Dioxin's Uncertain Legacy

Animal studies indicate dioxin's toxicity, but clinical data are lacking; this uncertainty compounds the problem of what to do with contaminated sites

An article in last week's issue examined how up to 100 sites in Missouri became contaminated with dioxin. Federal and state officials are now faced with difficult decisions on how to reduce further hazards to human health.

Times Beach, Missouri. A weary-looking Douglas King sits near a space heater in the office of the Easy Living Mobile Manor here and notes that since he moved to this blue collar town 10 years ago, four of his dogs have met with mysterious deaths. "They looked like they starved to death," King says. "But I ain't blamin' dioxin." Then he adds that he is concerned about the future health of his two teenage daughters. "But what can you do?" he asks in frustration and bewilderment.

Twelve years ago, waste oil polluted with the extremely toxic chemical dioxin was sprayed along many of the town's roads to control dust. But the contamination was only discovered in December. King is among the 800 families here who are asking rhetorical, yet very real questions about their future in Times Beach. They want to know whether their health has been endangered by dioxin. They want to know if their neighborhoods will be a safe place in which to live. They want to know if dioxin can be eliminated from their community. Or will Times Beach turn into a ghost town?

State and federal officials, to their own frustration, lack clear, precise answers. In terms of health effects, the data available can only provide a qualitative sense of the hazard. Animal studies show that the dioxin isomer found in Times Beach—2,3,7,8-tetrachlorodibenzodioxin—is a potent carcinogen and a teratogen. But good clinical data are scant. Nevertheless, scientists at the Environmental Protection Agency (EPA) wrote in an agency handbook called "Dioxins" that "The slightest trace of 2,3,7,8-TCDD in the environment may have adverse effects on the health of both human and animal populations."

The problem is magnified by the fact that it is exceedingly difficult to rid the environment of dioxin which is chemically very stable. If, as some officials believe, Times Beach is still widely contaminated with up to 100 parts per billion (ppb) of dioxin in the soil, cleanup will pose enormous problems. The Centers for Disease Control (CDC) recommends that human exposure be restricted to less than 1 ppb. Preliminary results from soil samples taken after the flood are to be released in early February.

In the absence of solid data on human exposure to dioxin, CDC officials wrestled with what to tell beleaguered Times Beach residents, already psychologically stressed from the flood disaster. Short of barricading the town off, authorities urged citizens not to go back to their homes. They then issued a long list of precautions for residents who insisted on returning to salvage their sodden belongings. But many, if not most, of the 300 families who returned have not heeded the advice. While EPA technicians slog through the silt in protective clothing and respirators to take soil samples, townspeople can be seen working with their bare hands and without face masks.

Gary Stein, CDC's field coordinator at Times Beach, says, "We're in a gray zone, because the data aren't available to give precise risk estimates." But results from animal and occupational studies give plenty of reasons to support CDC's cautious position.

The animal studies show dioxin's power as a poison. For example, a single oral dose of 0.8 microgram could kill a 14-ounce guinea pig. A small minnow called a mosquito fish is even more sensitive, showing toxicity at 3 parts per trillion.

The EPA dioxin handbook notes that under chronic conditions, the chemical has an "extremely high potential for producing adverse effects. . . ." In one study, rats that ingested 5 parts per trillion of dioxin daily developed cancer after a year and a half. Other experiments have shown marked increases in liver tumors. Dioxin is a tumor promoter as well.

Other chronic effects in animals also make the chemical very worrisome. Several studies in rats and mice have shown dioxin to be teratogenic at incredibly low doses. It affects animals' blood, causing anemia in rhesus monkeys and lowering the number of white blood cells in mice.

Some of the acute and chronic effects seen in animals have also been observed in humans, many of whom were victims of chemical plant accidents over the past three decades. Awareness of the compound's toxicity increased substantially when a chemical plant exploded in Seveso, Italy, in 1976, spreading dioxin dust over 250 acres.

The most obvious and frequent acute symptom of dioxin exposure is chloracne, a severe form of acne that is often disfiguring. According to Renate Kimbrough, a CDC epidemiologist, there is no good treatment for the skin disorder, which may persist for years. But it is an "erroneous assumption," she says, that dioxin exposure always results in chloracne. Other signs of exposure include lassitude, headaches, impotence, loss of weight and hair, anorexia, severe liver damage and nerve disorders.

Epidemiologists, have not yet confirmed dioxin as a cause of cancer in humans. They are, however, seriously concerned that there may be a correlation between dioxin and sarcomas, a rare cancer. A study by Swedish researchers in 1978 reported a five- to six-fold increase in sarcomas in workers exposed to herbicides. The National Institute for Occupational Safety and Health has begun two studies that may shed further light on a possible link. One is examining the causes of death in about 3000 workers involved with the production of the herbicide 2,4,5-T and other chemicals in which dioxin is an unwanted byproduct. Results are due in 1985. Another study is investigating whether the pathology of sarcomas in seven chemical workers reportedly exposed to dioxin has similarities. This study is to be completed within a year.

Given the lack of data on chronic exposure to humans, public health officials are hesitant to draw any conclusions about the future health of Times Beach residents. Kimbrough notes that at Seveso, workers were exposed to a cloud of dioxin. At Times Beach, the dioxin was found in the soil, to which it clings tenaciously. There is little data that reveal how dioxin, bound to soil particles, is absorbed by the body. EPA and CDC scientists say that this kind of data will be very difficult to obtain. Meanwhile, CDC is conducting some preliminary health surveys of Times Beach residents.

Environmental officials face perplexing problems as well. If soil samples show similar levels of contamination that were present before the flood, they will probably have to clean up at least part of Times Beach. During the early 1970's,

scientists believed that the half-life of dioxin was 1 year, but that proved to be wrong. The half-life is now estimated to be up to 10 years. Given its stability, officials may have to treat or excavate potentially thousands of tons of contaminated soil.

Paul E. des Rosiers, a leading expert at EPA on treating dioxin, indicates that few options are available. Italians at Seveso and at least one American firm successfully treated areas of contamination by subjecting them to ultraviolet light in the presence of a hydrogen donor. (The ingenious Italians used a rather abundant hydrogen donor: olive oil.) Treatment by photolysis, however, is only effective at the surface; the contamination at Times Beach apparently extends well beneath the surface.

Des Rosiers says that incineration may prove to be the only good way to eliminate dioxin but the technology is limited to dioxin-laced liquids. Again, Times Beach loses out.

The most practical and economical method to clean up dioxin, he says, is to take the contaminated material to a certified landfill. But this solution has already proved to be fraught with political problems. Landfill disposal may also be impractical for Times Beach, given the immense amount of soil that would have to be moved.

An internal EPA document stated the need to strive for imaginative solutions. Referring to another dioxin-contaminated site in Missouri known as the Minker-Stout site, the document suggested that the area be purchased and then "should be considered for re-sale as a H.W. [hazardous waste] landfill after clean-up." Times Beach residents are unlikely to find that a satisfactory solution.

—MARJORIE SUN

Nestlé Letter Stops NIH Talk

The Nestlé Company, according to officials at the National Institutes of Health (NIH), used its clout to get NIH to drop a discussion of the infant formula dispute from a symposium on bioethics in January. Nestlé charged that the speakers were biased against industry. Several participants in the symposium saw this as a bad precedent, for they believe NIH leaders bowed to political pressure. One angry staffer said, "This decision goes to the heart of the principles of scientific freedom and open discussion."

The meeting, which began on 10 January, was a 2-day course on ethical dilemmas, part of an in-house education program called STEP, the acronym for Staff Training/Extramural Programs. It was a closed session attended only by NIH staffers. The attendees discussed in vitro fertilization, extraordinary life-sustaining techniques, and genetic screening in the workplace. But scheduled talks on the infant formula controversy were canceled at the last minute.

Nestlé at first agreed to participate, later withdrew, and finally sent a letter to Health and Human Services Secretary Richard Schweiker protesting that the symposium was "thoroughly slanted against either the administration, the infant formula industry, or both." The letter was mailed on 5 January, with copies sent to David Gergen and Edward Rollins at the White House. On 7 January, 72 hours before the meeting was to begin, the segment on infant formula was canceled.

The decision was made by Thomas Malone, deputy director of NIH, and William Raub, associate director for extramural research and training. Raub says he only wanted to postpone the meeting until an industry spokesman could be found, but this is not the message NIH staffers received. They understand that the symposium will not be held. One of the disinvited speakers, Patricia Young of the United Presbyterian Church, also says she was told the symposium has been canceled. NIH simply told her to send in a copy of her prepared speech, and she would receive an honorarium, she says.

John Mongoven, vice president of the Nestlé Coordination Center for Nutrition in Washington and author of the letter to Schweiker, says he took pen in hand simply to explain why his company had decided not to participate. The meeting was "stacked," he says. In his letter, he criticized the choice of a "leading political activist" as one speaker. This was Edward Baer of the Interfaith Center for Corporate Responsibility, a New York group that lobbies against the marketing of infant formula. Mongoven wrote: "Mr. Baer's credentials include no scientific or professional expertise in the field, in our opinion, and represent only a long history of anticorporate activism."

Young, who was scheduled to give the history and background of the controversy, is described in Mongoven's letter as "a non-scientist whose only significant experience is as a board member of INFACT, an anti-industry organization which has historically misrepresented the facts in this issue in general and our company's policies in particular." Mongoven enclosed an article describing Young as a "scourge of the multinationals." He ended by suggesting that NIH had replaced Reagan Administration policy with a "policy of bias against industry."

According to NIH staffers, the meeting was not intended to be a debate on infant formula, but a discussion of ethical conflicts and lessons to be learned from the 10-year controversy. Planning for the meeting began in July. Most infant formula makers declined to participate, according to the symposium's organizers. Nestlé, the sole exception, agreed to send a speaker. Then, 10 days before the event, Nestlé pulled out because no other industry speakers were appearing and because Young was giving the "overview" speech. (A talk on the government's role was to be be given by John Bryant of NIH.) The sponsors, determined to salvage the event, called on Carol Adelman, an Agency for International Development official considered sympathetic to the industry's point of view, to serve in Nestlé's place. She agreed. Still annoyed, Nestlé protested to Schweiker, and the meeting was canceled.

Was the discussion censored? "I can assure you that we don't feel stifled," Raub says. "What seems to have happened is that a tentative consensus on the panel fell apart at the 11th hour. Faced with the decision of whether to go ahead with a flawed configuration of speakers or to eliminate that one element [on infant formula], it seemed best to defer that element until later." Now, he says, NIH is trying to decide whether it makes sense to reassemble the entire group to include the discussion of infant formula, one of four ethical cases examined.—ELIOT MARSHALL