

Letters

The Safety of 2,4,5-T

This is in response to the full-page advertisement by the Dow Chemical Company (28 Sept., p. 1330) extolling the untarnished virtues of 2,4,5-T. I write as one of the 59 "top world experts" that were brought together last June at the Dow-financed conference upon whose "consensus" the substance of this proclamation was based. I participated in the ecology workshop, and therefore address myself to the unqualified assertions that 2,4,5-T is "safe!" and that it "poses no practical environmental harm."

Our group was primarily concerned with the unavoidable dioxin (2,3,7,8-tetrachlorodibenzo-*p*-dioxin) contaminant of 2,4,5-T and with the potential environmental threat posed by this pernicious poison. As I recall, the group concluded, *inter alia*, that it has not yet been established whether dioxin is presently accumulating in the environment or whether routine use of 2,4,5-T might lead to adverse biological effects. Moreover, we recognized the need for a routine program of environmental monitoring for potentially dangerous levels of dioxin, but at the same time concluded that presently available analytical methods of detection were inadequate to carry out such a program. So much for "safe!" Some specific data will prove instructive.

The 2,4,5-T on the market today contains between 50 and 100 micrograms per kilogram of dioxin, if one assumes all goes well during the manufacturing process. Additionally, the quantity of dioxin can be slightly augmented in nature through the combustion of 2,4,5-T, with a yield of perhaps 1 milligram per kilogram and possibly more. The amount of dioxin applied to a right of way as a result of a typical application of 5 kilograms of 2,4,5-T per hectare would be in the neighborhood of 380 micrograms per hectare. Between half and three-quarters of this dioxin would rather quickly decompose or be widely dispersed (that is, within days) and the remaining 100 mi-

crograms per hectare or so (approximately 75 picograms per kilogram in the topsoil) would become incorporated into the ecosystem and remain there for a considerable period of time. In fact, the environmental half-life of this remaining dioxin is in the neighborhood of 3 years or even longer. In other words, perhaps 40 micrograms per hectare will still be present after 4 years, when the next batch is introduced.

As the applications continue, a steady-state contamination level will in time be attained that fluctuates between 70 and 170 micrograms per hectare (or 50 to 130 picograms per kilogram of topsoil). Various local animals would as a result be expected to attain body burdens of perhaps 10 to 100 times this concentration in the soil, that is, of perhaps 1.3 to 13 nanograms per kilogram. Indeed, three of several dozen cows recently tested in Texas that had been grazing on rangelands previously treated with 2,4,5-T were found to have up to 60 nanograms per kilogram of dioxin in their fat. It is disquieting, moreover, that macaques have been reported to succumb in a year or less when subjected to a dioxin body burden in the neighborhood of 340 nanograms per kilogram, a value thus only 26 to 260 times what can be expected as a result of routine right-of-way treatment.

Injurious or even fatal amounts of dioxin cannot be seen, smelled, or otherwise sensed by humans or, presumably, by the other animals at risk. And such concentrations cannot even be recognized in environmental samples (soil, plant, animal) by any but the most exquisitely sophisticated equipment operated by the most highly trained technicians. Indeed, only a handful of laboratories in the entire world—presently five in the United States and one each in Switzerland and Holland—have the capability to test environmental samples for concentrations of dioxin as small as 1 to 3 nanograms per kilogram. Those several that make a business of analyzing such samples charge \$750 to \$1000 or even more for each single analysis performed.

Therefore, to all intents and purposes, we are unable to routinely monitor the environment for the possible presence of dangerous levels of dioxin. We are thus in some senses at the mercy of the proficiency, prudence, care, and honesty of the manufacturers and applicators.

Our federal and state bureaucracies have demonstrated little ability to cope comprehensively and consistently with the regulation and monitoring of pesticides. Moreover, existing regulations—even if these are considered adequate—are only indifferently enforced in many parts of the country. And there are a number of indications to suggest that efforts to protect our environment are, in the face of growing fuel shortages and rising inflation, regressing rather than advancing.

In conclusion, permit me to suggest that we leave ourselves too small a margin of safety when we use 2,4,5-T. We are, through the use of 2,4,5-T, forced to deal with a substance—dioxin—that is dangerous at the very limits of detection and beyond. Even with 2,4,5-T prepared and applied as recommended, such doses are within about one or two orders of magnitude of lethality for some animals, and even closer for nonlethal, though still toxic, concentrations. And, of course, that does not take into account man's occasional lapses and other foibles.

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The question raised by Westing of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) accumulating in the environment would hardly appear justified in light of recent studies on this subject. Investigations of the areas of heavy 2,4,5-T agricultural use in Texas and Arkansas reveal that the search for TCDD has been negative.

In one of the earliest studies, Shadoff *et al.* (1) reported the results of a search for TCDD in an area of Arkansas where 2,4,5-T had been used for weed control on rice for the past 20 years. Water from the rice fields was held and reused year after year. The reservoir used for holding this recycled water was studied for any accumulation of TCDD. Samples of two species of fish, bottom sediment, and water were examined for TCDD, but none was detected using an analytical method sensitive to 10 parts per trillion (ppt). A similar study was conducted in an area of Texas where large portions of a watershed had been sprayed with

2,4,5-T for rangeland brush control over a 20-year period. Water from this watershed was collected in a reservoir. Samples of two species of fish, bottom sediment, and water from this reservoir were examined for TCDD. Again, none was detected at the 10 ppt level.

In 1979, Garcia *et al.* (2) in Texas reported on studies of the search for TCDD in the American coot. These studies revealed the absence of TCDD and the presence of 2,4,5-T only at the part per billion (ppb) level in coot body tissue.

Additional studies by Garcia searching for TCDD in soils, lake sediments, turtles, and fish from watershed areas in Texas where 2,4,5-T has been applied have been negative (3). None of the samples collected over a 13-month period contained TCDD.

Newton and Snyder (4) conducted studies searching for TCDD in mountain beavers feeding in areas sprayed with 2,4,5-T. The livers of the animals were analyzed for TCDD. The minimum detectable levels ranged from 3 to 17 ppt. At this level only one sample showed a possible positive reading at 3 ppt (readings at that level can be caused or influenced by several factors). All other samples were negative.

The negative findings in the search for TCDD in the environment from agricultural uses of 2,4,5-T support the studies of Crosby *et al.* (5), in which they found that the herbicide formulations exposed to natural sunlight on leaves, soil, and glass plates lost most or all of the TCDD during a single day.

One might consider the detection of 2,4,5-T in rural areas as an indicator of the possible presence of TCDD. Two recent reports on this subject lend further credence to the unlikely occurrence of TCDD in the environment where 2,4,5-T has been used. One study was reported by the Environmental Protection Agency (6) in which 48 samples of catfish/crayfish, reservoir water, and sediment were examined. Only one sample of surface water contained 0.03 ppb of 2,4,5-T. In another study (7) regarding their food monitoring program recently released by the Food and Drug Administration, no 2,4,5-T was reported in either 1978 or 1979.

The question of burning sprayed vegetation frequently is raised in discussing forestry uses of 2,4,5-T. It is very difficult to design any kind of research that adequately covers all the factors that need to be considered. Studies conducted in Texas by Baur *et al.* (8) have shown that residues of 2,4,5-T in sprayed

live oak trees 6 months after spraying were less than 1 part per million (ppm). Burning sprayed trees is not a regular practice, but it may be done where it is desirable to remove unsightly dead trees. Burning, if desired, is generally done when the trees and brush have become dry enough to burn easily. This period of time varies from 2 to 5 years after spraying. Under laboratory conditions, it has been determined by Stehl *et al.* (9) that 0.00016 percent of the 2,4,5-T in plant parts when burned might be converted to TCDD. Thus, if there were 1 ppm 2,4,5-T in the wood being burned, the amount of TCDD produced would be insignificant.

The speculative assumption made by Westing that TCDD will occur in the environment is not supported by the actual studies noted above and conducted in the field in the search for TCDD in areas under heavy agricultural use. The responses reported in the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Scientific Advisory Panel Report of 27 September 1979 (10) also support this position. Specific questions by EPA to the panel were related to issues about exposure in rice-growing areas, and the panel's response was that "... insufficient data was presented or made available to the Panel in support of the argument that human exposure from spray drift and the water environment is likely to be broad or substantial."

Considering the field studies mentioned here and the evaluation made by the FIFRA Scientific Advisory Panel, it would appear that well-qualified scientists have concluded that the likelihood of TCDD residues occurring in the environment from applications of the herbicide 2,4,5-T is extremely remote.

In light of the recent studies reported from the United States and Europe on chlorinated dioxins resulting from combustion, one would conclude that in certain geographic areas TCDD might be found in environmental samples from sources other than the herbicide (11).

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References and Notes

1. L. A. Shadoff, R. A. Hummel, L. Lamparski, J. H. Davidson, *Bull. Environ. Contam. Toxicol.* **18**, 478 (1977).
2. J. D. Garcia and M. J. Rhodes, *ibid.* **23**, 231 (1979).
3. J. D. Garcia, personal communication.
4. M. Newton and S. P. Snyder, *Bull. Environ. Contam. Toxicol.* **20**, 743 (1978).
5. D. G. Crosby and A. S. Wong, *Science* **195**, 1337 (1977).

6. T. E. Dixon, "2,4,5-T/silvex crayfish study in Louisiana" (Environmental Protection Agency, Washington, D.C., 1979).
7. *Pest. Tox. Chem. News*, 24 October 1979, pp. 16-17.
8. J. R. Baur, R. W. Bovey, J. D. Smith, *Weed Sci.* **17**, 567 (1969).
9. R. H. Stehl and L. L. Lamparski, *Science* **197**, 1008 (1977).
10. FIFRA Scientific Advisory Panel, "Review of notices of intent to hold FIFRA section 6 (b)(2) hearing on 2,4,5-T and silvex" (Environmental Protection Agency, Washington, D.C. 1979).
11. R. L. Rawls, *Chem Eng. News* **57**, 23 (12 February 1979).

Atlantic Hot Springs?

Richard A. Kerr, in his article "How is new ocean crust formed?" (Research News, 14 Sept., p. 1115), repeatedly states incorrectly that no submarine hot springs have been found in the Atlantic. The TAG (Trans-Atlantic Geotraverse) Hydrothermal Field, a site of hot springs and hydrothermal metal deposits, was discovered on the mid-Atlantic ridge at latitude 26°N in 1972 and is well documented in the scientific literature (1). It is the first active submarine hydrothermal field found on any oceanic ridge.

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References

1. M. R. Scott, R. B. Scott, P. A. Rona, L. W. Butler, A. J. Nalwalk, *Geophys. Res. Lett.* **1**, 355 (1974); R. B. Scott, P. A. Rona, B. A. McGregor, M. R. Scott, *Nature (London)* **251**, 301 (1974); P. A. Rona, B. A. McGregor, P. A. Betzer, G. W. Bolger, D. C. Krause, *Deep-Sea Res.* **22**, 611 (1975); B. A. McGregor and P. A. Rona, *J. Geophys. Res.* **80**, 3307 (1975); P. A. Rona, R. N. Harbison, B. G. Bassinger, R. B. Scott, A. J. Nalwalk, *Geol. Soc. Am. Bull.* **87**, 661 (1976); R. P. Lowell and P. A. Rona, *Earth Planet. Sci. Lett.* **32**, 18 (1976); P. A. Rona, *Geophys. Res. Lett.* **5**, 993 (1978).

In my article, I stated that "... no hot springs have been found in the Atlantic, [but] several different kinds of evidence indicate that they are there." The evidence in the TAG area does not as yet include any visual or photographic observations. As long as unequivocal direct observations are unavailable, the consensus seems to be that active hot springs in the TAG area are a strong possibility, but they have not been found.

—RICHARD A. KERR

Erratum: In the report by Ballou *et al.* "Tumor location detected with radioactively labeled monoclonal antibody and external scintigraphy" (16 Nov., p. 844), the abstract should have read: *Murine teratocarcinomas were located in mice by external γ-ray scintigraphy with a ¹³¹I-labeled monoclonal antibody specific to the tumors. The specificity of the method was increased by subtracting the radiation produced by a ¹³¹I-labeled indifferent monoclonal antibody of the same immunoglobulin class as the tumor-specific antibody.*