of the forest canopy; and earlier studies have shown that only 6 percent of this deposit would likely reach the ground. Taking this factor into consideration, the amount of dioxin ever reaching the forest floor would be four millionths of a pound per acre without assuming any photo or chemical degradation of the chemical. The 4 millionths of a pound of dioxin per acre converts to 1.9 milligrams per acre or .04 micrograms of dioxin per square foot on either the soil or deposited in the underbrush. This would be the concentration of dioxin from Herbicide Orange immediately after a spray mission; however, one should also consider that many of these forests had trees which were 150 feet tall, and that there may be as high as 300 tons of vegetation per acre on which this small quantity of dioxin fell.

Under tropical conditions, the effects of Herbicide Orange sprayed at the rate of 3 gallons per acre were not seen for a period of one to two weeks when leaf browning and discoloration took place. However, leaf drop did not occur until one to two months after application, reaching a maximum in two to three months. Since the denial of cover to the enemy did not take place until at least a month after application, generally our forces did not operate in these areas until the cover was eliminated. Inevitably, in any operation as vast as the Vietnam War, some military persons may have entered regions before defoliation and some few may have been exposed to spray. Hence, an environment decay factor also acted to further reduce the minute initial dioxin concentrations. A 1978 study of the fate of dioxin in plants, soil, water and air of a microagroecosystem using tritium-labeled dioxin at concentrations of 44 or 7,500 parts per billion applied to bluegrass found that the dioxin concentrations was initially 20 parts per trillion (10^{-12}g/g of grass) but after 4 weeks, the concentration was at or below 1 part per trillion. The half-life was approximately six days. The investigators concluded that volatization (about 10 percent) of dioxin was a major pathway of dissipation from their microagroecosystem chamber. Once the dioxin was volatilized, it was dechlorinated in the direct sun and apparently even in the shade (as we might have under the jungle canopy) and even without the presence of ultraviolet light.

Another study, a year earlier, found that herbicide formulations (including Orange) which contained known amounts of dioxin and exposed to natural sunlight on leaves, soil and grass, lost most of the dioxin in a single day, due mainly to photochemical dechlorination. Despite the known soil persistence of the pure form of dioxin, it was not stable as a contaminant in thin herbicide films exposed to outdoor light.

As a result of the National Institute of Health report that 2,4,5-T could cause malformations and stillbirths, the Department of Defense in October 1969 restricted the use of Herbicide Orange to areas in Vietnam which were remote from population concentrations concurrent with civilian actions. In April 1970, the Department ceased all operations involving the use of Herbicide Orange. This was done because of its possible teratogenicity and the now recognized contamination with minute concentrations of the highly toxic dioxin or TCDD. At the time of the suspension of all spray operations there were 1.37 million gallons of Herbicide Orange in storage in South Vietnam, and another .85 million gallons sorted at the Naval Construction Battalion Center in Gulfport, Mississippi. In September of 1971, the Department directed that all of the Herbicide Orange in Vietnam be returned to the United States and that the entire 2.2 million gallons be disposed of in an environmentally safe manner. The Herbicide Orange from Vietnam was moved in April 1972 to Johnston Island in the Pacific Ocean for later disposal. During the period between 1971 and 1977, several methods of disposal and reprocessing to remove the contaminant dioxin were researched. In March 1977, the Air Force requested the EPA to approve the destruction of stored herbicide through high temperature incineration on-board of a specially designed incineration vessel on the open sea, West of Johnston Island. This was approved and was accomplished. A total of three herbicide loadings were required, one from Gulfport and two from Johnston Island to eliminate the entire stored DoD stock of Herbicide Orange.

During the land based operations involving removal of the herbicide from the storage drums and transfer to the incineration ship, air sampling was conducted on a continuing basis; and the levels of 2,4-D and 2,4,5-T vapors were at least two- and in most cases three, orders of magnitude below the acceptable, threshold, limit values for these substances. Dioxin was not detected in any air samples at either site. Approximately 200 personnel carried out the removal from storage drums and transfer activities at the two locations. Comparisons of available pre- and post-operational medical examinations of military personnel involved have revealed no apparent physical effects as a result of these transfer operations with Herbicide Orange.

As a result of an April 10, 1978 letter from the late Ralph H. Metcalfe to the General Accounting Office, in which he expressed concern about the possible long-term adverse health effects on individuals that were exposed to Herbicide Orange in Vietnam, the GAO began the investigation which produced the report

entitled, "Health Effects of Exposure to Herbicide Orange in South Vietnam Should Be Resolved", published on April 6, 1979. This report pointed out that since 1977, Vietnam veterans have been contacting the Veterans Administration about health problems which they believe were caused by exposure to herbicides in Vietnam. Problems in identifying personnel exposed to herbicides and determining the possible health consequences of such exposure had hindered the Veterans Administration efforts to resolve the concerns posed by these veterans. The report made the recommendation that the Department of Defense, with the assistance and guidance of an appropriate interagency group, conduct a survey of any long-term medical effects on military personnel who were likely to have been exposed to herbicides in South Vietnam. It also recommended that the Secretary of Defense provide guidance to ensure that Air Force, Army, and Navy medical facilities are uniformly monitoring and evaluating possible herbicide-related concerns of personnel who served in Vietnam. Information thus developed in Defense medical facilities should be coordinated with the Veterans Administration.

Our Department did not agree with the recommendation that the DoD undertake a comprehensive interagency study of the long-term medical effects on military personnel who might have been exposed to Herbicide Orange in Vietnam. It was our position that a retrospective epidemiological study of that population would not produce reliable results because: (1) About 17 years have elapsed since the beginning of herbicide operations in Vietnam, and during this interim period any number of other influences on health may have supervened; (2) There are generally no data on exposure concentrations and exposure items; and lacking a reliable estimate of exposure, the interpretation of the results would be highly unreliable; and (3) Identifying an appropriate control group would be virtually impossible. For any group to serve as an appropriate control, it would be necessary to show that these people were not exposed to Herbicide Orange, and that they have, essentially, the same shared influences on their health as those of the exposed group. The Department, as an alternative, proposed to support the then-current effort of the National Academy of Science's Committee of Toxicology to study, in cooperation with the Italian Government, the health effects of the release of large amounts of TCDD into the environment from an industrial accident in Seveso, Italy. We believed this would be a better study than that recommended by GAO because the concentration of TCDD was determined, known exposures are documented, and prompt medical follow up was achieved.

Subsequently, in response to a letter of May 21, 1979 from Senator Percy, the GAO continued their study of the use of Herbicide Orange in South Vietnam. The GAO concentrated on determining (1) when and what military units were in or near areas sprayed with Herbicide Orange; and (2) what precautions were taken to prevent ground troops and others from exposure. The GAO determined, to their satisfaction, that a large number of U.S. Army and Marine Corps ground troops were in or close to sprayed areas during and shortly after spraying. They did not determine the names and last known addresses of Marines assigned to these units. Also, Army personnel could not be identified by name because the Army records were found to be incomplete. During the time of the spraying operations up to 1979, Herbicide Orange was not considered to be toxic or dangerous to humans, and few precautions were taken to prevent expsoure to the substances.

The GAO could not document from available records whether ground troops were actually exposed or the degree of exposure to Herbicide Orange. The GAO recommended that Congress direct DoD, VA, HEW or EPA to determine whether a study is needed on the health effects of Herbicide Orange on the ground troops that were identified in their analysis.

The Department of Defense, through the Military Departments, have now issued guidance to their medical facilities concerning Herbicide Orange health effects to ensure uniform monitoring and evaluation. The Department of Defense still believes that an extensive, retrospective epidemiological study of the ground troops in Vietnam, a truly prodigious undertaking, is very unlikely to uncover causality between exposure to Herbicide Orange and subsequent ill effects on health.

With respect to our Department's interest in other studies currently underway, we are actively participating as a member of the recent established interagency working group which was initiated by the Office of the President to facilitate, coordinate, and monitor studies sponsored by the participating agencies to determine possible long-term health effects of phenoxy herbicides and their contaminations including the dioxins. This Working Group, chaired by the General Counsel, D/HEW will have our full support and technical assistance whenever needed.

In addition, we intend to continue to work with the Veterans Administration in an effort to be responsive to their data needs in consonance with our available resources. Many of the Executive Department agencies involved in this new interagency working group have for a couple of years been interacting in a cooperative effort to resolve these problems.

The Department of Defense particularly supports the Air Force Ranch Hand Study as it is directed at a defined population who had repeated and known exposure to Herbicide Orange which is the substance of concern to our Vietnam veterans. The study will consider a locatable population which can be followed for an extended period of time to determine any significant directions in expected morbidity, mortality, or general health status. Further, the Air Force personnel who will be involved in this study as well as the control group will have been exposed to many of the in-country environments as other veterans who served in Vietnam. However, any study of this magnitude and scope will take time to accomplish in a thorough manner. We believe by the end of 1986 that the study will provide significant data to help resolve whether there are long term health problems related to exposure to Herbicide Orange in this military population.

An other study of particular interest to us is the investigation of the industrial accident which took place in Serveso, Italy in 1976 in which a defined population was exposed to gross contamination. The Department of Agriculture and the Board of Toxicology of the National Academy of Sciences have been closely following this accidental exposure in cooperation with the Department of State and the Government of Italy.

As to your inquiry about studies in the private sector, the Department has recently received a report on the mortality experience of workers exposed to TCDD in a tricholophenal process accident at the Monsanto Chemical plant in Nitro, West Virginia in 1949. One-hundred twenty-one male workers who developed chloracne resulting from this accident were selected and followed up. The study has shown no apparent excess in total mortality or in deaths from malignant neoplasms or diseases of the circulatory system in a group of industrial workers with a high peak exposure to TCDD over a follow-up period of 29 years. Caution as to any conclusiveness of the findings is, however necessary as the number of workers is limited and the number of deaths observed is rather small (32) for this 29 year period.

We intend to follow two other herbicide related studies. These particular studies have been mentioned because of their relevancy to the effects of high exposures of these substances to defined and traceable populations.

Many Federal agencies, e.g., Environmental Protection Agency, National Cancer Institute are sponsoring research relevant to Herbicide Orange and prepared by private organizations. We will follow such work but defer to the relevant agencies for any comment about their result: (1) A Dow study on the mortality analysis of employees engaged in the manufacture of 2, 4, 5-T, and (2) the Vertac health effects study on 200 workers manufacturing 2, 4, 5-T at Jacksonville, Arkansas.

We are, committed, however, to do whatever we can to help resolve this troublesome concern for the Government and for those who served in Vietnam. In this regard, cognizance for matters concerning health effects of Herbicide Orange have now been moved into the Office of the Assistant Secretary of Defense (Health Affairs), from the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics) (Energy, Enviroment and Safety).

Thank you.

APPENDIX 1

An Evaluation of Chemical Corp Destruction in Vietnam, Betts and Denton, (AD–779 790, $5.25) October 1967.

A Statistical Analysis of the US Corp Spraying Program in South Vietnam, Russo (AD–779 791, $5.25) October 1967.

Research and Analysis Study ST67–003, Evaluation of Herbicide Operations in RVN (AD–779 792, $4.75) 12 July 1966.

Report on the Herbicide Policy Review, 28 August 1968 (AD–779 794, $10.00).

Evaluation of Herbicide Operations in the Republic of Vietnam, September 1962-September 1963 (Declassified from SECRET) (AD–779 795, $5.75) 10 October 1963.