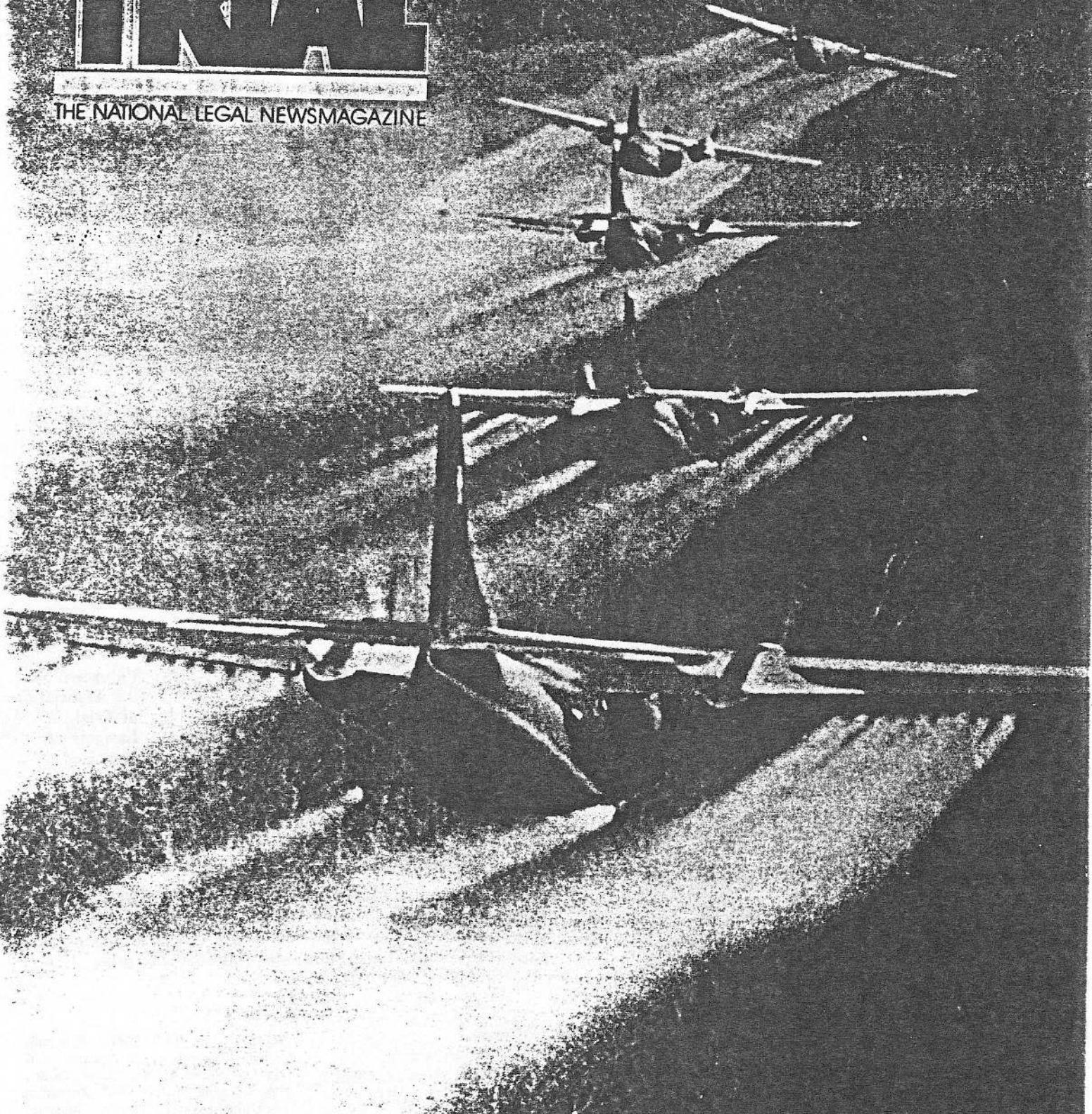


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# TRIAL

THE NATIONAL LEGAL NEWSMAGAZINE



## TOXIC TORTS

# TRIAL

THE NATIONAL LEGAL NEWSMAGAZINE

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**COVER: C-123s spraying the defoliant Agent Orange over the jungles of Vietnam set the stage for this month's theme of toxic torts. Photo courtesy of Agent Orange Victims International/Bob Rand.**

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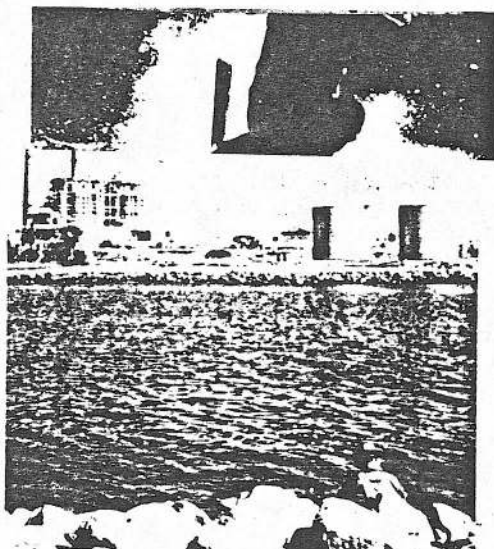
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**44 AGENT ORANGE LITIGATION: COOPERATION FOR VICTORY** Authors Victor John Yannacone, Jr., W. Keith Kavenagh and Margie T. Searcy review the history of this litigation and explain the plaintiffs' goals and organizational enterprise.

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# DIOXIN

## MOLECULE OF DEATH

By Victor John Yannacone, Jr.  
W. Keith Kavenagh  
and  
Margie T. Searcy

Shortly after World War II, work on phenoxy herbicides at the New York State Agricultural Station was supported in part by a grant from The Dow Chemical Co. which also supplied the chemicals.

The effectiveness of chlorophenoxy compounds such as 2,4,5-T and 2,4-D as herbicides had been first demonstrated in 1944 by the US Department of Agriculture (USDA) at Beltsville and Camp Detrick, Maryland. By 1951 tests at Camp Detrick determined that the herbicide of choice for military defoliation operations was an equal mixture of the butyl esters of 2,4-D and 2,4,5-T. The effectiveness of this formulation was established in 1959 in a large-scale test over four square miles at Fort Drum, New York. In 1961 the Department of Defense (DOD) conducted large-scale aerial application trials of the herbicide in Southeast Asia.

In December 1946, Franklin D. Jones sold to American Chemical Paint Co. a US patent for methods of killing weeds with halogenated phenoxy monocarboxylic aliphatic acids,

their esters and salts, including 2,4-D and 2,4,5-T. In May 1947, the Dow Chemical Co. brought a declaratory judgment action against American Chemical Paint Co. seeking a declaration of the invalidity of the Franklin D. Jones patent under which the American Chemical Paint Co. was making 2,4-D and 2,4,5-T. In turn American Chemical sued Dow for patent infringement and sought an injunction against further sales of 2,4-D and 2,4,5-T by Dow.

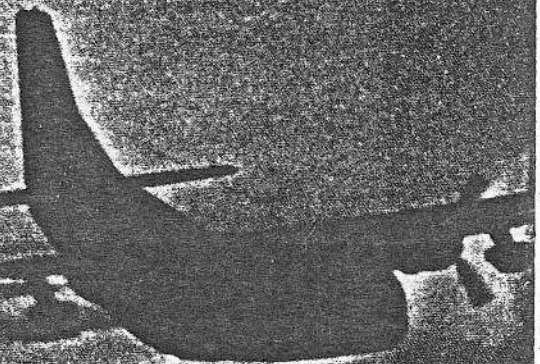
Between 1940 and 1962 many of the chemical companies which eventually supplied "Agent Orange" to the military for use in Southeast Asia were experimenting with phenoxy herbicides and patenting the results of their research.

In 1952 Dow reported that its "Teron Brush Killer" was a mixture of

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2,4-D and 2,4,5-T, clearly establishing that 2,4-D and 2,4,5-T had been combined and marketed commercially long before "Agent Orange" was formulated for the government.

When the DOD turned to the American chemical industry for defoliants suitable for use in Vietnam, the government sought an herbicide which was "immediately available in quantity" and "nontoxic to humans." Commercial mixtures of 2,4-D and 2,4,5-T were tried in field tests because the government had been assured by the manufacturers that "these chemicals have been known and used in the US for more than 15 years, and are considered safe to animals and humans..." From 1961 to 1963, Dow, Ansul, and Monsanto were the main sources of herbicides for the screening field tests.

At the "First Defoliation Conference" conducted by the DOD, Fred J. Delmore, Commanding General, US Army, Edgewood Arsenal, alerted the chemical companies in attendance—Pennsalt, General Anoline & Film Corp., Ethyl Corp., Ansul Chemical Co., The Dow Chemical Co., and Monsanto Co.—of the "need right now of chemicals that will do the job at an earlier time, and in a quicker period." General Delmore specifically charged the companies present with the "particular objective" of "mak[ing] sure it [the herbicide to be developed] is perfectly innocuous to man and animals and at the same time, will do its job."

Albert Hayward, chief of the program coordination office of Fort Dietrich, said at the conference:

"It goes without saying that the materials must be applicable by ground and air spray, that they must be logistically feasible, and that they must be *nontoxic to humans and livestock* in the area affected. Not only should these materials be nontoxic, but it seems to me that it is important that they not have any cosmetic effect. If, for example, a material had a marked red fluorescence and a number of people were obviously stained by the material, then our enemy might derive considerable propaganda value from this fact even though the individuals were not in any way injured by the material.

"In a very real sense, this program in defoliation is a little bit unique with respect to the usual military-in-

dustrial collaboration. Ordinarily, in military R&D we have a military concept that leads to the statement of a military requirement, technical characteristics, performance specifications, and other strictly delimited aspects. In this program we do not have rigidly specified characteristics. I have stated some of the broad requirements that a successful defoliating chemical should have, but within this general framework we will accept and use materials that will do a job for us. In a few years it may be that we will come up with more definite specifications but at the moment we simply solicit the assistance of you gentlemen [the defendants present] in finding materials that can be used successfully within the reasonably broad and general guidelines that General Delmore has stated and that I have repeated."

The government had not developed any chemical defoliants for use in Vietnam and had no specifications in 1964. The DOD invited the agrichemical companies to compete in the development of a fast-acting and safe herbicide and to provide the government with the specifications for procuring the herbicides they were formulating. There was "lack of the use of military specifications for [herbicide] procurement actions" until 1967 when a coordinated military specification was drawn from information supplied by the war contractors.

In March 1968, while the government was attempting to finish the fashioning of a coordinated military specification for the purchase of "Agent Orange," efforts were made "to resolve industry exceptions" to the Air Force's purchase description (not specifications), and as a result of those concerns, changes were made in the purchase description "...to more nearly reflect commercial practices in production of Orange...."

Military herbicide operations were carried out from 1962 to 1971. They were used primarily for 1) defoliation of trees and plants to improve observation and prevent ambush of friendly forces and 2) destroying food crops of hostile forces. After a relatively slow build-up from 1962 to 1965, herbicide operations increased rapidly to a peak in 1967, then declined slightly in 1968 and 1969, dropping sharply in 1970, and eventually stopping in 1971. Defense estimated that approximately 17.7 million

gallons of herbicides were sprayed during the nine-year period. The National Academy of Sciences estimated that of the 3.6 million acres sprayed, 66 percent were sprayed once, 22 percent twice, eight percent three or more times, and four percent four or more times.

Converting the millions of gallons sprayed to pounds of herbicide, the 44 million pounds of 2,4,5-T contained an estimated 368 pounds of the toxic contaminant 2,3,7,8-tetrachloro dibenzo P-dioxin (TCDD or dioxin). The National Academy of Sciences estimated that between 220 and 368 pounds of TCDD were released over South Vietnam during the period August 1965 to February 1971.

### Termination of Herbicide Use

The decision on April 15, 1970 leading to the termination of all military herbicide use was caused by a fascinating interplay of diverse elements of our political fabric—scientific, regulatory, diplomatic, and legislative. These included the National Academy of Sciences (NAS), the National Cancer Institute (NCI), the National Institutes of Health (NIH), the American Association for the Advancement of Science (AAAS), a spate of independent scientists, a host of executive departments and agencies, the Departments of State, Defense, Agriculture, Interior, and Health, Education, and Welfare (HEW) (now Health and Human Services), the Air Force, the Surgeon General, the Office of the President, and Congress itself.

One of the first of many distinguished scientists to voice concern over the continued use of herbicides containing the toxic substance dioxin was Yale botanist Arthur W. Galston, at the time president-elect of the Botanical Society of America. In a 1967 article in the *New Republic*, professor Galston warned of the potential hazards of continued unbridled use of herbicides that was all too prophetic:

"We are too ignorant of the interplay of forces in ecological problems to know how far-reaching and how lasting will be the changes in ecology brought about by the widespread spraying of herbicides in Vietnam. These changes may include immediate harm to people in sprayed areas...."

The DOD was not unmindful of



the growing criticism within the scientific community of the department's use of herbicides in Vietnam. Each year the justification for continuation of Operation Ranch Hand was reviewed. In 1967, DOD contracted with Midwest Research Institute (MRI) of Kansas City, Missouri, for an in-depth assessment of the ecological effects of extensive or repeated use of herbicides. MRI concluded that the greatest short-term or long-term ecological consequence [in South Vietnam] was the "destruction of the vegetation..." the long-term effects on wildlife were unpredictable (some good, some bad), "the herbicides used [in South Vietnam]...will not persist in the soil for a long period of time..." and, finally, "...the possibility of lethal toxicity to humans...is highly unlikely and should not be a matter of deep concern..."

Both NAS and AAAS reviewed the report following its publication in December 1967 and felt that although it was a creditable review of the available scientific literature relating to herbicides and the ecological effects, most of it supported by the chemical companies which manufactured the herbicides, it was only a first step in such an investigation.

In September 1968, the State Department released an assessment of the ecological consequences of the defoliation program in South Vietnam. Tschirley, a plant ecologist, visited South Vietnam for one month and later published the results of his observations in *Science*, the journal of the AAAS, concluding:

"The defoliation has caused ecologic change, not irreversible, but recovery will take a long time.... The effect on animals is now unknown, but it does not appear to have been extreme.... There is no evidence to suggest that the herbicide used in Vietnam will cause toxicity for man or animals...."<sup>2</sup>

Responsibility in Science sponsored a visit by two zoologists in March 1969. Orians and Pfeiffer published their report in 1970...."<sup>3</sup>

In a February 1969 meeting of the NAS/National Research Council Committee, a "confidential" report prepared by the Bionetics Research Council (BRC) Committee (which the USDA had employed to study the mutagenic, carcinogenic, and teratogenic potential of 140 commonly used pesticides) was distributed indicating a "significant potential [for 2,4,5-T] to increase birth defects."

About four months after the NAS

committee had seen the BRC report (June or July 1969), the first reports of human birth defects allegedly attributed to the Herbicide Orange appeared in Vietnamese newspapers. They blamed the increases on the chemicals used in defoliation. There is still no scientific agreement regarding interpretation of these essentially anecdotal findings.

Mounting national concern about 2,4,5-T took on a greater sense of urgency when, in October 1969, Dr. Lee F. Dubridge, science adviser to the President, announced that there would be a partial curtailment of the use of this herbicide. Following this announcement by the Office of the President, the DOD restricted the use of Herbicide Orange to areas remote from population in South Vietnam. An NIH report that 2,4,5-T could cause malformations and stillbirths in mice prompted these actions.

In all probability, the "leaking" to the press of the USDA report (allegedly by a member of "Nader's Raiders," who "suggested" that the USDA was trying to "hide" the adverse report) prompted the Surgeon General of the United States to issue, on April 15, 1970, an opinion that the use of 2,4,5-T might be hazardous to "our health."

On April 5, 1970 the Secretaries of Agriculture, HEW, and the Interior jointly announced the suspension of certain uses of 2,4,5-T. The suspension resulted from published studies indicating that 2,4,5-T was a teratogen. On the same day, the DOD suspended all use of Herbicide Orange. Dow, the primary manufacturer of 2,4,5-T and 2,4-D, stated that according to its tests (with 2,4,5-T that had been produced in accordance with production specifications) there was no indication of any fetal abnormalities. However, the Dow tests did confirm the BRC findings that when dioxin was present in quantities exceeding (then-current) production specifications, birth defects did occur.

#### Civilian Use of 2,4,5-T

The herbicide 2,4,5-T has been marketed as a "registered pesticide" in the United States since 1948. The USDA reported that principal domestic use in 1974 was for weed control on rights-of-way, range land and pastures, rice crops, and forests.

Since 1950 most of the chemical industry has known that large quantities of TCDD may be formed as a by-product of the 2,4,5-T manufacturing process if the manufacturing procedures were not carefully controlled. At one time, 2,4,5-T which contained between 30-40 ppm of TCDD was produced. After concern arose in 1969 about the extremely toxic effects of TCDD, manufacturing methods were changed, and by 1971 industry had reduced TCDD content in commercial samples to less than 1 ppm. Current US manufacturing specifications require 2,4,5-T presently being sold to contain less than 0.1 ppm, and several foreign countries now produce commercial 2,4,5-T containing less than 0.05 ppm of TCDD.

Herbicide 2,4,5-T has been the subject of a number of federal regulatory actions following its first registration in March 1948. Initially, regulation of 2,4,5-T came under the aegis of the USDA. Subsequently this function was transferred to the Environmental Protection Agency (EPA). On April 13, 1966 the USDA and the Food and Drug Administration (FDA) jointly announced in the *Federal Register* the abolition of the "no residue and zero tolerance" concepts

(of drug and chemical registration) as scientifically unattainable. Future registrations were to be granted on the basis of either "Negligible Residue" or "Permissible Residue." Industry was given until December 31, 1967 to comply by obtaining tolerances for residues of 2,4,5-T in all treated food, feed products, and by-products. On May 1, 1970, the EPA cancelled (among other uses) all 2,4,5-T uses on food crops intended for human consumption.

Dow and Hercules, Inc. petitioned to refer the cancellation to an advisory committee of scientists to review all relevant facts. The advisory committee met and submitted its report in May 1971, recommending: "permitted use of 2,4,5-T on forests, range land and rights-of-way providing that the limit of 0.1 ppm contamination with TCDD be set for all future production of 2,4,5-T; that all 2,4,5-T be applied no more than once a year at any one site; and that 2,4,5-T be

In addition to the exposures of American and Australian servicemen in Southeast Asia, there are also occupational accidents....

applied with proper caution so that it will not contaminate other areas where it may come into contact with humans."

The USDA published a Pesticide Registration (PR) Notice on September 28, 1970 advising of the presence of chlorodioxin contaminants (such as TCDD) in economic poisons (including herbicides and pesticides). It stated further that such contaminants in 2,4,5-T constituted a possible hazard to people since they had been found to be extremely toxic to laboratory animals. This PR advised that appropriate regulatory action would be taken under the Federal In-

secticide, Fungicide and Rodenticide Act (FIFRA) because products containing chlorodioxins were considered to be "in violation of FIFRA."

Dow promptly moved to protect one of its major markets, rice, and filed for injunctive relief in the district court in Arkansas, an area heavily involved in rice crop production. An injunction was granted in July 1972, enjoining further administrative action against 2,4,5-T. The US court of appeals for the Eighth Circuit overturned this injunction in April 1973, and the EPA proceeded with formal cancellation hearings to remove the herbicide from the market. (Dow was not the complete loser in this action: It had been successful in gaining nearly two years of delay in the suspension of the appeal.)

Extensive public hearings were held during 1974 on all uses of 2,4,5-T, including insecticides as well as herbicides containing 2,4,5-T. In June 1974, the EPA decided that it would "continue its TCDD residue monitoring" since it did not have sufficient hard evidence needed to rebut the herbicide's manufacturers and users (farm groups), and (to the shock of environmental groups) withdrew the proceedings.

#### Background of Dioxins

The "dioxin" of today's media accounts usually refers to the 2,3,7,8-tetrachloro isomer of p-dibenzo dioxin (TCDD). It has been called the most lethal synthetic chemical known to man, but it is only one of a group of related aromatic, tricyclic compounds. The number of chlorine atoms in the chlorinated dioxins may vary from one to eight, and more than 221 different isomeric forms of the polychlorinated dibenzo-p-dioxins (PCDDs) are possible. Because of their toxicity, few of the chlorinated dioxins have been synthesized so far and studied for their chemical and physical properties, and only the isomer with chlorines at the 2,3,7,8 position (2,3,7,8-tetrachloro dibenzo p-dioxin, the "dioxin" of the "Agent Orange" case) has even begun to be examined in detail for its toxicological effects.

Although the first chlorinated dioxin, the octa-isomer, was prepared as early as 1872 in Germany, its struc-