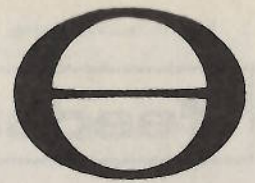


# environmental action

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**Herbicide misuse:  
gambling with the future?**

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**Editor's note:** On June 24, the Environmental Protection Agency (EPA) cancelled plans to ban most uses of the herbicide 2,4,5-T, which has been linked to birth defects in laboratory animals. Announcing that "adequate data does not yet exist to assess the potential hazards," the EPA abandoned its three-year effort to prohibit the use of the chemical on food crops, rangeland, and railroad, highway or utility rights of way.

The controversy over 2,4,5-T use began in the 1960s during the Vietnam War. Along with another herbicide, 2,4,5-T was used by the Pentagon in Agent Orange, the most widely used general defoliant in the war. In 1969 a previously unreleased government study, showing that the herbicide caused a high rate of birth defects in laboratory mice was leaked to Ralph Nader researchers and the press. Commissioned in 1964 by the National Cancer Institute, the so-called Bionetics study (prepared by the private Bionetics Laboratory in Bethesda, Maryland) had preliminary results as early as 1966. But only after the leaks in 1969 did the government acknowledge the existence of the study.

**I**n October of 1969 President Nixon's Science Advisor, Dr. Lee Dubridge announced the findings and declared a ban on the use of 2,4,5-T on all food crops and in populated areas. However, it made very little difference what Dubridge banned since the Agriculture Department (USDA) and the Pentagon ignored his edict with Presidential acquiescence.

Three months later, after more embarrassing studies were released, the USDA finally announced an official ban of 2,4,5-T for home use, around bodies of water, and on all food crops, rangeland and rights-of-way. Dow Chemical, the major 2,4,5-T producer, did not dispute the prohibition on home and water use, but did exercise its right under existing regulations to appeal the cancellation on the other three uses. In the meantime, Dow was free to continue selling the herbicide for the contested uses.

Later in 1970 the 2,4,5-T case was turned over to the newly formed Environmental Protection Agency, which delayed the issue by appointing an advisory panel to review the evidence on 2,4,5-T and make a recommendation. When the panel gave its report in May of 1971, recommending that the ban be lifted, many environmentalists and scientists were outraged. Finally, in August, then-EPA administrator William Ruckelshaus took the virtually unprecedented step of overruling his advisory committee. He let the contested cancellations stand and ordered public hearings.

Dow Chemical promptly filed a lawsuit against the EPA, claiming Ruckelshaus had arbitrarily rejected the advisory committee's report. Other delays followed, including the EPA's inability to assemble conclusive proof of the dangers of 2,4,5-T. By the time the agency's Deputy Administrator John Quarles announced the decision last month to drop the cancellation and hearings, over four years had passed since the first 2,4,5-T ban was ordered. Quarles said the failure of the agency to achieve a methodology "breakthrough" in its 2,4,5-T research meant that hearings "would not be productive." The deputy administrator said the agency would continue "intensive efforts to develop the information required to resolve the questions" of 2,4,5-T use. Spokespersons for EPA said proceedings would be resumed if the research proved 2,4,5-T is harmful, but the minimum time necessary to complete the studies is two to three years. ■



By Lucile Adamson

pay later?

**T**wo types of evidence are accumulating on the hazards to humans of 2,4,5-T. A great deal of circumstantial or anecdotal evidence — accounts of isolated illness or disease — has surfaced but has not been taken very seriously by government regulatory agencies or by the herbicide manufacturers. When a neighbor of a sprayed field complains of symptoms such as dizziness, skin rash, nausea and emotional instability, the complaint is typically dismissed as being paranoia on the part of the complainer, mere coincidence of the spraying with the onset of the symptoms, the result of some other environmental agent, or at worst, due to a "bad batch" or "misuse" of herbicide.

Controlled studies using experimental animals to assess the toxicity of 2,4,5-T are given more credence. However, effects easily overlooked or not observable in animals (such as anxiety or headache) will be missed in the experiments. Furthermore, because these experiments usually use animals and relatively high concentrations of pesticides, positive results can be explained away on the basis that they were caused by higher dosages than would be encountered under actual conditions of use and that the results with animals are not directly applicable to humans anyway. Therefore, the neighbors of treated land who object to being exposed to 2,4,5-T are trapped in a sort of regulatory catch-22: any effects they may experience and believe to be caused by use of 2,4,5-T are dismissed because they were not observed and duplicated under experimental conditions, while experimental results are dismissed as not relevant because they do not correspond to conditions or symptoms seen in actual use.

**T**he most carefully assembled and scientifically evaluated anecdotal evidence against 2,4,5-T was derived from its use in Vietnam. Following persistent rumors and reports of human injury from the massive spraying program in Vietnam and after several attempted surveys by individuals or organizations to evaluate these reported effects, the National Academy of Sciences (NAS) conducted a study with the cooperation of the Department of Defense. A specially appointed international committee visited South Vietnam, examined medical records, toured treated areas where possible and attempted to make a complete assessment of the effects of the spraying program.

The committee received frequent reports of teratogenesis (congenital malformations), stillbirths and illness and death among children, which were attributed to the spraying. However, because of deficiencies in the health records kept in wartime Vietnam, the remoteness from medical facilities of much of the sprayed area and the inability of the committee to visit the Montagnard areas where deaths and deformities in children reportedly occurred most frequently, the committee was unable to reach a definitive conclusion as to whether the defoliation program did indeed cause increased malformations and infant mortality. The report, released in May 1974, states:

/ The data in the available Tu Du Annual Reports [Tu Du

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Lucile Adamson, a biochemist, is a staff scientist for the Environmental Defense Fund in Washington.

is a hospital in Saigon] do not show a consistent relationship between amounts of herbicide sprayed and the rates of malformations, but they are not sufficient for firm conclusions . . . It must be pointed out, however, that the circumstances were such that an appreciable increase in the malformation rate in the offspring of sprayed individuals could have remained undetected by our investigation.

According to Dr. Matthew Meselson of Harvard University, who has studied the evidence available from Vietnam, the data gathered by the committee were about as positive as they could have been under the circumstances. Among the congenital malformations most frequently attributed to 2,4,5-T were cleft lip, cleft palate and neural tube malformations including spina bifida.

Spina bifida is a severe congenital malformation, often causing death, in which a part of the protective bony spinal column does not close. Because of the relative infrequency of spina bifida, a very large number of births from uniformly exposed mothers would need to be monitored before the statistical significance of any increase could be demonstrated. Therefore, it was not possible to determine whether the increased spina bifida noted in Vietnam was due to 2,4,5-T or to mere coincidence.

"Coincidence" was presumably the official explanation given to a couple living on an island in British Columbia.

The wife gave birth to a child with spina bifida after the source of their water supply was sprayed in the first trimester of her pregnancy. It could indeed have been a coincidence. But in New Zealand a woman who lived on a farm in a neighborhood where 2,4,5-T was sprayed during the first trimester of her pregnancy gave birth to a child with spina bifida. Another coincidence? Then what of her neighbor who also gave birth to a child with the disease within one month of the first woman. Coincidence compounded? At what point does the coincidence "explanation" become a delusion or an excuse to retain the agronomic and economic advantages of 2,4,5-T?

**I**n spite of these multiple coincidences, it is still questionable whether 2,4,5-T usage does cause teratogenesis and stillbirths in humans. However, there is little doubt that 2,4,5-T causes less severe effects. The NAS Vietnam study states:

The reports of serious deleterious consequences . . . are internally consistent . . . Reports of human illness following spraying are so striking it is difficult to dismiss them as simply the effects of propaganda, high normal death rates, or faulty understanding of cause and effect.

Symptoms reported with great consistency include abdominal pains, diarrhea, skin rashes, coughs lasting for weeks,

**L**ast summer Derek Owen and a group of his neighbors in Hopkinton, New Hampshire, stood at the edge of his farm with a loaded rifle on two consecutive mornings. Until being calmly dispersed by the local police, Owen's desperate and deadly serious action — "I wouldn't have shot them, but I'd've shot their equipment, that's for sure" — prevented contractors for New England Power from spraying a mixture of Weed-one 2,4,5-T and Amdon 102 herbicides along the power line right-of-way on his property.

Since the line was built through Owen's property in 1929, New England Power has maintained the cleared strip by cutting trees and brush that endangered the power lines. But, for the last three years, herbicides have been used for clearing this right-of-way and now for hundreds of feet almost all plants except grasses are killed — whether or not they endanger the power line.

**H**erbicide clearing of rights-of-way is relatively new in New England. So far, the most serious effects most people notice is that one of the best places to pick wild berries no longer exists. But there are much more serious

potential dangers. While environmentalists and chemical companies debate the possible teratogenicity of this family of herbicides, a number of incidents have gone uninvestigated.

In 1969 a pine forest in Alvsbyn, Sweden, was sprayed with a mixture of 2,4-D and 2,4,5-T to clear undergrowth. Some weeks later a Lapp family's large reindeer herd was driven through the area. Over 150 deer disappeared, about 100 died and about 40 females aborted their young in the following two months. In 1964, in New Zealand, 10 cows out of 160 in a paddock accidentally sprayed with 2,4,5-T gave birth to deformed calves. In January 1970, 502 sheep suddenly died in Utah a short time after a mixture of 2,4-D and 2,4,5-T was accidentally aeri ally sprayed over their alfalfa pasture.

In the summer of 1971, the Bureau of Reclamation authorized the spraying

of Silvex on national lands along the Rio Grande River in New Mexico. The purpose was to kill salt cedar trees which, according to the Bureau, "need too much water." Equipped with spray tankers and a helicopter, an army of private contractors bravely waged war with the thirsty trees. The result was dead trees and near financial ruin for Lewis Trotter, a San Acacia, New Mexico, cattleman. Trotter's range was private land and no permission to spray had been sought or obtained. But, with no warning whatsoever, Trotter watched the helicopter spray Silvex directly over his cattle.

Immediately after the spraying, the herd waded into the river in an apparent

Elliott Kofod, a native of Lebanon County, Pa., is now traveling across the country collecting information about herbicide use.

## Too many questions left unanswered

By Elliot Kofod



Photo courtesy USDA

dizziness, nausea, fever, and general sickness. These same symptoms were reported from many different locations.

They have also been reported frequently by people in the U.S. In case after case, unfortunate neighbors of routine spray operations reported that they and their domestic animals were injured by 2,4,5-T. Some of the effects suffered in one such case are indicated in the table on page 13. Many similar complaints were mailed to government agencies, forest service officials, highway departments and other users of 2,4,5-T. During the years when the official attitude was that 2,4,5-T was unquestionably safe, these complaints were simply ignored. In recent years, however, since the discovery of the "TCDD problem," it has become apparent that the complaints had been justified.

Workers engaged in manufacturing 2,4,5-T have contracted a severe disease known as chloracne, which is believed to be caused by a contaminant of the herbicide called TCDD (2,3,7,8-tetrachloro-dibenzo-p-dioxin). Although it is usually referred to as a skin disease, it is not merely a severe rash. The other symptoms, including psychological and emotional disturbances, may be even more distressing to the victim than the rash. The close correspondence between chloracne symptoms and the complaints of people in the vicinity of 2,4,5-T spraying operations suggests that at least some of the adverse effects of 2,4,5-T usage in the field are due to TCDD.

Most of these symptoms are so common and nonspecific that they invite dismissal or a diagnosis of hypochondria.

effort to avoid the range. An increased saliva flow and general weakness were immediately apparent. The cattle began to show marked weight losses. Some of the herd were stricken with partial paralysis of the hindquarters. Three months after the incident, a steer that was off the sprayed pasture and fed unsprayed grain and hay for a week before slaughtering showed traces of Silvex in muscle and organ tissue. On October 1, the USDA Deputy Director of Meat Inspection from Dallas ordered that the cattle could be slaughtered only if they had been off the sprayed range for at least two weeks. Four months after the spraying, 20 of his 200 cattle had died, several had mercifully been shot and Lewis Trotter was selling contaminated meat for fertilizer.

**T**he state of Pennsylvania leads most of the country in herbicide use, and for more than a decade Paul Sanger of Fredricksburg has been studying their effects and trying to stop the spraying. A former Chairman of the Board of the Lebanon County Commissioners, 62-year-old Sanger is the owner-operator of a 500-acre dairy, grain and vegetable operation and has farmed in the area for over 30 years.

He has seen frequent incidents of still-born, miscarried and deformed livestock occur near a spraying site. Until 10 years ago, Sanger had a sale every two or three years to sell his excess cattle. Now, in his words, "If they spray highways, power lines or railroads around your herd, the cattle die off faster than you can raise them."

Sanger claims that milk production is also affected by herbicide spraying. He says that after extensive spraying nearby, a cow will not return to full milk production until it calves. "The sad part of it is that only about five percent will ever breed again if herbicides are regularly sprayed within a few miles of the herd," he says.

**S**anger's correlation of decreases in dairy productivity with herbicide spraying should not be difficult to substantiate. He first noticed it while driving his son's milk pick-up route for a week. On the first day he saw a road crew spraying Route 22, a highway within two miles of most of the dairies where he picked up milk. During that week he picked up 19,680 pounds less than the average weekly pickup. After that, whenever milk production was down at certain farms, Sanger would

climb into his pickup and drive to the farms involved. Without exception, according to Sanger, spraying of 2,4-D or 2,4,5-T in the vicinity of a dairy farm caused a large drop in milk production.

Every time a tanker picks up milk, the farmer gets a receipt noting the pounds of milk received. With such detailed records available, a comprehensive study correlating milk production and herbicide spraying should not be difficult — but no one is doing it.

The most important allegation Sanger makes from his experiences is that gases from 2,4-D and 2,4,5-T are generated from sprayed surfaces under certain climatic conditions for as long as two years after a spraying. According to his theory, plants and animals need not come in direct contact with the spray itself in order to be harmed. Herbicide gases move through the air and are breathed by plants and animals. Sanger believes that, unlike pesticides which must generally be eaten, herbicides do their dirty work through respiration processes.

**D**riving around Lebanon County with Sanger as a guide, one can see effects of herbicides which are perhaps less serious than birth defects, but

However, when the same "nonspecific" symptoms are reported independently and spontaneously after wartime use in Vietnam, and after civilian use of 2,4,5-T in various locations in the U.S., and when it is noted that these same symptoms are characteristic of chloracne, it becomes apparent that the effects are almost certainly real and are not due to coincidence or to hypochondria.

**C**ommercial use of 2,4,5-T in the U.S. began in 1949 after development of the herbicide during World War II. Its use increased rapidly and by 1960 three percent of the U.S. land area had been treated with 2,4,5-T. Yet, the President's Science Advisory Committee reached this conclusion about the herbicide in 1971:

Relatively little toxicological information has been available on 2,4,5-T. Most of the experiments prior to the National Cancer Institute screening study were of acute single-dose or short-term toxicity. The longest period of observation was 90 days . . . Relatively little is known about the mechanisms of toxicity of 2,4,5-T or of its metabolism in men and animals.

Not until the disclosure of scientific studies in 1969 — after 20 years of animal and human exposures to this agent — was it revealed that commercial preparations of 2,4,5-T were teratogenic and fetocidal (causing death of fe-

tuses) in animals. It was then concluded that these effects were due to the contamination of TCDD which has been described as "perhaps the most potent small-molecule toxin known."

Numerous experiments to measure the short and long term effects of 2,4,5-T and TCDD were belatedly undertaken and most are not yet complete. One of the crucial questions is whether TCDD can accumulate in the environment or in the food chain. TCDD is much more stable in the environment than is 2,4,5-T and was shown to be present in Vietnamese fish and shellfish. Preliminary studies also show the chemical's presence in U.S. fish and shellfish.

Research now completed shows that TCDD doses to pregnant mice of three micrograms per kilogram of weight per day for 10 days caused cleft palates in three to 22 percent of the offspring, depending on the strain of mouse used. For comparison, the lowest effective teratogenic dose for thalidomide in mice is 10,000 times higher. Humans are approximately 60 times as susceptible as mice to thalidomide. It is unknown whether humans are also more sensitive to TCDD.

Pure 2,4,5-T is relatively non-toxic in the direct sense, but there are indications that it is teratogenic. Experiments with purified 2,4,5-T have resulted in more teratogenesis than could be accounted for by the minute amount of TCDD still present in the 2,4,5-T. Occupational exposures to

which, through competent study, would be much more difficult for the chemical industry to disprove. The problem involves the "selectivity" of so-called weed killers. Often trees over a mile away from a sprayed highway go through a complete defoliation cycle. Less than a week after a spraying, the leaves facing the highway turn brown, followed in the weeks to come by a near-total leaf kill and drop. During the summer a sprayed highway can be recognized by dead brown stalks around the guardrails and along with shoulders. Even trees set back from the highway are often damaged. Locust, elm, maple, mimosa, chinaberry, cherry and apple trees appear to be a few of the most vulnerable.

Relevant to this is a letter Dow Chemical sent in 1970 to a person complaining of damage to specific trees from herbicide drift. E.R. Laning of Dow's Midland, Michigan, Agricultural Department wrote, "Trees such as mimosa, chinaberry, locust, persimmon and silver maple would suffer some temporary defoliation and growth inhibition following drift of 2,4-D and 2,4,5-T to the extent of three to four exposures over a period of five to six years. This temporary defoliation and growth inhibi-

tion would occur following each exposure." Laning doesn't mention that the sprays can drift many miles, that some highways are sprayed three to four times per year, or that few trees can survive repeated defoliation over a period of years.

Last summer Paul Sanger's neighbor used a mixture of 2,4-D and 2,4,5-T to control weeds in his soybean field for

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*"Even if 2,4-D and 2,4,5-T were absolutely safe their gross overuse is a political scandal. In Lebanon County, Pa., I have witnessed the spraying from barrels labelled 2,4,5-T of a paved highway shoulder three days after a frost. Even if the highway department can convince people that this saves money and that dead brown stalks on the side of the road are somehow aesthetically pleasing, it would take a lot of work to convince anyone of the need to spray herbicides anywhere (especially on pavement) after an October frost."*

*Elliott Kofoed, 1974*

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the first time in several years. Sanger's potato field and one of his tomato fields are about 400 yards from the sprayed fields at the closest point and about one-half mile at the furthest point. Immediately after the spraying the leaves began to curl on the young potato and tomato plants. Sanger claims they lost several weeks' growth and that his yield was down 50 percent. Again, quoting E.R. Laning of Dow's Agriculture Department, "Drift of 2,4-D or 2,4,5-T could cause injury — from negligible to serious — in home gardens. Potatoes, radishes and tomatoes are especially susceptible to these herbicides. Dependent on the dosages received, injury could be serious."

Among the most important trees being killed by herbicides are fruit trees. This fall, a 40-acre orchard in Lebanon County was uprooted to make way for a suburban development. Nearly every tree was dead and those alive were producing very little fruit. Six years ago, Sanger warned the owner that if he didn't fight to have spraying stopped along the road (which ran through the orchard) and along the rails (which abutted the orchard) he'd lose every one of his trees. After this happened, the farmer, upset at the total loss of his

2,4,5-T, whether to manufacturing personnel or individuals applying the herbicide, provide no measure of the teratogenicity of 2,4,5-T itself, since most of the exposed people have not been pregnant women. Persistent reports of fetal deaths or malformations after indirect exposures of pregnant women to spray operations indicates that the possibility that pure 2,4,5-T causes teratogenesis in humans is still uncertain.

Once it was proven that 2,4,5-T as produced commercially was contaminated by TCDD and would therefore cause teratogenesis, the manufacturing process was modified about 1970 to greatly decrease the amount of the TCDD contaminant. Armed with new calculations and experiments, manufacturers again claim that 2,4,5-T is safe. This may be correct. It may also be wrong. Some of the questions about 2,4,5-T which must be answered are now clear, but most of the answers remain unknown:

- How small is a "harmless" dose of TCDD?
- How stable is TCDD in the environment and how extensively has it been concentrated in the food chain?
- Will the lower level of TCDD now produced in 2,4,5-T slowly accumulate

orchard, called in the County Agricultural Agent (from the U.S. Department of Agriculture) to examine his trees. Not too surprisingly, the agent found the trees to be full of parasites and diseases and he incorrectly termed this the cause of the loss. A tree weakened year after year by herbicides is prone to attack by most any parasite or disease.

If we started today to replant in an area unpolluted by herbicides acre-for-acre every lost fruit tree, it would take six to eight years before there would be any fruit at all and as long as 15 years before previous production could be matched. However, instead of expanding orchard acreage, more and more good orchard land is being taken out of production by the increasing use of herbicides. The likely result: a future fruit shortage and dramatic price increases.

For every widely-scattered but strikingly similar report of livestock, garden, shrub or tree damage by herbicides, there could be dozens of incidents in which those who complained were intimidated and discredited by county agents, spray contractors or utility, government or chemical company officials. In the files of the Environmental Defense Fund in Washington there are

in the environment and in the food chain to reach a dangerous level?

- Experiments have shown that TCDD can be formed when 2,4,5-T is burned, but does this occur in the environment, such as when treated brush is burned?
- What is a safe TCDD tissue level for pregnant women and what are the current levels in pregnant women and other humans — particularly those who live near areas where 2,4,5-T is used repeatedly?

The issue for society is a choice between permitting a new technology to be used unless it is proven harmful or, where there is doubt, prohibiting the use until safety is established. In the case of 2,4,5-T, the first philosophy has clearly prevailed.

### LESS SERIOUS EFFECTS OF 2,4,5-T

Symptom	Chloracne <sup>1</sup>	Vietnam <sup>2</sup>	Wisconsin <sup>3</sup> Resident
Crawling sensation on skin	+	+	+
Skin rashes	+	+	+
Abdominal pains	+	+	+
Prolonged fatigue	+	+	+
Prolonged cough	+	+	+
Nausea	+	+	+
Diarrhea	+	+	+
Headache, fever	+	+	+
Depression, anxiety	+	+	+
Muscular cramps, aches and pains	+	+	+
Dizziness	+	+	+
Impaired concentration	+		+

+ indicates symptom experienced.

1. Symptoms resulting from occupational exposure to TCDD in 2,4,5-T manufacturing operations (hearings before the Senate Commerce Committee, April 7 and 15, 1970: Effects of 2,4,5-T on Man and the Environment).

2. Cited in the NAS report.

3. Based on one of the many letters in the files of the Environmental Defense Fund from citizens seeking help to prevent any further 2,4,5-T exposures to themselves on their domestic animals.

scores of these reports from all over the country. There are letters from rural and suburban people begging for someone to do something about the right-of-way spraying that destroyed their gardens, defoliated or killed their trees, aborted livestock fetuses, deformed animal offspring or caused respiratory and muscular problems with humans.

One community has taken direct action. Shaken by the desperate act of a respected farmer, the citizens of Hopkinton, New Hampshire, in this year's

democratic town meeting, voted nearly unanimously to prevent herbicide use without consent of property owners and to insure that land adjoining sprayed property is protected from drift.

Derek Owen's rifle is back on the rack. Short of having a few thousand Owens, Sangers and others who will stand up and fight indiscriminate herbicide use, scientific work must be done to understand what herbicides really do and to put a stop to their criminal abuse.