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Chemical Wastes—Illegal Hazards and Legal Remedies

Vast quantities of hazardous wastes have been produced in the United States in the past four decades.[1] The chemical industry is the major source of these toxic materials, and since 1958 the 53 largest chemical manufacturers have disposed of over 750 million tons of unwanted process by-products.[2] Among these discarded substances are carcinogens, neurotoxins, mutagenic agents, and compounds capable of causing reproductive impairment. Their release has until now been largely unregulated either by government or by industry. In consequence, the wastes have been dispersed widely in the environment and also have been allowed to accumulate in an estimated 30,000 to 50,000 disposal sites across the nation.[3] Some of these sites are illegal, many are abandoned, and a few are both illegal and abandoned. They range in size from backyard operations with a few 55-gallon barrels to massive collections of toxins such as the Love Canal, the Valley of the Drums in Kentucky, and the radioactive holding tanks at the Hanford Atomic Works in Washington State.

The health of the public may be seriously jeopardized by toxic chemical wastes, and many of the potential hazards are illustrated in the episode described by Rice in this issue of the *Journal*.[4] Fire is a major danger. Explosions and fires have occurred at chemical waste dumps in Elizabeth and Logan Township, New Jersey and in Chester, Pennsylvania; chemical wastes have ignited in the Cuyahoga River in Cleveland; solvents flushed into sewers have exploded under the streets of Louisville, Kentucky. A particular hazard of chemical waste fires is the formation of toxic combustion products: overheated polyvinyl chloride (PVC) evolves hydrochloric acid;[5] acrylonitrile produces hydrogen cyanide;[6] polychlorinated biphenyls (PCBs) form tetrachlorodibenzofurans;[7] chlorinated benzenes yield tetrachlorodibenzodioxins.[8] Firefighters, particularly in rural areas, are seldom prepared to deal safely with such fires, and serious episodes of toxic inhalation have occurred among firefighters exposed to burning chemical wastes.[9,10] There exists an urgent, unmet national need for firefighters to be trained and equipped to cope with such emergencies.

Workers other than firefighters may also be injured or made ill as a result of their occupational exposures to chemical wastes. In the routine operations associated with the storage and treatment of discarded industrial toxins, workers may be splashed with acids, exposed by inhalation to solvent and pesticide fumes, or coated with sludges. Those risks are magnified for workers who must investigate or decontaminate abandoned dump sites or participate in emergency clean-up of spills. A first step in the reduction of these occupational hazards will be the identification of the toxic materials to which workers are exposed and the determination of their toxicity. Worker protection can then be designed around a program of appropriate engineering safeguards such as remote control handling devices, reinforced bulldozers with sealed cabs, and properly designed landfills; use of personal protective gear should be relegated in routine operations for contact with only the most hazardous materials. In emergency clean-ups, by contrast, or when otherwise it is not possible to inventory the wastes to which workers are exposed, respirators and impervious clothing must become the mainstays of protection. Such equipment is, however, always a poor substitute for engineering safeguards. Respirators may malfunction,

and suits may be dissolved by corrosive chemical toxins. Workers who must wear impervious suits are at heightened risk of heat exhaustion.[10] The workforce engaged in the clean-up of hazardous wastes will increase greatly in size in the next decade. Research is badly needed to develop better engineering controls and personal gear for protection of the health and safety of this expanding group of workers.

Contamination of ground water is a long-term hazard of the uncontrolled release of toxic wastes into the environment. Pollution of a major aquifer was narrowly averted in the episode described by Rice.[4] Elsewhere, in less fortunate circumstances, pesticide intermediates have been found in groundwater near a dump in Hardeman County, Tennessee;[1] trichloroethylene has appeared in high concentrations in wells in Montgomery County, Pennsylvania following a discharge at a metal pipe manufacturing plant;[11] after a spill from an overturned railway tank car, phenol appeared in wells in rural Wisconsin.[12]

Surface waters also may be contaminated by the release of chemical wastes. Examples include contamination of the Coosa River in north Georgia and of the Hudson River with PCBs; contamination of the Tennessee River near Triana, Alabama with DDT;[13] and contamination of the James River and Chesapeake Bay with kepone.[14] When poorly degradable compounds are involved in such episodes, the contamination will persist for decades.

The general public may be exposed to toxic chemical wastes through inhalation as in the Colorado episode, or through ingestion of contaminated food or water. Persons near dump sites are at particular risk of exposure. Families living near the Love Canal, for example, were exposed to lindane and organic solvents which have overflowed the canal. Factory workers in plants adjacent to the Hyde Park Landfill in Niagara Falls were exposed to airborne lindane, mirex, and dioxins.[15] Assessment of the health effects of community exposures to toxic chemical wastes is difficult, because exposures are usually lower than those of landfill workers, and the effects may be subtle and delayed in their onset. Epidemiologic evaluations of such exposures must therefore be carefully targeted and linked to the results of environmental studies which can provide data on external dose. More sensitive and specific indicators are needed to identify the early manifestations of neuropathy, renal and hepatic dysfunction, and reproductive impairment in members of communities exposed to chemical wastes.

Prevention of unsafe releases of toxic wastes will clearly be the most efficient means of reducing the hazards associated with exposure to such materials. Recycling must be encouraged, and when disposal is the only option, it must be accomplished by environmentally sound techniques. The recently passed Resource Conservation and Recovery Act (RCRA—PL 94-580) is intended to achieve those goals. This Act envisions a scheme of "cradle-to-grave" safeguarding of toxic chemicals as they move through commerce; it strictly regulates chemical dumping according to the toxicity, reactivity, flammability, and corrosiveness of each chemical to be discarded.

While the Congress recognized that such safeguards will increase the costs of disposal, those costs may provide an incentive for more innovative reuse of chemicals. An unfortunate consequence of the Act, could be an increase in the frequency of illegal dumping. The dangers to the public of widespread secret disposal are self-evident, and the practice must be vigorously combated.

It is hoped that future clean-up of hazardous wastes released into the environment from fires, spills, and improper disposal practices will be assisted by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (PL 96-510), also known as "Superfund." This recently enacted legislation authorizes immediate governmental response to actual or threatened releases of hazardous substances, unless prompt and proper clean-up is undertaken by the party responsible for the release. The Act envisions both permanent clean-up of wastes as well as temporary and emergency response actions.

The Superfund Act attempts to assure that sufficient resources will be available to cover the costs of governmental response, environmental assessment and restoration, public health evaluation, and worker protection. It creates a $1.6 billion fund which is financed primarily by taxes on the production of hazardous materials. The polluter has initial liability under the Act without regard to fault, but if the polluter cannot be ascertained or is not willing or able to pay costs within 60 days, claims can be brought against the fund.

While Superfund gives primary responsibility for action to the federal government, it recognizes that certain states and municipalities may have the capability to respond immediately to releases of hazardous wastes; accordingly, the Superfund legislation is not intended to preempt state action. Under the Act, the federal government is required in the event of a toxic release to consult with state officials on response strategies. If the federal government determines that the state can accomplish the necessary clean-up, it can delegate some or all of its responsibility to the state through a contract or cooperative agreement; this delegation also confers the right to make claims against the fund.

Had the Superfund legislation been in existence at the time of the Colorado incident described by Rice, it would have been possible for the state or federal government immediately to initiate emergency clean-up activities at the site and in the surrounding community. The course of the response would not then have been dictated by the slow pace of legal wrangling over liability, sources of funds, and compensation, but would instead have been guided by medical and scientific necessity. To be sure, there will forever be wrangling over liability and compensation under the complex and vague Superfund claims administration procedures. However, the primary objective of the Act is the protection of human health and of the natural environment, and attainment of those objectives would have received first consideration.

Also in the Colorado episode Superfund would have authorized the study of potential long-term adverse effects of the fire on both the natural environmental and public health. Such evaluations would have been especially important in this incident, because the neighboring community was ex-

posed to unknown quantites of exceptionally hazardous pesticides and chemical by-products.

The dangers now apparent from unregulated chemical disposal are only a foretaste of hazards yet to come. If we do not take seriously the warnings afforded us today, we can expect far worse fires, loss of life, and contamination of our natural resources in the future. The provisions of RCRA and of the Superfund must be vigorously enforced. Even if no further indiscriminate releases of chemical toxins are allowed to occur, there are already in our environment sufficient quantities of hazardous wastes to provide a legacy of disease and death to our descendants for generations to come. We have not been wise stewards of our planet.

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How Much, For What, and For Whom?

Trying to make sense out of long-term health care policy and research is a little like playing Steve Allen's game, "the question man." Steve would sit solemnly (if only for an instant) behind a desk reading answers that had been supplied to him. His job was to come up with the question to the answer. Sometimes the results were very funny.

In long-term care we have the answer—a coordinated, comprehensive system of services which is case-managed and cost-effective. Now what is the question? There are a number of candidates: How can the cost of long-term care services be controlled? How can families be helped so that they do not give up caring for a disabled older person? How can an older person's functional abilities be maintained and/or enhanced? How can this country care for a growing population of very old women? (This latter question may actually be the one for which we should seek answers.)

A good deal of research has been conducted around this answer in the last few years by the Health Care Financing Administration, the Administration on Aging, and the National Center for Health Services Research—and the results are now becoming available.[1-5] These results, however, do not give the definitive findings one would like for undergirding social policy. The article on Triage in this issue of the Journal is a good example of the kinds of difficulties we face in long-term care research.[6]

The most obvious conclusion of the Triage article is that it cost Triage more money for, essentially, the same outcome as the comparison group—no difference. The article claims that Triage had an effect on MSQ (mental status quotient) scores. This is, suspect, however, as it applies only to those persons who had a maximum MSQ at entry. The baseline of the two populations differed significantly on this variable. For those clients with less than the maximum MSQ (presumably a target of potential social intervention), it was the comparison group that deteriorated more slowly.

Results on the use of institutions were mixed. During one year Triage does better, while the next year it is the comparison group that does better. Both service costs and service utilization are higher for the Triage group than for the comparison group, and this is without including the costs of the Triage case management system.

The Triage results will not come as a surprise to anyone following the experience of recent long-term care demonstrations. Some of the research will confirm the Triage findings, other research will contradict it. These contradictions may be the result of the types of measures utilized, different program designs, or types of research objectives. It may be that all the long-term care demonstrations are attaining very important objectives that just have not been measured. For example, families receiving some help may