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DDT: The Critics Attempt To Ban Its Use in Wisconsin

Madison, Wisconsin. For the past year and a half DDT and other persistent pesticides have had a persistent enemy in the Environmental Defense Fund, a fledgling Long Island-based organization founded in the fall of 1967 (*Science*, 22 December 1967). EDF has tried to prevent local and state agencies from using DDT or dieldrin by filing suits in state or federal courts (sometimes in both) in New York, Michigan, and Wisconsin. Its success in court has been limited, but EDF is now taking advantage of an administrative hearing procedure provided by the Wisconsin Department of Natural Resources, and this may give EDF its best chance yet to win a major victory.

For 3 weeks in December and January EDF, led by Victor J. Yannacone, Jr., a 32-year-old attorney from Patchogue, Long Island, had its scientific witnesses testifying on ecological effects of DDT. It built up its most comprehensive case to date against this pesticide which it regards as an environmental contaminant that should be banned.

When the hearings (now in recess for a month or longer) are resumed, the agricultural chemical industry will present its defense. The industry may well be viewing the EDF challenge uneasily. For, while a ruling in EDF's favor would apply only in Wisconsin, it would mean that a public agency had concluded, on the basis of scientific testimony given subject to cross examination and rebuttal, that DDT was a serious environmental pollutant.

Specifically at issue in the hearings is the question whether DDT is a pollutant within the meaning of the water quality standards administered by the Wisconsin Department of Natural Resources. The department could not ban all use of DDT in Wisconsin, but it could forbid all use of it resulting in water pollution.

(The Arizona Pesticide Control Board recently banned use of DDT in commercial agriculture for 1 year, but this was not done to condemn this pesticide as a pollutant. Rather, it was done largely to ease the fears of dairymen and livestock and food-crop growers that their products might be found to have DDT residues exceeding acceptable tolerance levels and be declared unmarketable.)

EDF's scientific witnesses, some ten of them altogether, included fishery and wildlife biologists, botanists, an organic chemist, a pharmacologist, and an entomologist. A frequent tactic of attorneys for the agricultural chemical industry was to try to show, through cross examination, that EDF witnesses were testifying outside their areas of scientific competence. Yannacone insisted, however, that these witnesses were not to be pigeonholed as narrow specialists; they were, he said, investigators belonging to an "environmental science community" whose members stay in close touch and use teamwork to understand ecological problems.

Nesting Failures

The testimony ranged widely but much of it focused on reproductive failures in certain species of birds, such as the bald eagle and peregrine falcon. EDF witnesses related in detail how, after years of scientific detective work by researchers in the United States and abroad, these failures were traced to DDT or its metabolites.

In previous EDF cases Yannacone has gone into court asserting the novel doctrine that citizens have a constitutional right to an environment unspoiled by pollutants such as DDT. By its pioneering effort, EDF has hoped to establish important legal precedents and to cut out for itself a role in "conservation law" analogous to the roles the American Civil Liberties Union and the Legal Defense Fund of the NAACP have played so successfully in civil rights law.

But, although in some instances EDF has delayed or prevented the use of dieldrin or DDT, no judge has actually outlawed the use of these pesticides, or acknowledged that Yannacone's constitutional theories have validity. In general, judges have held that it is within the discretionary authority of state and local agencies to decide whether or not to use pesticides, and that for the courts to interfere would be improper.

In the present Wisconsin case, however, EDF has not had to test far-out legal concepts. For a 1943 Wisconsin statute allows private citizens to petition a state agency for a ruling on how, or whether, laws or regulations (in this instance, the water quality standards) which it administers apply to a particular question (such as the charge that DDT is a pollutant). The Department of Natural Resources' willingness to rule on the anti-DDT petition, presented by EDF on behalf of two Wisconsin conservation groups, is itself significant; had the department wished, it no doubt could have found reason to reject the petition.

That the petition was not rejected reflects the widespread concern felt within the state about DDT. U.S. Senator Gaylord Nelson and a number of other prominent Wisconsin politicians have been advocating an outright ban on DDT. Conservation groups, which are politically potent in Wisconsin, encourage this attitude. Also, there is the fact that even some farmers, especially among the dairymen, feel DDT should be banned, although the Wisconsin Farm Bureau Federation does not agree.

The water quality standards which the department will interpret, subject to court review, would seem to give EDF a real possibility of getting a favorable ruling. According to these standards, a substance shall be regarded as a pollutant if its use results in public health problems or in "acute or chronic [injury] to animal, plant, or aquatic life." (Wisconsin is one of 7 states which now have federally approved water quality standards. According to Bern Wright, acting chief of the Federal Water Pollution Control Administration's water quality standards branch, DDT would fit the definition of a pollutant under most, if not all, state standards upon a showing that it is harmful to aquatic life.)

One of the prime movers behind the DDT hearings was Mrs. Lorrie Otto, a Milwaukee suburbanite and DDT foe of long standing who has been known to store dead robins in her freezer for

use as evidence in her anti-DDT appearances before her village board. Last year she joined the Citizens Natural Resources Association (CNRA), a relatively small but sophisticated Wisconsin conservation organization to which a number of academic people belong, for the purpose of proposing that EDF be invited to Wisconsin to do battle against DDT.

Her proposal was readily accepted, for CNRA had for some time viewed DDT as a major environmental threat. Moreover, CNRA knew of EDF from its earlier pesticide suits in the Midwest, which had received substantial press coverage. The Wisconsin division of the Izaak Walton League joined CNRA in petitioning for the hearings, and last fall these organizations raised nearly $20,000 to pay EDF's expenses (Yannacone is receiving no fee), the air fares and other expenses of witnesses, and the like. Also, a volunteer organization of about 60 people, a third of them University of Wisconsin scientists and graduate students, was set up to support the hearing effort in various ways, such as carrying on the literature search and providing quarters for EDF people and out-of-town witnesses.

Ecologists "Build a Wall"

The hearings began in December in the Assembly chambers of the State Capitol, but were moved later to the less formal atmosphere of a hearing room of the Department of Natural Resources. The hearing examiner, Maurice H. Van Susteren, while conducting the hearings impartially, seems as intrigued as anyone by what EDF is trying to do. "A legal case is like a wall, and you have to put it in brick by brick," he remarked to a *Science* reporter. "Usually, the scientist has been interested only in his own brick. Now ecologists are trying to put all the bricks together."

The hearings' most striking personality is Yannacone, a dynamic, exuberantly aggressive individual who usually impresses scientists by his quickness in grasping scientific material. His style would go over poorly in a dignified Wall Street law firm. For example, at a meeting of the Littoral Society last fall, Yannacone, as the guest speaker, asked rhetorically what was the course of last resort in dealing with polluters and other despoilers of the environment. Then, grasping a revolving blackboard, he whirled it about so that it proclaimed, in large block letters, SUE THE BASTARDS!

EDF's other key figure at the hearings is Charles F. Wurster, Jr., an assistant professor of biological sciences at the State University of New York at Stony Brook, Long Island. Through extensive correspondence and personal contact, Wurster has managed to build up EDF's scientists advisory committee until now more than 100 scientists are on tap to furnish opinions or testimony (though not all EDF witnesses are committee members). George M. Woodwell, chief ecologist at Brookhaven National Laboratory, was the first to head the EDF committee, but lacking time for it, he passed the job on to Wurster. "Charlie is very, very bright and remembers everything he reads," Woodwell says. "I think, unquestionably, he knows more about persistent pesticides than anybody in the world."

Of the several lawyers representing the agricultural chemical industry the one who has taken the most active part in the hearings is Louis A. McLean, a deliberate, slow-talking man who questions EDF witnesses with an air of kindly forbearance. At the start of the hearings, McLean was himself called to the stand as an EDF witness. Yannacone questioned him about an article in *BioScience* (September 1967) in which McLean had declared that the antipesticide people are compulsive types who, while seeking "youth and purity in the simple and primitive," actually fear loss of physical powers and are "preoccupied with the subject of sexual potency."

Though Yannacone likes to play the underdog battling corporate giants, Willard Stafford, a prominent Madison attorney who has recently joined in the DDT defense, says, "In this case, it's hard to know which is David and which is Goliath." For his part, Wurster observes, "At first we were taken for a bunch of bird-watchers, but the industry is worried now. They've got the money, we've got the science."

The EDF Strategy

The strategy used by EDF in presenting its case was, first, to have Wurster and others describe the world's ecosystems as interrelated and inseparable; then to tell how DDT is now present in all regions of the earth, having been found far from places of its application, even in Antarctica where it has been detected in penguins. Next, they related how DDT, by its broad biological activity, either killed outright or had sublethal effects on various organisms, from phytoplankton and crustaceans to fish, birds, and some mammals.

Victor J. Yannacone, Jr., counsel for the Environmental Defense Fund.

For example, Kenneth Macek, testifying in his official capacity as a staff biologist of the Department of the Interior's fish-pesticide laboratory at Columbia, Missouri, told of his research findings that, when brook trout were fed low, sublethal doses of DDT, the eggs and fry they produced had significantly higher mortalities; moreover, the trout were more susceptible to environmental stress (as from changes in water temperature). Also, Macek noted that a colleague, Howard Johnson of Michigan State University, had identified DDT residues as the most probable cause of heavy mortalities of coho salmon fry in Michigan hatcheries.

A University of Wisconsin wildlife ecologist, Joseph Hickey, testified on avian reproduction failures attributed to DDT, particularly in birds of prey such as the eagle, osprey, and peregrine falcon. By the early 1960's, ornithologists in Europe and the United States were aware that these birds were experiencing repeated nesting failures and that catastrophic declines in population were under way.

DDT residues, found in parent birds and in embryos, were suspected as a cause, but an explanation of just what was happening was lacking.

In 1965 an international conference on the population biology of the peregrine falcon was held, and after this meeting, Hickey said, investigators began to focus on what had been discovered to be a widely observed phenomenon: the eggs of the peregrine and some other raptors were often breaking and failing to hatch. A breakthrough occurred in 1967 when D. A. Ratcliffe, a British ornithologist, reported that an extraordinary change had occurred in the weight and thickness of the shells of eggs produced by the falcon, the golden eagle, and the sparrow hawk. These birds, their calcium metabolism having been somehow upset, were laying thin-shelled eggs.

Hickey and D. W. Anderson, a graduate student, confirmed this by their own comparison of eggshells produced in recent years by the falcon, the bald eagle, and the osprey with eggshells of the pre-DDT era available in various museums. In this study, Anderson is said to have examined 34,500 eggshells. An explanation of the mystery was now felt to be at hand. For, several years earlier, pharmacologists at the Burroughs Wellcome Research Laboratory at Tuckahoe, New York, had discovered by chance that chlordane (a chlorinated hydrocarbon similar to DDT), which a caretaker had sprayed to put down an outbreak of bedbugs, was inducing enzymes in rats used in their drug research. Rats exposed to chlordane had quickly metabolized the pentobarbital administered to them and showed only slight reaction to the drug.

DDT an "Enzyme Inducer"

Later, it was learned that other chlorinated hydrocarbons, such as DDT, also were "enzyme inducers" in rats, and that the enzymes broke down not only drugs but a number of different substrates, including estrogen, a female sex hormone. Estrogen is known to play a role in mediating calcium metabolism in birds, causing them to accumulate calcium in the hollow parts of the skeleton, for later transfer by way of the bloodstream to the oviduct, where the eggshell is formed. Thus, Hickey and others, such as Wurster, hypothesized that, by breaking down estrogen and upsetting the calcium physiology, DDT (and its metabolite DDE) was responsible for the avian reproduction failures that had so mystified them, though experimental evidence of this was lacking.

Lucille Stickel, pesticide research coordinator of the Department of the Interior's Patuxent Wildlife Research Center, in testifying for EDF, has now furnished experimental proof that the presence of small quantities of DDT and DDE in the diets of mallard ducks decreased eggshell thickness, increased egg breakage, and decreased overall reproductive success. Similar results were obtained from an experiment in which kestrals, a species closely related to the peregrine falcon, were fed low dosages of DDT and dieldrin in combination, Mrs. Stickel said.

Another EDF witness, Richard Welch, a biochemical pharmacologist with the Burroughs Wellcome Research Laboratory, said that, if one extrapolates from animal data, the prediction would be that DDT would have a biochemical effect on man causing an increase in the metabolism of hormones and drugs. In questioning Welch, Yannacone's purpose was, partly, to stress that the entire world population is presently being used as the involuntary subject of an uncontrolled experiment.

Defense not Yet Heard

The agricultural chemical industry is yet to be heard from and it may be that the Department of Natural Resources will find the industry's defense persuasive. Medical experts will be invited to testify, and other scientists with special knowledge of pesticides surely will appear in the industry's behalf. Certainly EDF is still a long way from having won its case, for, even if the department decides in its favor, the industry would no doubt appeal to the courts.

But, whatever else may be said, the Wisconsin hearings are a striking instance of local conservation groups using a legal forum to deal with what they judge to be a major environmental problem. Just as striking is the fact that a state government is providing that forum, though Wisconsin has more of a progressive tradition than most states. Further, the role of the Environmental Defense Fund in the DDT case clearly has been a key one and, had there been no such organization, it seems altogether possible that nothing would have happened.

—LUTHER J. CARTER

COVER

Eaglet and an egg (which never hatched) were photographed in April 1965 in a nest on the Muskegon River in Michigan. The chipped, flaked condition of the egg is ascribed to a calcium deficiency attributable to residues of DDT or its metabolites in the parent. University of Wisconsin wildlife ecologist Joseph J. Hickey, who calls DDT a "chemical of extinction," introduced this photograph at DDT hearings last month in Madison. See page 548. [Robert Harrington, Michigan Department of Natural Resources]