

Agent Orange

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Agent Orange or Herbicide Orange (HO) is one of the herbicides and defoliants used by the U.S. military as part of its chemical warfare program, Operation Ranch Hand, during the Vietnam War from 1961 to 1971. Vietnam estimates 400,000 people were killed or maimed, and 500,000 children born with birth defects as a result of its use.^{[1][2]} The Red Cross of Vietnam estimates that up to 1 million people are disabled or have health problems due to Agent Orange.^[3] The United States government has dismissed these figures as unreliable and unrealistically high.^{[4][5]}

A 50:50 mixture of 2,4,5-T and 2,4-D, it was manufactured for the U.S. Department of Defense primarily by Monsanto Corporation and Dow Chemical.

The 2,4,5-T used to produce Agent Orange was contaminated with 2,3,7,8-tetrachlorodibenzodioxin (TCDD), an extremely toxic dioxin compound. It was given its name from the color of the orange-striped 55 US gallon (208 l) barrels in which it was shipped, and was by far the most widely used of the so-called "Rainbow Herbicides".^[6]

During the Vietnam War, between 1962 and 1971, the United States military sprayed nearly 20,000,000 US gallons (76,000,000 l) of material containing chemical herbicides and defoliants mixed with jet fuel in Vietnam, eastern Laos and parts of Cambodia, as part of Operation Ranch Hand.^{[7][8]} The program's goal was to defoliate forested and rural land, depriving guerrillas of cover; another goal was to induce forced draft urbanization, destroying the ability of peasants to support themselves in the countryside, and forcing them to flee to the U.S. dominated cities, thus depriving the guerrillas of their rural support and food supply.^{[8][9]}

The US began to target food crops in October 1962, primarily using Agent Blue. In 1965, 42 percent of all herbicide spraying was dedicated to food crops.^[9] Rural-to-urban migration rates dramatically increased in South Vietnam, as peasants escaped the war and famine in the countryside by fleeing to the U.S.-dominated cities. The urban population in South Vietnam nearly tripled: from 2.8 million people in 1958, to 8 million by 1971. The rapid flow of people led to a fast-paced and uncontrolled urbanization; an estimated 1.5 million people were living in Saigon slums.^[10]

United States Air Force records show that at least 6,542 spraying missions took place over the course of Operation Ranch Hand.^[11] By 1971, 12 percent of the total area of South Vietnam had been sprayed with defoliating chemicals, at an average concentration of 13 times the recommended USDA application rate for domestic use.^[12] In South Vietnam alone, an estimated 10 million hectares (25 million acres, 39,000 square miles) of agricultural land was ultimately destroyed.^[13] In some areas, TCDD concentrations in soil and water were hundreds of times greater than the levels considered safe by the U.S. Environmental Protection Agency.^{[14][15]} Overall, more than 20% of South Vietnam's forests were sprayed at least once over a nine-year period.^[9]



U.S. Army Huey helicopter spraying Agent Orange over Vietnamese agricultural land

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Chemical description and toxicology

Chemically, Agent Orange is an approximately 1:1 mixture of two phenoxy herbicides –

2,4-dichlorophenoxyacetic acid (**2,4-D**) and 2,4,5-trichlorophenoxyacetic acid (**2,4,5-T**) – in iso-octyl ester form.^[16]

Numerous studies have examined health effects linked to Agent Orange, its component compounds, and its manufacturing byproducts.^[17]

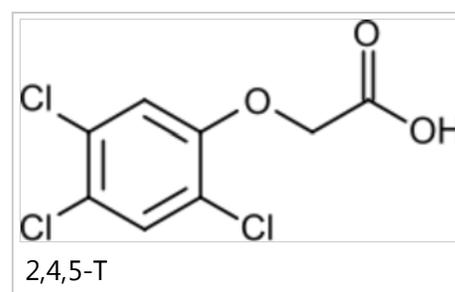
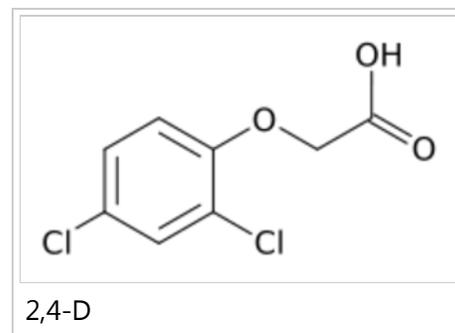
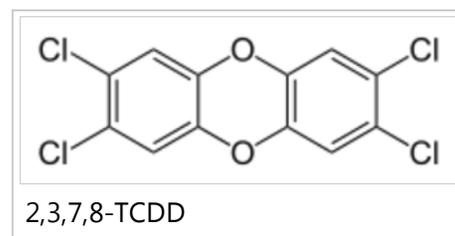
Prior to the controversy surrounding Agent Orange, there was already a large body of scientific evidence linking 2,4,5-T to serious negative health effects and ecological damage.^[18] But in 1969, it was revealed to the public that the 2,4,5-T was contaminated with a dioxin, 2,3,7,8-tetrachlorodibenzodioxin (**TCDD**), and that the TCDD was causing many of the previously unexplained adverse health effects which were correlated with Agent Orange exposure.^[19] TCDD has been described as "perhaps the most toxic molecule ever synthesized by man".^[20] Internal memoranda revealed that Monsanto (a major manufacturer of 2,4,5-T) had informed the U.S. government in 1952 that its 2,4,5-T was contaminated.^[21] In the manufacture of 2,4,5-T, accidental overheating of the reaction mixture easily causes the product to condense into the toxic self-condensation product TCDD. At the time, precautions were not taken against this unintended side reaction, which caused also the Seveso disaster in Italy in 1976.

In 1979, the Yale biologist Arthur Galston, who specialized in herbicide research, published a review of what was known at the time about the toxicity of TCDD. Even "vanishingly small" quantities of dioxin in the diet caused adverse health effects when tested on animals.^[20] Since then, TCDD has been comprehensively studied. It has been associated with increased neoplasms in every animal bioassay reported in the scientific literature.^[22] The National Toxicology Program has classified TCDD as "known to be a human carcinogen", frequently associated with soft-tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's lymphoma and chronic lymphocytic leukemia (CLL).^{[23][24]}

Of the two herbicides that make up Agent Orange, 2,4-D and 2,4,5-T, the latter is considered to be less biodegradable.^[25] While degradation of 2,4,5-T with a half-life on a scale of days can be achieved by adding bacteria of a special strain, "no substantial degradation" was observed in the same soil without addition of bacteria.^[26] The half-life of dioxins in soil is more than 10 years,^[27] and that of TCDD in human fat tissue is about 7 years.^[28]

A 1969 report authored by K. Diane Courtney and others found 2,4,5-T could cause birth defects and stillbirths in mice.^[29] Several studies have shown an increased rate of cancer mortality for workers exposed to 2,4,5-T. In one such study, from Hamburg, Germany, the risk of cancer mortality increased by 170% after working for 10 years at the 2,4,5-T-producing section of a Hamburg manufacturing plant.^[22] Three studies have suggested prior exposure to Agent Orange poses an increased risk of acute myelogenous leukemia in the children of Vietnam veterans.^[17]

It has often been claimed^{[30][31][32][33][34][35][36][37]} that the contamination with dioxin was discovered only *later*. However, prior to Operation Ranch Hand (1962-1971), health-risks had become apparent,



from several accidents in 2,4,5-T-production in the U.S. and in Europe.^[38] The causes had been investigated, and results published^[39] in 1957, specifically stating "tetrachlordibenzodioxine proved very active." Additionally "Boehringer, which used the relative safer low-temperature-process since 1957, in the same year warned the other producers of 2,4,5-TCP, which were using the high-t-process, pointing out the risk and providing suggestions how to avoid them."^[40] Furthermore, Dr. James R. Clary (a former government scientist with the Chemical Weapons Branch, BW/CW Division) has stated that "When we (military scientists) initiated the herbicide program in the 1960's, we were aware of the potential for damage due to dioxin contamination in the herbicide. We were even aware that the 'military' formulation had a higher dioxin concentration than the 'civilian' version due to the lower cost and speed of manufacture. However, because the material was to be used on the 'enemy', none of us were overly concerned."^{[41][42]}

Starting in 1991, the US Congress asked the Institute of Medicine to review the scientific literature on Agent Orange and the other herbicides used in Vietnam, including their active ingredients and the dioxin contaminant. The IOM found an association between dioxin exposure and diabetes.^{[43][44]}

Early development

In 1943, plant biologist Arthur Galston began studying the compound triiodobenzoic acid as a plant growth hormone, in an attempt to adapt soybeans to a short growing season. Galston applied a low dose of the substance on a Soybean plant. The plant presented with flowering and accelerated growth when compared to a control. However, applied in excess, the plant would respond with catastrophic defoliation — a finding later used by his colleague Ian Sussex to develop the family of herbicides used in Operation Ranch Hand.^[45] Galston was especially concerned about the compound's side effects to humans and the environment.^[46]

In 1943, the U.S. Department of the Army contracted the University of Chicago to study the effects of 2,4-D and 2,4,5-T on cereal grains (including rice) and broadleaf crops. From these studies arose the concept of using aerial applications of herbicides to destroy enemy crops to disrupt their food supply. In early 1945, the U.S. army ran tests of various 2,4-D and 2,4,5-T mixtures at the Bushnell Army Airfield in Florida, which is now listed as a Formerly Used Defense Site (FUDS).^{[47][48]}

Use in the Vietnam War

During the Vietnam War, between 1962 and 1971, the United States military sprayed nearly 20,000,000 US gallons (75,700,000 l) of chemical herbicides and defoliants in Vietnam, eastern Laos and parts of Cambodia, as part of the aerial defoliation program known as Operation Ranch Hand.^{[7][8]} The goal was to defoliate rural/forested land, depriving guerrillas of food and cover and clearing sensitive areas such as around base perimeters.^[49] The program was also a part of a general policy of forced draft urbanization, which aimed to destroy the ability of peasants to support themselves in the countryside, forcing them to flee to the U.S. dominated cities, depriving the guerrillas of their rural support base.^{[8][9]}

Spraying was usually done either from helicopters or from low-flying C-123 Provider aircraft, fitted with sprayers and "MC-1 Hourglass" pump systems and 1,000 US gal (3,800 L) chemical tanks. Spray runs were also conducted from trucks, boats, and backpack sprayers.^{[50][51][52]}



Military film footage of U.S. troops spraying Agent Orange from a riverboat in Vietnam

The first batch of herbicides was unloaded at Tan Son Nhut Air Base in South Vietnam, on January 9, 1962.^[6] Air Force records show at least 6,542 spraying missions took place over the course of Operation Ranch Hand.^[11] By 1971, 12 percent of the total area of South Vietnam had been sprayed with defoliating chemicals, at an average concentration of 13 times the recommended USDA application

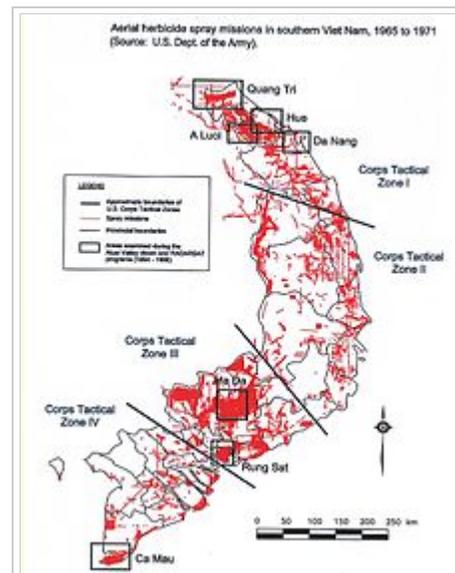
rate for domestic use.^[12] In South Vietnam alone, an estimated 10 million hectares of agricultural land were ultimately destroyed.^[13] In some areas, TCDD concentrations in soil and water were hundreds of times greater than the levels considered safe by the U.S. Environmental Protection Agency.^{[14][15]}

The campaign destroyed 5 million acres (20,000 km²) of upland and mangrove forests and millions of acres of crops. Overall, more than 20% of South Vietnam's forests were sprayed at least once over a nine-year period.^{[9][53]}

In 1965, members of the U.S. Congress were told "crop destruction is understood to be the more important purpose ... but the emphasis is usually given to the jungle defoliation in public mention of the program."^[53] Soldiers were told they were destroying crops because they were going to be used to feed guerrillas. They later discovered nearly all of the food they had been destroying was not being produced for guerrillas; it was, in reality, only being grown to support the local civilian population. For example, in Quang Ngai province, 85% of the crop lands were scheduled to be destroyed in 1970 alone. This contributed to widespread famine, leaving hundreds of thousands of people malnourished or starving.^[54]

The U.S. military began targeting food crops in October 1962, primarily using Agent Blue; the American public was not made aware of the crop destruction programs until 1965 (and it was then believed that crop spraying had begun that spring). In 1965, 42 percent of all herbicide spraying was dedicated to food crops. The first official acknowledgement of the programs came from the State Department in March 1966.^{[9][48]}

Many experts at the time, including Arthur Galston, the biologist who developed and intensively studied 2,4,5-T and TCDD, opposed herbicidal warfare, due to concerns about the side effects to humans and the environment by indiscriminately spraying the chemical over a wide area. As early as 1966, resolutions were introduced to the United Nations charging that the U.S. was violating the 1925 Geneva Protocol, which regulated the use of chemical and biological weapons.^{[46][55]}



Map showing locations of U.S. army aerial herbicide spray missions in South Vietnam taking place from 1965 to 1971



Stacks of 55-gallon (200 L) drums containing Agent Orange



Defoliant spray run, part of Operation Ranch Hand, during the Vietnam War by UC-123B Provider aircraft.



U.S. Army armored personnel carrier (APC) spraying Agent Orange over Vietnamese rice fields during the Vietnam War



A UH-1D helicopter from the 336th Aviation Company sprays a defoliation agent over farmland in the Mekong Delta

Effects on the Vietnamese people

Health effects

The Vietnam Red Cross reported as many as 3 million Vietnamese people have been affected by Agent Orange, including at least 150,000 children born with birth defects.^[56] According to Vietnamese Ministry of Foreign Affairs, 4.8 million Vietnamese people were exposed to Agent Orange, resulting in 400,000 people being killed or maimed, and 500,000 children born with birth defects.^[1] Women had higher rates of miscarriage and stillbirths, as did livestock such as cattle, water buffalo, and pigs.^[57]

Children in the areas where Agent Orange was used have been affected and have multiple health problems, including cleft palate, mental disabilities, hernias, and extra fingers and toes.^[58] In the 1970s, high levels of dioxin were found in the breast milk of South Vietnamese women, and in the blood of U.S. soldiers who had served in Vietnam.^[59] The most affected zones are the mountainous area along Truong Son (Long Mountains) and the border between Vietnam and Cambodia. The affected residents are living in substandard conditions with many genetic diseases.^[60]

About 28 of the former US military bases in Vietnam where the herbicides were stored and loaded onto airplanes may still have high level of dioxins in the soil, posing a health threat to the surrounding communities. Extensive testing for dioxin contamination has been conducted at the former US airbases in Da Nang, Phu Cat and Bien Hoa. Some of the soil and sediment on the bases have extremely high levels of dioxin requiring remediation.



Major TỰ ĐỨC PHANG was exposed to dioxin-contaminated Agent Orange



Vietnamese babies, deformed and stillborn after prenatal dioxin exposure from Agent Orange

The Da Nang Airbase has dioxin contamination up to 350 times higher than international recommendations for action.^{[61][62]} The contaminated soil and sediment continue to affect the citizens of Vietnam, poisoning their food chain and causing illnesses, serious skin diseases and a variety of cancers in the lungs, larynx, and prostate.^[58]

Ecological effects

About 17.8% (3,100,000 ha) of the total forested area of Vietnam was sprayed during the war, which dramatically disrupted ecological equilibrium. Furthermore, the persistent nature of dioxins, erosion caused by loss of protective tree cover, and loss of seeding forest stock, meant reforestation was difficult or impossible in many areas.^[63] Many defoliated forest areas were quickly invaded by aggressive pioneer species, such as bamboo and cogon grass, which make it unlikely the forests will be able to regenerate. Animal species diversity was also significantly impacted: in one study, a Harvard biologist found 24 species of birds and 5 species of mammals in a sprayed forest, while in two adjacent sections of unsprayed forest there were 145 and 170 species of birds and 30 and 55 species of mammals.^[64]

Dioxins from Agent Orange have persisted in the Vietnamese environment since the war, settling in the soil and sediment and entering into food chain through the animals and fish that feed in the contaminated areas. Movement of dioxins through the food web has resulted in bioconcentration and biomagnification.^[65] The areas most heavily contaminated with dioxins are the sites of former U.S. air bases.^[66]

Sociopolitical effects

The RAND Corporation's *Memorandum 5446-ISA/ARPA* states: "the fact that the VC obtain most of their food from the neutral rural population dictates the destruction of civilian crops ... if they (the VC) are to be hampered by the crop destruction program, it will be necessary to destroy large portions of the rural economy – probably 50% or more".^[67]

Rural-to-urban migration rates dramatically increased in South Vietnam, as peasants escaped the war in the countryside by fleeing to the U.S.-dominated cities. The urban population in South Vietnam nearly tripled, growing from 2.8 million people in 1958 to 8 million by 1971. The rapid flow of people led to a fast-paced and uncontrolled urbanization; an estimated 1.5 million people were living in Saigon slums.^[10]

Effects on U.S. veterans

Some studies showed that veterans who served in the South during the war have increased rates of cancer, and nerve, digestive, skin and respiratory disorders. Veterans from the south had higher rates of throat cancer, acute/chronic leukemia, Hodgkin's lymphoma and non-Hodgkin's lymphoma, prostate cancer, lung cancer, colon cancer, soft tissue sarcoma and liver cancer. With the exception of liver cancer, these are the same conditions the US Veterans Administration has determined may be associated with exposure to Agent Orange/dioxin, and are on the list of conditions eligible for compensation and treatment.^[56]

Military personnel who loaded airplanes and helicopters used in Ranch Hand probably sustained some

of the heaviest exposures. Members of the Army Chemical Corps, who stored and mixed herbicides and defoliated the perimeters of military bases, and mechanics who worked on the helicopters and planes, are also thought to have had some of the heaviest exposures. However, this same group of individuals has not shown remarkably higher incidences of the associated diseases. Others with potentially heavy exposures included members of U.S. Army Special Forces units who defoliated remote campsites, and members of U.S. Navy river units who cleared base perimeters.^[68] Military members who served on Okinawa also claim to have been exposed to the chemical but there is no verifiable evidence to corroborate these claims.^[69]

While in Vietnam, the veterans were told not to worry, and were persuaded the chemical was harmless.^[70] After returning home, Vietnam veterans began to suspect their ill health or the instances of their wives having miscarriages or children born with birth defects might be related to Agent Orange and the other toxic herbicides to which they were exposed in Vietnam. Veterans began to file claims in 1977 to the Department of Veterans Affairs for disability payments for health care for conditions they believed were associated with exposure to Agent Orange, or more specifically, dioxin, but their claims were denied unless they could prove the condition began when they were in the service or within one year of their discharge.

By April 1993, the Department of Veterans Affairs had only compensated 486 victims, although it had received disability claims from 39,419 soldiers who had been exposed to Agent Orange while serving in Vietnam.^[71]

Legal and diplomatic proceedings

US veterans class action lawsuit against manufacturers

Since at least 1978, several lawsuits have been filed against the companies which produced Agent Orange, among them Dow Chemical, Monsanto, and Diamond Shamrock.

Hy Mayerson of The Mayerson Law Offices, P.C. was an early pioneer in Agent Orange litigation, working with environmental attorney Victor Yannacone in 1980 on the first class-action suits against wartime manufacturers of Agent Orange. In meeting Dr. Ronald A. Codario, one of the first civilian doctors to see afflicted patients, Mayerson, so impressed by the fact a physician would show so much interest in a Vietnam veteran, forwarded more than a thousand pages of information on Agent Orange and the effects of dioxin on animals and humans to Codario's office the day after he was first contacted by the doctor.^[72] The corporate defendants sought to escape culpability by blaming everything on the U.S. government.^[73]

The Mayerson law firm, with Sgt. Charles E. Hartz as their principal client, filed the first U.S. Agent Orange class-action lawsuit, in Pennsylvania in 1980, for the injuries soldiers in Vietnam suffered through exposure to toxic dioxins in the defoliant.^[74] Attorney Hy Mayerson co-wrote the brief that certified the Agent Orange Product Liability action as a class action, the largest ever filed as of its filing.^[75] Hartz's deposition was one of the first ever taken in America, and the first for an Agent Orange trial, for the purpose of preserving testimony at trial, as it was understood that Hartz would not live to see the trial because of a brain tumor that began to develop while he was a member of Tiger Force, Special Forces, and LRRPs in Vietnam.^{[76][77]} The firm also located and supplied critical research to the Veterans' lead expert, Dr. Ronald A. Codario, M.D., including about 100 articles from toxicology journals dating back more than a decade, as well as data about where herbicides had been sprayed,

what the effects of dioxin had been on animals and humans, and every accident in factories where herbicides were produced or dioxin was a contaminant of some chemical reaction.^[72]

The chemical companies involved denied that there was a link between Agent Orange and the veterans' medical problems. However, on May 7, 1984, seven chemical companies settled the class-action suit out of court just hours before jury selection was to begin. The companies agreed to pay \$180 million as compensation if the veterans dropped all claims against them. Slightly over 45% of the sum was ordered to be paid by Monsanto alone.^{[78][79]} Many veterans who were victims of Agent Orange exposure were outraged the case had been settled instead of going to court, and felt they had been betrayed by the lawyers. "Fairness Hearings" were held in five major American cities, where veterans and their families discussed their reactions to the settlement, and condemned the actions of the lawyers and courts, demanding the case be heard before a jury of their peers. Federal Judge Julius Weinstein refused the appeals, claiming the settlement was "fair and just". By 1989, the veterans' fears were confirmed when it was decided how the money from the settlement would be paid out. A totally disabled Vietnam veteran would receive a maximum of \$12,000 spread out over the course of 10 years. Furthermore, by accepting the settlement payments, disabled veterans would become ineligible for many state benefits that provided far more monetary support than the settlement, such as food stamps, public assistance, and government pensions. A widow of a Vietnam veteran who died of Agent Orange exposure would only receive \$3700.^[80]

In 2004, Monsanto spokesman Jill Montgomery said Monsanto should not be liable at all for injuries or deaths caused by Agent Orange, saying: "We are sympathetic with people who believe they have been injured and understand their concern to find the cause, but reliable scientific evidence indicates that Agent Orange is not the cause of serious long-term health effects."^[81]

New Jersey Agent Orange Commission

In 1980, New Jersey created the New Jersey Agent Orange Commission, the first state commission created to study its effects. The commission's research project in association with Rutgers University was called "The Pointman Project". It was disbanded by Governor Christine Todd Whitman in 1996.^[82]

During Pointman I, commission researchers devised ways to determine small dioxin levels in blood. Prior to this, such levels could only be found in the adipose (fat) tissue. The project studied dioxin (TCDD) levels in blood as well as in adipose tissue in a small group of Vietnam veterans who had been exposed to Agent Orange and compared them to those of a matched control group; the levels were found to be higher in the former group.^[83]

The second phase of the project continued to examine and compare dioxin levels in various groups of Vietnam veterans, including Army, Marines and brown water riverboat Navy personnel.

US Congress

In 1991, the US Congress enacted the Agent Orange Act, giving the Department of Veterans Affairs the authority to declare certain conditions 'presumptive' to exposure to Agent Orange/dioxin, making these veterans who served in Vietnam eligible to receive treatment and compensation for these conditions.^[84] The same law required the National Academy of Sciences to periodically review the science on dioxin and herbicides used in Vietnam to inform the Secretary of Veterans Affairs about the strength of the scientific evidence showing association between exposure to Agent Orange/dioxin and

certain conditions.^[85]

Through this process, the list of 'presumptive' conditions has grown since 1991, and currently the U.S. Department of Veterans Affairs has listed prostate cancer, respiratory cancers, multiple myeloma, type II diabetes, Hodgkin's disease, non-Hodgkin's lymphoma, soft tissue sarcoma, chloracne, porphyria cutanea tarda, peripheral neuropathy, chronic lymphocytic leukemia, and spina bifida in children of veterans exposed to Agent Orange as conditions associated with exposure to the herbicide. This list now includes B cell leukemias, such as hairy cell leukemia, Parkinson's disease and ischemic heart disease, these last three having been added on August 31, 2010. Several highly placed individuals in government are voicing concerns about whether some of the diseases on the list should, in fact, actually have been included.^[86]

U.S.–Vietnamese government negotiations

In 2002, Vietnam and the US held a joint conference on Human Health and Environmental Impacts of Agent Orange. Following the conference, the US National Institute of Environmental Health Sciences (NIEHS) began scientific exchanges between the US and Vietnam, and began discussions for a joint research project on the human health impacts of Agent Orange.^[87]

These negotiations broke down in 2005, when neither side could agree on the research protocol and the research project was cancelled. More progress has been made on the environmental front. In 2005, the first US-Vietnam workshop on remediation of dioxin was held.^[87]

Starting in 2005, the U.S. Environmental Protection Agency (EPA) began to work with the Vietnamese government to measure the level of dioxin at the Da Nang Airbase. Also in 2005, the Joint Advisory Committee on Agent Orange, made up of representatives of Vietnamese and US government agencies, was established. The committee has been meeting yearly to explore areas of scientific cooperation, technical assistance and environmental remediation of dioxin.^[88]

A breakthrough in the diplomatic stalemate on this issue occurred as a result of United States President George W. Bush's state visit to Vietnam in November 2006. In the joint statement, President Bush and President Triet agreed "further joint efforts to address the environmental contamination near former dioxin storage sites would make a valuable contribution to the continued development of their bilateral relationship."^[89]

In late May 2007, President Bush signed into law a supplemental spending bill for the war in Iraq and Afghanistan that included an earmark of \$3 million specifically for funding for programs for the remediation of dioxin 'hotspots' on former US military bases, and for public health programs for the surrounding communities;^[90] some authors consider this to be completely inadequate, pointing out that the U.S. airbase in Da Nang, alone, will cost \$14 million to clean up, and that three others are estimated to require \$60 million for cleanup.^[15] The appropriation was renewed in the fiscal year 2009 and again in FY 2010. An additional \$12 million was appropriated in the fiscal year 2010 in the Supplemental Appropriations Act and a total of \$18.5 million appropriated for fiscal year 2011.^[91]

Secretary of State Hillary Clinton stated during a visit to Hanoi in October 2010 that the US government would begin work on the clean-up of dioxin contamination at the Da Nang airbase.^[92]

In June 2011 a ceremony was held at Da Nang airport to mark the start of US-funded decontamination

of dioxin hotspots in Vietnam. \$32m has so far been allocated by the US congress to fund the program.^[93]

A \$43 million project began in the summer of 2012, as Vietnam and the U.S. forge closer ties to boost trade and counter China's rising influence in the disputed South China Sea.^[94]

Vietnamese victims class action lawsuit in U.S. courts

On January 31, 2004, a victim's rights group, the Vietnam Association for Victims of Agent Orange/dioxin (VAVA), filed a lawsuit in the United States District Court for the Eastern District of New York in Brooklyn, against several U.S. companies for liability in causing personal injury, by developing and producing the chemical. Dow Chemical and Monsanto were the two largest producers of Agent Orange for the U.S. military, and were named in the suit, along with the dozens of other companies (Diamond Shamrock, Uniroyal, Thompson Chemicals, Hercules, etc.). On March 10, 2005, Judge Jack B. Weinstein of the Eastern District – who had presided over the 1984 US veterans class-action lawsuit – dismissed the lawsuit, ruling there was no legal basis for the plaintiffs' claims. He concluded Agent Orange was not considered a poison under international law at the time of its use by the U.S.; the U.S. was not prohibited from using it as a herbicide; and the companies which produced the substance were not liable for the method of its use by the government. The U.S. government was not a party in the lawsuit, due to sovereign immunity, and the court ruled the chemical companies, as contractors of the US government, shared the same immunity. The case was appealed and heard by the Second Circuit Court of Appeals on June 18, 2007. The Court of Appeals upheld the dismissal of the case, stating the herbicides used during the war were not intended to be used to poison humans and therefore did not violate international law.^[95] The US Supreme Court declined to consider the case.

Three judges on the Second Circuit Court of Appeals in Manhattan heard the appeal on June 18, 2007. They upheld Weinstein's ruling to dismiss the case. They ruled that, though the herbicides contained a dioxin (a known poison), they were not intended to be used as a poison on humans. Therefore, they were not considered a chemical weapon and thus not a violation of international law. A further review of the case by the whole panel of judges of the Court of Appeals also confirmed this decision. The lawyers for the Vietnamese filed a petition to the US Supreme Court to hear the case. On March 2, 2009, the Supreme Court denied certiorari and refused to reconsider the ruling of the Court of Appeals.^[96]

In a November 2004 Zogby International poll of 987 people, 79% of respondents thought the US chemical companies which produced Agent Orange defoliant should compensate US soldiers who were affected by the toxic chemical used during the war in Vietnam. Also, 51% said they supported compensation for Vietnamese Agent Orange victims.^[97]

Help for those affected in Vietnam

To assist those who have been affected by Agent Orange/dioxin, the Vietnamese have established "peace villages", which each host between 50 and 100 victims, giving them medical and psychological help. As of 2006, there were 11 such villages, thus granting some social protection to fewer than a thousand victims. U.S. veterans of the war in Vietnam and individuals who are aware and sympathetic to the impacts of Agent Orange have supported these programs in Vietnam. An international group of veterans from the U.S. and its allies during the Vietnam War working with their former enemy — veterans from the Vietnam Veterans Association — established the Vietnam Friendship Village^[98]

outside of Hanoi.

The center provides medical care, rehabilitation and vocational training for children and veterans from Vietnam who have been affected by Agent Orange. In 1998, The Vietnam Red Cross established the Vietnam Agent Orange Victims Fund to provide direct assistance to families throughout Vietnam that have been affected. In 2003, the Vietnam Association of Victims of Agent Orange (VAVA) was formed. In addition to filing the lawsuit against the chemical companies, VAVA provides medical care, rehabilitation services and financial assistance to those injured by Agent Orange.^[99]

The Vietnamese government provides small monthly stipends to more than 200,000 Vietnamese believed affected by the herbicides; this totaled \$40.8 million in 2008 alone. The Vietnam Red Cross has raised more than \$22 million to assist the ill or disabled, and several U.S. foundations, United Nations agencies, European governments and nongovernmental organizations have given a total of about \$23 million for site cleanup, reforestation, health care and other services to those in need.^[100]

Vuong Mo of the Vietnam News Agency described one of centers:^[101]

"May is 13, but she knows nothing, is unable to talk fluently, nor walk with ease due to for her bandy legs. Her father is dead and she has four elder brothers, all mentally retarded ... The students are all disabled, retarded and of different ages. Teaching them is a hard job. They are of the 3rd grade but many of them find it hard to do the reading. Only a few of them can. Their pronunciation is distorted due to their twisted lips and their memory is quite short. They easily forget what they've learned ... In the Village, it is quite hard to tell the kids' exact ages. Some in their twenties have a physical statures as small as the 7- or 8-years-old. They find it difficult to feed themselves, much less have mental ability or physical capacity for work. No one can hold back the tears when seeing the heads turning round unconsciously, the bandy arms managing to push the spoon of food into the mouths with awful difficulty ... Yet they still keep smiling, singing in their great innocence, at the presence of some visitors, craving for something beautiful."

On June 16, 2010, members of the U.S.-Vietnam Dialogue Group on Agent Orange/Dioxin unveiled a comprehensive 10-year Declaration and Plan of Action to address the toxic legacy of Agent Orange and other herbicides in Vietnam. The Plan of Action was released as an Aspen Institute publication and calls upon the U.S. and Vietnamese governments to join with other governments, foundations, businesses, and nonprofits in a partnership to clean up dioxin "hot spots" in Vietnam and to expand humanitarian services for people with disabilities there.^{[102][103][104]} On September 16, 2010, Senator Patrick Leahy (D-VT) acknowledged the work of the Dialogue Group by releasing a statement on the floor of the United States Senate. The statement urges the U.S. government to take the Plan of Action's recommendations into account in developing a multi-year plan of activities to address the Agent Orange/dioxin legacy.^[105]

Use outside Vietnam

While 'Agent Orange' was only used between 1965 and 1970, 2,4-D, 2,4,5-T and other herbicides were used by the US military from the late 1940s through the 1970s. There is, however, no scientific evidence that these herbicides contained the same levels of dioxin as those used in Vietnam.^{[106][107]}

Australia

Queensland

In 2008, Australian researcher Jean Williams claimed that cancer rates in the town of Innisfail, Queensland were 10 times higher than the state average due to secret testing of Agent Orange by the Australian military scientists during the Vietnam War. Williams, who had won the Order of Australia medal for her research on the effects of chemicals on U.S. war veterans, based her allegations on Australian government reports found in the Australian War Memorial's archives. A former soldier, Ted Bosworth, backed up the claims, saying that he had been involved in the secret testing. Neither Williams or Bosworth have produced verifiable evidence to support their claims. The Queensland health department determined that cancer rates in Innisfail were no higher than those in other parts of the state.^[108]

Brazil

The Brazilian government used herbicides to defoliate a large section of the Amazon rainforest so that Alcoa could build the Tucuruí dam to power mining operations. Large areas of rainforest were destroyed, along with the homes and livelihoods of thousands of rural peasants and indigenous tribes.^[109]

Canada

New Brunswick

The U.S. military, with the permission of the Canadian government,^[110] tested herbicides, including Agent Orange, in the forests near the Canadian Forces Base Gagetown in New Brunswick in 1966 and 1967. On September 12, 2007, Greg Thompson, Minister of Veterans Affairs, announced that the government of Canada was offering a one-time ex gratia payment of \$20,000 as the compensation package for Agent Orange exposure at CFB Gagetown.^[111]

On July 12, 2005, Merchant Law Group LLP on behalf of over 1,100 Canadian veterans and civilians who were living in and around the CFB Gagetown filed a lawsuit to pursue class action litigation concerning Agent Orange and Agent Purple with the Federal Court of Canada.^[112]

On August 4, 2009, the case was rejected by the court due to lack of evidence. The ruling was appealed.^{[113][114]}

In 2007 the Canadian government announced that a research and fact-finding program initiated in 2005 had found the base was safe.^{[citation needed][115]}

Ontario

On February 17, 2011, the Toronto Star revealed that the same chemicals used to strip the jungles of Vietnam were also employed to clear extensive plots of Crown land in Northern Ontario.^[116] The same day, in response to the Toronto Star article, the Ontario provincial government launched a probe into the use of Agent Orange.^[117]

On February 18, 2011, Ontario's Ministry of Natural Resources widened the probe of Agent Orange spraying to include all areas of the province where government managed forests on Crown land.^[118]

The Toronto Star reported that, "records from the 1950s, 1960s and 1970s show forestry workers, often students and junior rangers, spent weeks at a time as human markers holding red, helium-filled balloons on fishing lines while low-flying planes sprayed toxic herbicides including an infamous chemical mixture known as Agent Orange on the brush and the boys below."^[116]

British Columbia

Records show tens of thousands of gallons of the toxic mixture were applied to clear brush near highways and along power lines in the late 1960s and early 1970s – and in some cases the substance was sprayed next to homes. In B.C., the mix of 2-4-D and 2-4-5-T was called "Type B Weed and Brush Killer" in government invoices. Sometimes, the engineers ordered 2-4-5-T by itself, and dubbed it "Type C Weed and Brush Killer."

In total, about 26,000 gallons of Type B Weed and Brush Killer were ordered between 1965 and 1972. About 10,000 gallons of Type C Weed and Brush Killer were ordered in the same time period. The barrels were shipped to all four of the regions of B.C. as designated by the Ministry of Highways: Kamloops, Nelson, Prince George and Vancouver.

In 1976, documents from BC Hydro show 2-4-5-T and 2-4-D was sprayed along Hydro lines Vernon-Monashee and Nicola-Brenda circuits. The documents also say "brushkiller" was sprayed in Pemberton and Daisy Lake.^[119]

Korea

Agent Orange was used in Korea in the late 1960s.^[120] Republic of Korea troops were the only personnel involved in the spraying, which occurred along the Korean Demilitarized Zone (DMZ). "Citing declassified U.S. Department of Defense documents, Korean officials fear thousands of its soldiers may have come into contact with the herbicide in the late 1960s and early 1970s. According to one top government official, as many as '30,000 Korean veterans are suffering from illness related to their exposure'. The exact number of GIs who may have been exposed is unknown. But C. David Benbow, a North Carolina attorney who served as a sergeant with Co. C, 3rd Battalion, 23rd Infantry Regiment, 2nd Infantry Division, along the DMZ in 1968–69, estimates as many as '4,000 soldiers at any given time' could have been affected."^[121]

In 1999, about 20,000 South Koreans filed two separated lawsuits against U.S. companies, seeking more than \$5 billion in damages. After losing a decision in 2002, they filed an appeal.^[citation needed]

In January 2006, the South Korean Appeals Court ordered Dow Chemical and Monsanto to pay \$62 million in compensation to about 6,800 people. The ruling acknowledged that "the defendants failed to ensure safety as the defoliants manufactured by the defendants had higher levels of dioxins than standard", and, quoting the U.S. National Academy of Science report, declared that there was a "causal relationship" between Agent Orange and 11 diseases, including cancers of the lung, larynx and prostate. The judges failed to acknowledge "the relationship between the chemical and peripheral neuropathy, the disease most widespread among Agent Orange victims" according to the *Mercury News*.^[citation needed]

The United States local press KPHO-TV in Phoenix, Arizona alleged that the United States Army had buried Agent Orange in Camp Carroll, the U.S. Army base located in Gyeongsangbuk-do, Korea.^[122] It is based on the claim of three U.S. Army veterans. They claimed approximately 250 drums of Agent

Orange were buried at Camp Carroll in 1978. The South Korean Ministry of Environment announced that they will request cooperative investigation at Camp Carroll officially.^[123] The USFK issued a statement that confirmed that barrels were buried there, but all (plus an additional 60 tons of soil) were removed in 1996.^[124]

Currently, veterans who provide evidence meeting VA requirements for service in Vietnam, and who can medically establish that anytime after this 'presumptive exposure' they developed any medical problems on the list of presumptive diseases, may receive compensation from the VA. Certain veterans who served in Korea and are able to prove they were assigned to certain specified around the DMZ during a specific time frame are afforded similar presumption.^[125] The differences in requirements between Vietnam and Korea service stem from the fact that congress has not made any laws to provide for the same sweeping presumption of exposure similar to the Agent Orange Act of 1991 for Korean veterans.^[citation needed]

New Zealand

The use of Agent Orange has been controversial in New Zealand, because of the exposure of New Zealand troops in Vietnam and because of the production of Agent Orange for Vietnam and other users at an Ivon Watkins-Dow chemical plant in Paritutu, New Plymouth. There have been continuing claims, as yet unproven, that the suburb of Paritutu has also been polluted; see New Zealand in the Vietnam War.^[126] There are cases of New Zealand soldiers developing cancers such as bone cancer but none have been scientifically connected to exposure to herbicides.

Philippines

Herbicide persistence studies of Agents Orange and White were conducted in the Philippines.^[127] The Philippine herbicide test program was conducted in cooperation with the University of the Philippines, College of Forestry and was described in a 1969 issue of The Philippine Collegian.

Johnston Atoll

The Air Force operation to remove Herbicide Orange from Vietnam in 1972 was named Operation Pacer IVY while the operation to destroy the Agent Orange stored at Johnston Atoll in 1977 was named Operation Pacer HO. Operation Pacer IVY (InVentoryY) collected Agent Orange in South Vietnam and removed it in 1972 aboard the ship MV *Transpacific* for storage on Johnston Atoll.^[128] The Environmental Protection Agency (EPA) reports that 1,800,000 gallons of Herbicide Orange was stored at Johnson Island in the Pacific and 480,000 gallons at Gulfport Mississippi.^[129]

Research and studies were initiated to find a safe method to destroy the materials and it was discovered they could be incinerated safely under special conditions of temperature and dwell time.^[129] However, these herbicides were expensive and the Air Force wanted to resell its surplus instead of dumping it at sea.^[130] Among many methods tested, a possibility of salvaging the herbicides by reprocessing and filtering out the 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) contaminant with carbonized (charcoaled) coconut fibers. This



Leaking Agent Orange Barrels at Johnston Atoll circa 1973

concept was then tested in 1976 and a pilot plant constructed at Gulfport, Mississippi.^[129]

From July to September 1977 during Operation Pacer HO (Herbicide Orange), the entire stock of Herbicide Orange from both storage sites at Gulfport, Mississippi and Johnston Atoll was subsequently incinerated in four separate burns in the vicinity of Johnson Island aboard the Dutch-owned waste incineration ship MT *Vulcanus*.^[130]

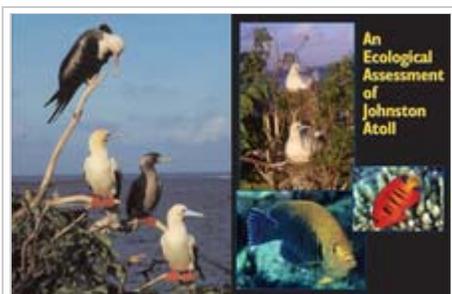


Rusting Agent Orange Barrels at Johnston Atoll, circa 1976

As of 2004, some records of the storage and disposition of Agent Orange at Johnston Atoll have been associated with the historical records of Operation Red Hat.^[131]

Allegations of usage and storage in Okinawa

There have been repeated reports in the Japanese press about use and/or storage of Agent Orange in Okinawa, based on statements by former US service members that had been stationed on the island, photographs, records, and unearthed storage barrels. The US Department of Defense (DoD) has denied these allegations, most recently in a January 2013 report that was released in April 2013.^{[132][133]}

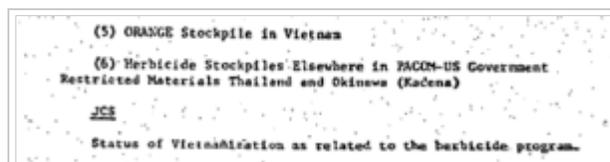


A scientific study of the effects military contamination at Johnston Atoll included a statement about Agent Orange storage in Okinawa.^[134]

In particular, the 2013 report refuted articles written by journalist Jon Mitchell as well as a statement from "An Ecological Assessment of Johnston Atoll" a 2003 publication produced by the United States Army Chemical Materials Agency that states, "in 1972, the US Air Force also brought about 25,000 55-gallon (208L) drums of the chemical, Herbicide Orange (HO) to Johnston Island that originated from Vietnam and was stored on Okinawa."^[134] The 2013 report stated: "The authors of the [2003] report were not DoD employees, nor were they likely familiar with the issues surrounding Herbicide Orange or its actual history of transport to the Island." and detailed the transport phases and routes of Agent Orange from Vietnam to Johnston Atoll, none of which included Okinawa.^[133]

Further official confirmation of

restricted (Dioxin containing) herbicide storage on Okinawa appeared in a 1971 Fort Detrick report titled "Historical, Logistical, Political and Technical Aspects of the Herbicide/Defoliant Program", which mentioned that the environmental statement should consider "Herbicide stockpiles elsewhere in PACOM(Pacific Command) U.S. Government restricted materials Thailand and Okinawa (Kadena AFB)."^[135] The 2013 DoD report says that the environmental statement urged by the 1971 report was published in 1974 as "The Department of Air Force Final Environmental Statement", and that the latter did not find Agent Orange was held in either Thailand or Okinawa.^{[132][133]}



Excerpt of U.S. Army 1971 Fort Detrick report describes Tactical Herbicide stockpiles of US Government restricted materials on Okinawa at Kadena AFB, in Thailand, and Vietnam.^{[135][136]}

In July 2013, 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and 2,4,5-T from U.S. herbicides was detected in buried barrels labelled DOW Chemical that were unearthed the previous month under an Okinawan soccer field on land that was formerly part of Kadena Air Force Base and was returned to civilian control

in 1987.^[137]

Thailand

Agent Orange was tested by the United States in Thailand during the war in Southeast Asia. Buried drums were uncovered and confirmed to be Agent Orange in 1999.^[138] Workers who uncovered the drums fell ill while upgrading the airport near Hua Hin, 100 km south of Bangkok.^[139]

Vietnam-era Veterans whose service involved duty on or near the perimeters of military bases in Thailand anytime between February 28, 1961 and May 7, 1975 may have been exposed to herbicides and may qualify for VA benefits. A claim for direct exposure is possible if the individual can verify that they worked or lived in close proximity to the affected areas of the bases in Thailand.

Report on defense tactics in Thailand A recently declassified Department of Defense (DoD) Report written in 1973, "*Project CHECO Southeast Asia Report: Base Defense in Thailand 1968–1972*," (<http://www.afhra.af.mil/shared/media/document/AFD-080819-065.pdf>) (8.3 MB, PDF) contains evidence that there was a significant use of herbicides on the fenced-in perimeters of military bases in Thailand to remove foliage that provided cover for enemy forces.

In 2013 VA determined that herbicides used on the Thailand base perimeters may have been tactical and procured from Vietnam, or a strong, commercial type resembling tactical herbicides.^[140]

United States

The University of Hawaii has acknowledged extensive testing of Agent Orange on behalf of the United States Department of Defense in Hawaii along with mixtures of Agent Orange on Kaua'i Island in 1967-68 and on Hawaii Island in 1966; testing and storage in other U.S. locations has been documented by the United States Department of Veterans Affairs.^{[141][142]}

In 1971, the C-123 aircraft used for spraying Agent Orange were returned to the United States and assigned various East Coast USAF Reserve squadrons, and then employed in traditional airlift missions between 1972 and 1982. In 1994, testing by the Air Force identified some former spray aircraft as "heavily contaminated" with dioxin residue. Inquiries by aircrew veterans in 2011 brought a decision by the US Department of Veterans Affairs opining that not enough dioxin residue remained to injure these post-Vietnam War veterans. On 26 January 2012, the US Center For Disease Control's Agency for Toxic Substances and Disease Registry challenged this with their finding that former spray aircraft were indeed contaminated and the aircrews exposed to harmful levels of dioxin.

In 1978, the U.S. Environmental Protection Agency suspended spraying of Agent Orange in National Forests, due to a threefold increase in miscarriages in women living near forests that had been sprayed.^{[143][144]}

On December 23, 1982, the EPA announced it had identified dangerous levels of dioxin in the soil of Times Beach, Missouri. Panic spread through the town, with many illnesses, miscarriages and animal deaths attributed to the dioxin. By 1985, the town was evacuated except for one elderly couple who refused to leave, and the site was quarantined. Residents were shunned in their new communities by people who feared the effects of exposure to dioxin were contagious.^[145]

A December 2006 Department of Defense report listed Agent Orange testing, storage, and disposal

sites at 32 locations throughout the United States, as well as in Canada, Thailand, Puerto Rico, Korea, and in the Pacific Ocean.^[146] The Veteran Administration has also acknowledged that Agent Orange was used domestically by U.S. forces in test sites throughout the US. Eglin Air Force Base in Florida was one of the primary testing sites throughout the 1960s.^[147]

See also

- Environmental impact of war
- Scorched earth
- Teratology
- U.S.-Vietnam Dialogue Group on Agent Orange/Dioxin
- Vietnam Syndrome

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- "HADES" (<http://bellanova.it/MKP/AgenteNaranja.html>) Dir. Caroline Delerue, Screenplay Mauro Bellanova 2011

External links

- Agent Orange Association of Vietnam (<http://vava.org.vn/>)
- Donate to Agent Orange Association of Vietnam Link (<http://vava.org.vn/modules.php?name=News&op=viewst&sid=1>)
- Vietnamese Victims of Agent Orange web site (<http://www.agentorange.org.au/>)
- U.S. Environmental Protection Agency – Dioxin Web site (<http://www.epa.gov/dioxin>)
- "Agent Orange/Dioxin Lawsuit" (<http://vietnam.vnnet.vn/vnp/en-us/15/222/default.aspx>) in "Vietnam Pictorial", *Vietnam News Agency*
- Agent Orange (<http://www.publichealth.va.gov/exposures/agentorange/>) *Office of Public Health and Environmental Hazards*, U.S. Department of Veteran Affairs
- Poisoned Lives (<http://www.getipm.com/articles/poisonedlives.html>)
- The Aspen Institute Advocacy and Exchange Program on Agent Orange/Dioxin (<http://www.aspeninstitute.org/policy-work/agent-orange/us-vietnam-dialogue-group-agent-orange/dioxin>)
- Make Agent Orange History (<http://makeagentorangehistory.org/>)
- Agent Orange Record (<http://www.agentorangerecord.com/>)
- Blue Water Navy Association - Advocacy Group and extensive AO Documentation Library (<http://www.bluewaternavy.org/>)

Media

- The short film *Agent Orange Study (June 26, 1990)* (<http://www.archive.org/details/org.c-span.13572-1>) is available for free download at the Internet Archive [*more*]
- The short film *Agent Orange Studies (July 11, 1989)* (<http://www.archive.org/details/org.c-span.8342-1>) is available for free download at the Internet Archive [*more*]

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