AN ENVIRONMENTAL TOXICOLOGY PROGRAM FOR FLORIDA

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ABSTRACT

The total burden of hazardous waste and pesticides in Florida does not appear excessive when compared with national figures. However, Florida is particularly vulnerable to these materials because it relies heavily on ground water for drinking water.

Florida has enacted an elaborate set of laws on water quality, hazardous waste management and disposal, pesticide usage, fuel storage, landfill management, and related matters that bear upon water and general environmental quality. In many cases, however, there are no cost effective technologies available that have been approved by the responsible agencies to permit compliance with these laws. This obvious need for strong research and delivery programs is being met by the Institute of Food and Agricultural Sciences at the University of Florida, the Center for Biomedical and Toxicological Research at Florida State University, and the Florida Toxicological Research Center at the University of South Florida. These agencies coordinate their efforts through the Center for Environmental Toxicology. The Toxicological Research Coordinating Committee ensures maximal contribution of these programs to the state through annual assessment and reports to the Governor and the Legislature.

A basis for research and development, thus, has been established in law and in program development. Fruitful results and real benefit to the state will come only with realistic support. To date funding has been inadequate for supporting the expanded research mandated by law.

RESUMEN

La carga total de desperdicios peligrosos y de pesticidas en la Florida no parece ser excesiva cuando se comparan con los datos nacionales. Sin embargo, la Florida es particularmente vulnerable a estos materiales porque depende mucho del agua debajo de la superficie de la tierra para beber.

La Florida ha en actado una serie de elaboradas leyes sobre la calidad del agua, la administración y disposición de desperdicios peligrosos, uso de pesticidas, almacenamiento de combustible, administración de rellenos de tierra, y materias relacionadas que tienen que ver con la calidad general del agua y del medio ambiente. Sin embargo, en muchos casos no hay tecnología disponible que su costo sea efectivo y que haya sido aprobado por agencias responsables que permita obedecer esas leyes. La
obvia necesidad de programas de investigación y de rendición, está siendo llenada por el Instituto de Alimentos y Ciencias Agrícolas de la Universidad de la Florida, el Centro de Investigación Biomédico y Toxicológico de la Universidad del Estado de la Florida, y el Centro de Investigación Toxicológica de la Florida en la Universidad del Sur de la Florida. Estas agencias coordinan sus esfuerzos a través del Centro de Toxicología Ambiental. El Comité Coordinador de Investigaciones Toxicológicas asiguran la máxima contribución de estos programas al estado a través de evaluaciones anuales y reportes al Gobernador y a la Legislatura.

De aquí que se ha establecido en ley y en desarrollo de programa una base de investigación y desarrollo. Resultados fructíferos y beneficios reales para el estado vendrán solo con apoyo realístico. Hasta ahora, apoyo monetario ha sido inadecuado para mantener y expandir las investigaciones mandadas por la ley.

Under the Resource Conservation Recovery Act of 1976 (RCRA—Public Law 94-580), the United States Environmental Protection Agency (EPA) is required to institute a national program to control hazardous wastes. It was the intent of Congress in passing RCRA that states assume responsibility for controlling hazardous waste within their borders. In 1980 the Florida legislature passed a comprehensive Florida hazardous waste management act which codified into state statutes the federal requirements established by EPA and RCRA.

There are in the world approximately five million known chemical compounds of which about 70,000 are in commercial use (Fishbein 1980). EPA has named 654 of these chemicals as hazardous materials that pose special problems if disposed of into the environment (CFR 40, Chapter 1, Part 261.33). They are classified as hazardous because of toxicity, reactivity, ignitability, or corrosivity. Two hundred and sixty of these compounds are listed for their acute toxicity and many of the pesticides in the list are among this latter group. According to the law, these materials become hazardous wastes when they are intended for disposal or actually disposed of.

EPA estimates that approximately 581 billion pounds of hazardous waste are generated in the U.S. annually (Ney 1984). On the average, this amounts to almost 158 thousand pounds for every square mile of land and water in the U.S. Furthermore, it is estimated that about one billion pounds of pesticides are used annually in the U.S. (Pimentel 1979). These pesticides, on the average, enter the U.S. environment at the rate of about 270 pounds per square mile, and account for about 0.17% of the total annual burden of hazardous materials on the environment.

This burden is, of course, not uniformly distributed. Florida is a smaller than average generator of hazardous waste, but larger than average user of pesticides. In a 1977 study of hazardous waste generators in Florida (Carter 1977), 320 organizations, including industrial firms and universities, were surveyed; and it was estimated that they generated approximately 638 thousand tons of waste per year or about 22 thousand pounds for every square mile of land and water in the state. Accurate figures on pesticide use in Florida are not available, but the state is generally considered to be second only to California in that regard. Thus, Florida is burdened with only about one-seventh the national average of hazardous waste per square mile but more than the national average of pesticides.

The total burden of hazardous waste and pesticides in Florida does not appear excessive when compared with national figures. However, Florida is particularly prone to serious problems from these materials because of the nature of its water supply (F1AACS 1984). Over 90% of Florida’s population relies on ground water for drinking water. Ground water is easily recharged by rain and surface runoff in much of the state and is easily contaminated by chemicals from spills, surface discharges, dumps, landfills,
and pesticide applications. Florida also shares the national concerns over atmospheric pollution, acid deposition, mycotoxins in food, and other kinds of environmental pollution. However, during the past three years the discovery of ground water and well field contamination by pesticides and other chemicals, the legislative action on hazardous waste management, and enforcement programs by the Florida Department of Environmental Regulation make it clear that the most urgent concern in Florida is point and nonpoint source pollution of ground water by toxic organic chemicals. The importance of this issue was emphasized in the summary of the Report of the Speaker's Task Force on Water Issues, Florida House of Representatives. This March, 1983, report cited contamination of ground and surface waters with hazardous wastes, sewage, industrial wastes, pesticides, and other chemical products as the most serious threat to Florida’s supplies of clean water and its fragile ecosystem. The report further cited the absence in Florida of systematic programs to either assess the extent of, or minimize or remove the threats posed by these different classes of pollutants.

These circumstances led to an elaborate set of laws on water quality, hazardous waste management and disposal, pesticide usage, fuel storage, land fill management, and numerous other matters that bear upon contamination of water and other parts of the environment by chemicals. Enforcement agencies, like the Florida Department of Environmental Regulation and U.S. EPA, are mandated to enforce these laws. In many cases, however, there are no cost effective technologies available that have been approved by the agencies to permit compliance with the laws. The only approved method of disposal of some hazardous waste, including for example large areas of pesticide contaminated land, is to put the material in sealed drums and ship it to an approved dump in Alabama. This is not only prohibitively expensive, but it cannot be a permanent solution. Alabama cannot serve as an infinite sink for wastes from the southeastern states.

An obvious need for strong research and delivery programs to address these matters was recognized by the Institute of Food and Agricultural Sciences (IFAS) at the University of Florida, Florida State University, and the University of South Florida some years ago, before the intrusion of aldicarb and ethylene dibromide into ground water became public issues, and before other cases of ground water contamination received public notoriety. We need to develop environmentally sound, cost effective technologies to dispose of hazardous chemicals, and to decontaminate soil and water that have already been contaminated by them. We need sound data bases for determining human health risk posed by chemical pollutants in our water. We need to understand how chemicals behave in the environment, and we need to know the toxicological implications of these events. We must have the ability to identify and determine the concentrations of these chemicals in soil, water, food, and other parts of the environment. Finally, the state needs experts in epidemiology to assess the effects of environmental pollutants on public health. Toward meeting these needs, the University of Florida, Florida State University, and the University of South Florida independently organized centers of environmental toxicology.

The University of Florida researches analytical methods for pesticides, fate and transport of chemicals in the environment, human exposure to pesticides, water treatment, and many other relevant environmental subjects. These were not, however, coordinated and funded to address the urgent environmental toxicology needs of the state. In an effort to provide coordination and funding mechanisms, the Center for Environmental Toxicology was formed in 1982. The center has missions in research, extension, and instruction. At the present, the research mission deals mainly with the development of analytical methods for chemical pollutants, the fate and transport of those chemicals in the environment, and their toxicology. The extension component serves as an authoritative source of information on the issues for the public, state
agencies, legislators, or other interested parties. The mission in instruction is primarily
graduate education and training to prepare scientists to work in this important aspect
of environmental science.

At Florida State University, the Center for Biomedical and Toxicological Research
forms the administrative hub for interdisciplinary research on ecological effects of
marine pollutants, effects of toxic organic substances in the environment, effects of
heavy metals, pesticides, and other pollutants on aquatic systems, etc. The center has
provided the Florida Departments of Health and Rehabilitative Services and Environ-
mental Regulation with health risk assessments of carcinogenic and toxic chemicals in
ground water. That center also has a mission in graduate education.

At the University of South Florida there is a large and growing Medical Center, a
newly established College of Public Health, and a close working relation with the VA
Hospital all of which form a strong base for their Florida Toxicological Research Center.
The missions of that center are basic research into the toxic chemicals present in Florida
and investigation into alternative chemicals and processes to presently used hazardous
chemicals, and to provide technical support for Florida state agencies with analytical
expertise and scientific consultation.

In recognition of the serious nature of the threat by chemical pollutants to Florida's
water supply and to the welfare of the citizens of the state, the legislature in 1984
provided a statutory basis for a systematic state-wide research program on those mat-
ners.

The Law of Florida, Chapter 84-338, Section 72 charges the Center for Biomedical
and Toxicological Research at Florida State University, the Institute of Food and Ag-
gricultural Sciences (IFAS) at the University of Florida, and the Florida Toxicological
Research Center at the University of South Florida to increase their research on chem-
icals that may adversely affect human health and the environment, and to do so without
unnecessary duplication of effort.

To ensure maximal contribution of these programs to the state, Section 73 of the
law established the Toxicological Research Coordinating Committee (TRCC) made up
of representatives of the three universities, and representatives from other appropriate
universities as recommended by the Board of Regents. The Committee is chaired by
the representative of the Center for Environmental Toxicology. The Committee is
charged to ensure efficient use of the state's resources, and toward that end, to meet
at least once a year to review research, develop activities, and establish priorities as
determined by state needs. The Committee is to submit annual reports concerning the
activities of each participating university and short- and long-range plans of each for
protecting human health and Florida's environment. The report shall be submitted on
March 15 to the Governor, the President of the Senate, and the Speaker of the House of
Representatives.

Section 74 of the law calls for submission of reports from participating universities
to the Toxicological Research Coordinating Committee on:

1) Chemicals that may affect human health and welfare, including epidemiological
studies.

2) Analytical methods, environmental fate and transport, and toxicology.

3) Environmentally safe methods to control pests other than through the use of
chemicals.

The Committee in turn is to provide risk assessment analysis to the Department of
Agriculture and Consumer Services, the Department of Health and Rehabilitative Ser-
dvices, the Department of Environmental Regulation, and Pesticide Review Council. It
must recommend standards of safety for chemicals in the environment, and perform
other functions necessary to carry out the provisions of the law. Section 75 of the law
mandates the creation of a data bank on environmental toxicology research results in
the Center for Environmental Toxicology in IFAS. Each participating university is to provide results of completed research on environmental fate and transport and toxicology to the data bank. Although not specified in Section 70, the provisions of Section 74 imply that reports should also include results on environmentally safe methods to control pests other than through the use of chemicals. On September 30 of each year, IFAS is to publish a listing of publicly available studies in the data bank. The list must also be issued to the Department of Agriculture and Consumer Services, the Department of Health and Rehabilitative Services, the Department of Environmental Regulation, and the Pesticide Review Council.

Unfortunately, the legislature was guilty of an oversight. The law was enacted without funding. Research relevant to the law has been funded by limited amounts of general review and by extramural funds of various kinds. In all cases, these funds are inadequate for, or contractually restricted from supporting the expanded research mandated by the law.

During the 1985 legislative session the oversight of last year was corrected by the provision of $750,000 from the Water Quality Trust Fund to support this state-wide program. That funding is not assured for next year, however. In spite of that, the Toxicological Research Coordinating Committee is proceeding with plans for the development of the Data Bank and with specific research projects selected from a list of high priority issues developed by the Department of Environmental Regulation, the Department of Agriculture and Consumer Services, and the Pesticide Review Council. Requests for support from general revenue for continuation of this support will be coordinated next year during the legislative session.

It cannot be argued that a groundwater contamination crisis exists in the state of Florida as a whole. The citizens of Fairbanks, Florida, however, whose well field was made unusable as a source of drinking water by contamination with toxic chemicals from a mismanaged chemical dump, have already lived through a crisis. That problem is being solved by extending the Gainesville water system to Fairbanks at a cost in excess of two million dollars.

The Florida Department of Health and Rehabilitative Services has been analyzing well water, mainly from drinking water wells, for the presence of ethylene dibromide (EDB) in areas where that chemical has been used for nematode control. As of June of this year, 9,208 wells had been analyzed and 1,019 (11%) of them were contaminated with ethylene dibromide in excess of the 0.02 parts per billion action level established by EPA. In fact some wells contained 600 to 700 parts per billion of EDB and the average among contaminated wells was 6.5 parts per billion. The owners of those wells face reduced property values and the inordinate inconvenience of relying on bottled water for household use. The state of Florida has assumed responsibility for some of these contaminated wells, and it was estimated in 1984 (DER, 1984b) that it would cost the state $4.9 million to meet that responsibility. At the time of that estimate, however, solutions to the problem were in terms of possibilities only and included carbon filters, new wells, and connection to community water supplies. It is probable that the ultimate cost to the state will be much greater than that estimated.

Data is still being collected by state agencies and Union Carbide Corporation on the extent to which aldicarb (Temik) has intruded into groundwater in areas where it has been used.

The Florida Department of Environmental Regulation is monitoring 402 sites at which hazardous wastes are being generated (DER, 1984a). Groundwater contamination in excess of adopted standards, or in some cases by specific contaminants for which standards have not been adopted, has been confirmed at 119 (30%) of those sites. Furthermore, according to DER all 654 of the chemicals on the EPA hazardous materials list are to be found among hazardous wastes produced in Florida.
Within the constraints of presently available technology, the contamination of wells with ethylene dibromide is for practical purposes irreversible in situ. That is true also of wells or aquifers that have become contaminated with gasoline, as happened recently in a small community southwest of Gainesville, or with other toxic organic chemicals. Except for activated carbon filtration there are no other proven cost effective technologies for the homeowner or community to purify water that has become contaminated with these chemicals.

Much of the ground water contamination that has occurred in Florida has been due to mismanagement and irresponsibility. However, the unavailability of cost effective technologies to dispose of hazardous waste means the accumulation of large amounts of these materials in storage and increases the probability of accidental or purposeful illegal disposal of them.

In any event, the need for research and development in these and related matters, as mentioned earlier, is obvious. A basis for that research has been established in law and in program development at the universities. Fruitful results and real benefit to the state will come only with realistic support for those programs. That support will be sought from various sources; but, in the interest of continuity and to assure that urgent matters in the state will be addressed, a significant portion of it should come from the state. Whether or not there is serious intent by the legislature in that regard should be apparent by this time next year.

REFERENCES CITED


