

ENVIRONMENTAL MEDICINE

Vitamin E vs. PCBs

Studies by scientists at the University of Kentucky in Lexington indicate that vitamin E appears to be an effective protectant against damage resulting from exposure to polychlorinated biphenyls (PCBs), toxic chemicals whose manufacture has been banned in the United States since 1977.

Although out of use for nearly 30 years, PCBs still remain the object of intense research interest because of their widespread presence and persistence in the environment. Produced as insulating fluids for electrical equipment and formerly released by industries such as paper mills and electronic equipment factories, PCBs are still found in soils and the sediments of rivers such as the Hudson in New York and the Fox in Wisconsin. The chemicals are also found in the atmosphere, drifting thousands of miles from warm climates and precipitating out into the Arctic region. PCBs are labeled as a probable human carcinogen by the U.S. Environmental Protection Agency and have also been shown to affect learning in both animals and humans. They are absorbed through the skin and can also be part of a meal if a person eats fish that have been swimming in contaminated water. David Carpenter, a professor of environmental health and toxicology at the

State University of New York at Albany, notes that everyone carries around some PCBs in their blood and fat tissue.

The Kentucky group, which includes Bernhard Hennig, a professor of toxicology and nutrition, and Larry Robertson, a pro-



E is for effective. New research shows that vitamin E can protect against damage from PCBs.

fessor of toxicology, has found that PCBs generate oxidative stress, the creation of tissue-damaging free radicals, in endothelial cells. Endothelial cells line blood vessels, and free radicals cause them to become inflamed, one of the early developments leading to atherosclerosis.

The group reported in the August 1995 issue of the *Journal of Biochemical and Molecular Toxicology* that damage occurred when cells in culture were exposed to PCBs for only 24 hours. In the December 1999 issue of *Toxicological Sciences*, they report that the damage can be blocked if the cultured cells are simultaneously exposed to vitamin E.

Hennig says the most recent results have a

clear and immediate message: "Some outreach programs might suggest that people who are at risk [for PCB exposure] take supplements of antioxidants to make them less susceptible to PCB-mediated toxicity," he says, noting that workers who clean up PCB-contaminated sites are one such high-risk group. He endorses the recommendation with no hesitation, even after such a preliminary experiment, because even large doses of vitamin E have not been shown to be harmful.

"[The Kentucky group's] work is really significant in showing that a major environmental contaminant alters the inflammatory system," says Bruce Hammock, a professor of entomology and head of the Superfund Basic Research Program at the University of California at Davis. "[This] is a very interesting finding that has not been demonstrated in most other systems," notes Carpenter, who adds that its newness enhances the knowledge of the impact of PCBs. "It's important because we're finding that PCBs affect organ systems that have not been previously demonstrated to have been altered. Once one finds these effects on different cell types, the question is how are they mediated," he says. Because vitamin E is known to counter the effects of free radicals, the fact that it can block damage helps firm up the idea that the damage is caused by PCB induction of free radicals, thus opening a new window onto the impact of PCBs on the body. —Harvey Black

ENDOCRINE DISRUPTORS

NRC: Not Enough Data

A committee of experts convened by the National Research Council (NRC) at the request of the U.S. Environmental Protection Agency, the Department of the Interior, and the Centers for Disease Control and Prevention has concluded that there is insufficient research, and therefore insufficient evidence, to say whether particular environmental contaminants known as endocrine disruptors, or hormonally active agents (HAAs), may be dangerous to humans and wildlife. A 4 August 1999 report released by the NRC titled *Hormonally Active Agents in the Environment* says it is clear that exposure to HAAs—chemicals that interfere with normal hormonal functions such as behavior, growth, and metabolism—can affect wildlife and human health, but uncertainties lie in not completely understanding their causal mechanisms. In its report, the committee addressed potential harm for developmental, reproductive, neurological, and immune systems. "The field is rife with uncertainty," said committee chairman Ernst Knobil, a professor of biology at the University of Texas Medical School in Houston, in an article in the 4 August 1999 issue of *The New York Times*.

The NRC report states that 70,000 industrial chemicals in use cannot be tested for endocrine-disrupting activity because the necessary tests do not even exist. "Determining what these exposures actually are is therefore of primary importance," says Knobil. The NRC report recommends improved monitoring of the development of

HAAs, studies to determine exposure pathways and background concentrations of HAAs in humans, and initiation of long-term studies of HAA exposures.

The committee concluded that the lack of evidence could not be taken as an indication that HAA exposure is completely risk-free. Although the report clearly states this consensus, it also addresses the disagreements among committee members. "Differences among committee members could be divided among two perspectives on the weight-of-evidence approach," says the report. Some members placed more weight on experimental evidence than others. Members were also divided on the use of the precautionary principle—the idea that in the face of uncertainty the most cautious approach is the best. "The absence of information can't be used to say these chemicals are safe," says committee member Frederick vom Saal, a professor of biology at the University of Missouri in Columbia.

Committee members agreed that wildlife and human populations should continue to be studied for effects including defects in development, declines in fertility, increased incidences of various cancers, and possible population declines in wildlife species.

"Determining the risk of environmental HAAs to humans and wildlife is difficult because exposure to these agents has not been routinely monitored," says the report. "We need to focus our research on the embryo, from conception to birth," adds Theo Colborn, a senior conservation scientist at the World Wildlife Fund. "When studying the research results, once the embryos have reached a reproductive age we are almost a generation late." —Lindsey A. Greene