The worse for biodegradation

Nobody wants a pesticide that lingers in the soil, to be absorbed eventually by crops or consumed by animals and humans. Yet biodegradable pesticides are not necessarily an improvement, according to M. T. Stephen Hsia of the University of Wisconsin. A pesticide may degrade into harmful, as well as innocuous, compounds. Hsia reported to the meeting of the ACS last week that a breakdown product of a widely used herbicide appears toxic to animals and people.

Propanil is an inexpensive and relatively safe chemical used to control broadleaf and grass weeds in a variety of U.S. crops. Once in the soil, propanil is metabolized by fungi and then microorganisms to an azobenzene compound, TCAB (3, 4, 3′, 4′-tetrachloroazobenzene). Hsia, who had been evaluating the toxicity of hydrocarbons, says, "I was alarmed by the similarity of TCAB to dioxin, the most toxic man-made chemical and teratogen known." Dioxin (TCDD or 2, 3, 7, 8- tetrachlorodibenzo-*p*-dioxin) is a worldwide environmental pollutant, a contaminant of the Agent Orange herbicide used by U.S. forces in Vietnam and of some chemical manufacturing processes (SN: 12/4/76, p. 359).

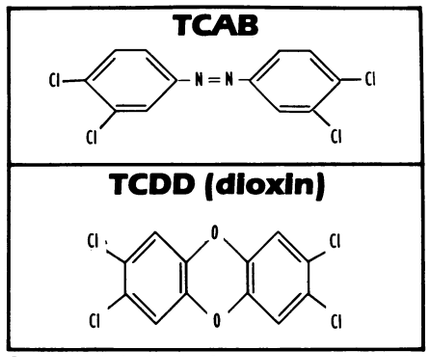
Hsia's concern was reinforced by a report from James Taylor and co-workers at the Cleveland Clinic Foundation. Severe and persistent chloracne had been observed in workers (and their families) at chemical plants that produce TCAB as a contaminant of herbicides or their precursors. Similar skin cysts, papules and scarring are typical of exposure to chlorinated compounds, including dioxin.

To assess health hazards of TCAB, Hsia did a variety of tests. He found that the chemical is more toxic to cells growing in culture than are two major components of PCB's. TCAB is weakly mutagenic in a bacterial mutagenicity test, but appears to be carcinogenic in a test using mouse embryonic cells. Although mammalian cell tests are considered the best short-term test for predicting cancer, Hsia says more definitive evaluations must await completion of long-term animal feeding studies. Hsia also found that TCAB increases the activity of enzymes in the liver that break down foreign compounds, and a TCAB metabolite may be able to bind DNA, RNA and protein and alter their characteristics.

At this time Hsia would not recommend banning propanil, but he emphasizes the need for further evaluation of the activity of its breakdown products. He thinks it will be possible to chemically modify the herbicide to a compound that will not degrade into toxic chemicals.

"TCAB won't be the only [breakdown] compound found with toxic properties," Hsia predicts. "Unless a chemical is converted completely into carbon dioxide and water, it needs watching." Until now chemical companies have met safety requirements simply by measuring the disappearance of the parent compound without regard for the formation and accumulation of products that may pollute the environment and threaten public health, Hsia says. Under field conditions, more than half the propanil can be degraded within 30 days, but the amount converted to TCAB has not been determined.

In addition to evaluating a potential health hazard, Hsia feels that research on TCAB may contribute to understanding of how dioxin acts and, perhaps, to discovery of an antidote. □



Structural similarity between TCAB *and dioxin alerted Hsia to potential hazard.*

DNA guidelines near

More than thirty representatives of public interest groups, scientific associations, government agencies and universities testified last week at a public hearing on the proposed National Institutes of Health revised guidelines for recombinant DNA research. Though most supported the revisions, which have significantly eased restrictions on several types of experiments, opinions were anything but unanimous. The criticisms included:

- Too many (or too few) lay representatives on the local Institutional Biohazards Committees.
- Lack of restrictions on private industry and groups not receiving NIH funds.
- Need to reduce (or increase) containment levels.
- Too much (or too little) control given the director of the NIH.
- Vagueness in describing permissible organisms for research.
- Too little attention to potential hazards to organisms other than man.
- Poor organization, which spreads instructions throughout the documents.
- Failure to specify guidelines for public notification and comment.

The NIH plans to publish its final revisions by mid-November. □

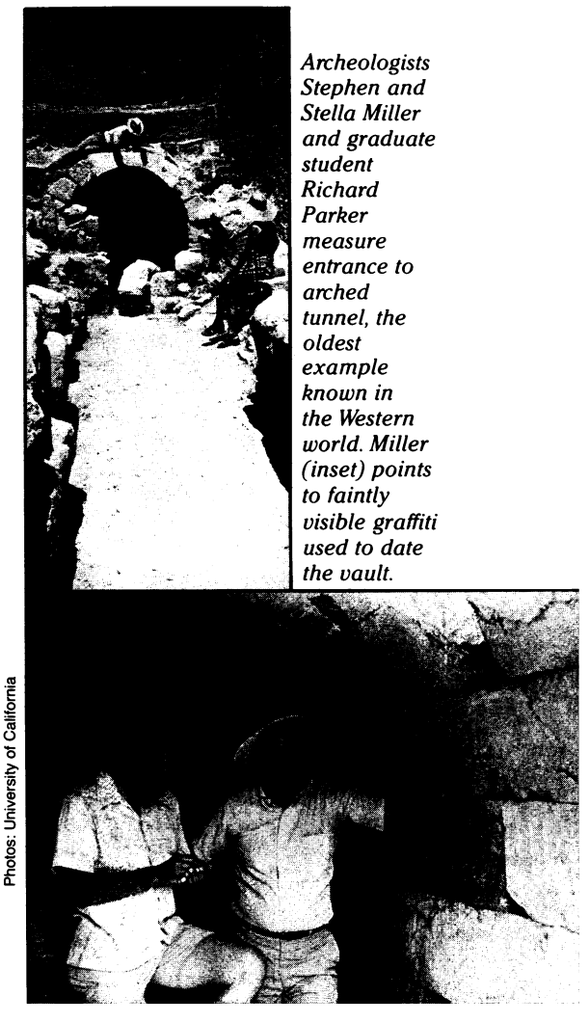
Pre-Roman arch: Ancient locker room?

Historians have generally believed that ancient Romans first introduced the arch to Western building design, thus freeing it from the blocky appearance of the post-and-lintel construction used earlier. But now a team of archeologists has found a vaulted tunnel, whose roof is constructed of wedged-shaped stones fitted together to form a continuous arch, built by Greeks around 320 B.C.

The team leader, Stephen G. Miller of the University of California at Berkeley, says the discovery should lead to some reassessment of the history of architecture: "The Romans get credit for developing the vault in the Western world," he says, "but it's clear now that it was already in use in Greece before the Romans began to use it."

In addition to other aids for dating the structure, including pottery shards, the team found graffiti that included the name of a boxer who is known to have been active before 320 B.C. The tunnel led into the athletic arena at Nemea, and Miller speculates that it may have served as a kind of locker room. "When we brought in lights, we could see the names of athletes scratched on the walls," he recalls. "I got goosebumps just walking in there."

Miller says the tunnel may have been built by the Macedonian workers Alexander the Great had recently taken to Persia, where the arch was already used extensively. □



Archeologists Stephen and Stella Miller and graduate student Richard Parker measure entrance to arched tunnel, the oldest example known in the Western world. Miller (inset) points to faintly visible graffiti used to date the vault.

Photos: University of California

Science Service, Inc. is collaborating with JSTOR to digitize, preserve, and extend access to *Science News*. www.jstor.org