

# CHEMISTRY

## From whence dioxin? Fire or industry?

Minute amounts of chlorinated dioxins, including some of the most toxic chemicals known, form from ordinary combustion processes, say Dow Chemical scientists. TCDD and other dioxins are unintentional byproducts in the commercial production of certain chemicals (SN: 12/4/76, p. 359), including three made at Dow's Midland, Mich., plant. Therefore, the plant was suspected as the source of TCDD found last summer in local river fish.

In a "crash" program to find the source of that TCDD, Dow says it has detected chlorinated dioxins originating from refuse incinerators, fossil-fueled powerhouses, gasoline- and diesel-powered automobiles and trucks, fireplaces, charcoal grills and cigarettes. "We found the Dow pesticide manufacturing facilities are not measurable sources of the trace levels of dioxins found in the fish taken from the river," says Robert R. Bumb of Dow.

A Dow news release says there is no need for alarm over the finding that dioxins are "ubiquitous." Bumb says, "We now think dioxins have been with us since the advent of fire. The only thing that's different is our new-found ability to detect them in the environment."

"There's a lot more different than that," Barry Commoner of Washington University's Center for the Biology of Natural Systems told SCIENCE NEWS. "The chemical industry is producing enormous amounts, and it has already been shown to be harmful." There is evidence linking dioxin with birth defects and with cancer. While Commoner does not doubt that dioxins may be formed during combustion, he believes that the real issue is Dow's interest in playing down the role of the petrochemical industry in dioxin contamination. The Environmental Protection Agency is currently reviewing the permitted uses of herbicide 2,4,5-T, which was used in Vietnam and is contaminated with dioxin. (According to the EPA, 5 million pounds of 2,4,5-T are used in the United States each year.) The agency also plans to examine a common household weed killer that contains dioxin.

## Sprouts recruited in cancer fight

Extracts of sprouts of wheat, mung bean and lentil are being considered as protection against chemically induced cancer. In the Ames bacterial test, a popular indicator of possible carcinogenicity, the extracts reduce the potency of chemicals such as 2-acetylaminofluorene, benzo(a)pyrene and aflatoxin B<sub>1</sub>, Chiu-Nan Lai, Betty J. Dabney and Charles R. Shaw told a recent American Chemical Society regional meeting in Corpus Christi, Tex. All those mutation-causing chemicals require activation by body enzymes. The sprout extracts are ineffective in inhibiting carcinogens that do not need metabolic activation. Extracts from carrots and parsley, which contain less chlorophyll, exhibit less inhibitory activity than do sprout extracts against mutagens requiring metabolic activation. Heating the extracts also reduces the inhibitory effect. The Texas System Cancer Center workers now are examining sprout extract's effect on mice treated with a chemical that produces colon cancer.

## Epoxy resins flunk Ames test

Human exposure to epoxy resins must be minimized to prevent cancer and genetic damage, say a group of investigators from the Royal Danish School of Pharmacy. They report in the Nov. 23 NATURE that three aromatic epoxy resins all cause mutations in bacterial tests. Previous studies have shown that simple epoxides and bifunctional alkylating epoxides also cause mutations and are therefore suspected carcinogens, while most diepoxides are carcinogenic in mice and rats. In 1973, 190,000 metric tons of epoxy resins were used, primarily for protective coatings and in paints and adhesives.

# TECHNOLOGY

## The fringes of scoliosis

Scoliosis is a spine-deforming disease of unknown origin afflicting one in ten children. About 10 percent of all victims need corrective treatment to prevent major spine-straightening surgery; early detection and treatment are the key. Physicists with the Canadian National Research Council's Photogrammetry Section have collaborated with an orthopedic surgeon in the design of a simple, low-cost diagnostic technique, according to NRC's SCIENCE DIMENSION (Vol. 10, No. 3, 1978).



An individual is positioned behind an illuminated screen strung with parallel, uniformly spaced, black nylon strings. Light passing through the screen sets up a pattern of shadows which appear on the back. Called a moiré fringe, the pattern can be photographed and studied. Like a topographic map, the pattern delineates back contours. Patterns of a normal spine will be symmetrical from left to right. Asymmetrical ones (like the picture on the right) indicate a deformity.

Under a government grant, Otal Precision Co. Ltd. of Ottawa has made three improved models from the NRC device and will distribute them about Canada and this country to test their dependability and marketability.

## A shocking approach to tender beef

Tenderness is probably the most important characteristic of meat we eat. Most rank it more important than flavor, juiciness, color and fat content. Now the beef-exporting Australians have refined a method to ensure tenderness, speed processing and cut costs by "stimulating" carcasses for one and a half minutes with low-voltage electricity.

The concept was tried experimentally in this country as early as 1951 and even patented; but it was never used commercially, according to Des Walker, Frank Shaw, Ed Bouton and Peter Harris of the Meat Research Laboratory at Cannon Hill in Queensland, Australia. Unlike those earlier efforts, which Walker says all relied on high voltages — up to 3,600 volts — his program uses low power stepped up from 20 to 110 volts during treatment.

Tenderness relates less to the age of the animal than to the degree to which its muscles contract after death. Hygiene requires chilling beef quickly after slaughter, but chilling leads to "cold-shortening" — meat shrinkage (and hence toughening) due to muscle contraction. To minimize shrinkage, meat is left stretched on the carcass while chilling. Electric stimulation nearly prevents cold-shortening, even in the toughest cuts of meat, and electrically treated meat remains more tender than unstimulated meat, even after aging.

Studies by Walker and colleagues show that tough silverside muscle will contract 1.2 percent when stimulated, as compared with 19.4 percent when unstimulated. Their tests also showed that stimulating reduced the sheer force required to chew it by more than half.

Results are so encouraging that Walker thinks slaughterhouses could even debone meat before chilling without risk of severe shrinkage and toughening. That approach would reduce the space needed to store meat, reduce energy needed to chill it, reduce time used to process it and reduce weight loss from evaporation. A report on Walker's work appears in the September RURAL RESEARCH (published by the Commonwealth Scientific and Industrial Research Organization in Melbourne).