
Item ID Number 00394

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Report/Article Title Dioxin Toxicity Data Sent to Aid Italy

Journal/Book Title Science News

Year 1976

Month/Day

Color []

Number of Images 1

Description Notes Alvin L. Young filed this item under the category "Human Exposure to Phenoxy Herbicides and TCDD"

Dioxin toxicity data sent to aid Italy

A vat overheated and the safety valve blew in an Italian chemical factory last July. A cloud, containing over two pounds of the most toxic synthetic chemical known, contaminated a cone-shaped area of several hundred acres. In the weeks after the accident, about 50 people were hospitalized and symptoms of toxicity were treated in more than 250 others. Over a thousand small animals in the area died.

Since July, hundreds of people have been evacuated from Seveso, an area near Milan. Italian authorities now still must decide if and how to try to return the region to normal life.

Replacing the top layer of soil in the contaminated area may be a feasible solution, according to a report recently sent to Italian health officials by Barry Commoner and Robert E. Scott of the Center for Biology of Natural Systems at Washington University in St. Louis. Commoner and Scott collected data from two American experiences with the toxic chemical involved, dioxin (2,3,7,8-tetrachlorodibenzo-*p*-dioxin, also called TCDD).

Dioxin is an unintentional byproduct of the manufacture of trichlorophenol. The Italian plant shipped trichlorophenol to Switzerland and Clifton, New Jersey, to be made into hexachlorophene for antibacterial soap.

In one American precedent to the Seveso accident, soil of four horse arenas in rural Missouri was accidentally contaminated with dioxin in 1971. The soil had been sprayed with industrial waste oil from a trichlorophenol plant. The amount of contamination in the arenas was similar to that in Seveso.

Commoner and Scott collected the reports on this incident. Dioxin was still detectable after three years in an undisturbed arena, but was undetectable in two other arenas where about 12 inches of contaminated soil had been removed and replaced. The reports describe death of small animals and illness of horses and people. The most severely affected humans were children who played in the soil. Symptoms included urinary tract bleeding, gastrointestinal illness, chloracne and headache. Among the horses there was also a high incidence of spontaneous abortions and birth defects.

Other observations of dioxin in the environment come from the Air Force. Trichlorophenol contaminated with dioxin was used to manufacture the herbicide 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), which was sprayed in Vietnam. Between 1962 and 1964, the Air Force released herbicide contaminated with dioxin in a Florida test area during trials of spray equipment. When use of 2,4,5-T was prohibited, the Air Force began additional studies of the degradation of the herbicide constituents, including dioxin, to aid in

disposal of the remaining 2.3 million gallons of herbicide.

These Air Force studies found the half-life of dioxin to be 190 to 330 days. According to the reports, dioxin is not moved in the soil by either water or diffusion. Thus degradation of dioxin in the soil at Seveso would require seven to fourteen years before reoccupation could be safely undertaken. But despite heavy rainfall, dioxin will probably not spread into the groundwater or to other regions. This immobility supports the feasibility of replacing the upper layers with uncontaminated soil as an effective way of rapidly reducing human contact with the chemical.

The Air Force studies also looked at the

effects of herbicide constituents on wildlife around the spray-testing site. The concentration of dioxin there is only about a thirty thousandth as great as the concentration in the most contaminated area at Seveso. Commoner and Scott report that the studies showed dioxin concentrated in the livers of mice, meadowlarks and sunfish. Beach mice had enlarged livers and spleens and also a decreased number of fetuses, indicating either reduced fertility or early fetal death.

Detoxification studies are complicated by the absence of a simple, rapid method of measuring dioxin. Detection now requires a combination of gas chromatography and mass spectroscopy and may take a month, Commoner says. So far studies provide no guide to effective methods of decontaminating buildings and equipment. □

Clicks hasten quail egg hatching

Eggs in the nest can be a noisy lot when hatching time approaches. The last day before hatching, the embryos of birds such as chicken, duck, bobwhite and Japanese quail make clicking sounds as they breathe. These noises and other prehatching vocalizations seem to be essential for normal communications between mother birds and their young (SN: 10/21/72, p. 264).

Clicks, as communication among the eggs, now have been given a role in controlling development. The egg sounds seem to influence final maturation of quail embryos and to synchronize their emergence from the eggs.

The timing of egg hatching is important for many species of birds whose nests are on the ground and whose offspring hatch already well-developed. Synchronous hatching of eggs reduces the time parent birds must spend trying both to incubate eggs and to protect and feed the mobile hatchlings.

Artificial clicks, 37-millisecond bursts of broad-band noise, presented to quail eggs from a loudspeaker can influence the hatching time. Nigel K. Woolf of Johns Hopkins University Medical School, John L. Bixby of the California Institute of Technology and Robert R. Capranica of Cornell University report that the hatching time of quail eggs was advanced when the eggs were stimulated with synthetic clicks for two hours during the final three days of incubation. This period included time before and after most quail embryos first crack their shells.

The earliest hatching, about a day before the normal time, was observed when the eggs were acoustically stimulated on the 17th day of incubation, two days before normal hatching. Clicks presented to embryos less than 14.5 days old had no effect. The researchers suspect embryos are unable to hear the clicks that early in development.

If an embryo that had not been exposed

to the clicks was removed from its shell a day early, it would not be fully developed and could not survive. The quails that hatch early after the click stimulation, however, are not premature by any physiological or behavioral measures.

"Since the time of hatching can only be changed if the developmental sequence leading to hatching is also changed, it follows that the acceleration of hatching time is the result of accelerated embryogenesis," the researchers write in the Nov. 26 SCIENCE. "This report provides, to our knowledge, the first unequivocal evidence that the rate of development of a vertebrate embryo can be affected by brief exposure to sensory stimulation during the prenatal period." □

Temperatures down

The Commerce Department's quarterly long-range weather forecast was issued some two weeks early this fall at the request of the House Subcommittee on Energy and Power. The reasons are not hard to find; an unusually cold fall has raised fears that winter may be particularly bitter this year, occasioning even more spending for expensive foreign oil. The advance report does not allay those fears.

While couching their prediction with odds that would hardly excite a gambler, the meteorologists say the wind patterns that brought chilly northern air down into much of the United States early this autumn now appear to be firmly established. Thus the South, the southern Great Plains and the Ohio valley may expect an abnormally cold winter, while the upper Great Plains, the California coast and the Pacific Northwest should experience warmer than usual temperatures. The confidence levels for these predictions, however, are less than the usual 60 percent, and in other areas of the country the odds for deviation are just too close to call. □