LETTERS

Kepone: Hazard to Aquatic Organisms

Rudolph J. Jaeger (Letters, 9 July, p. 94) reports the chronology of mammalian toxicity tests with Kepone (chlordecone) and the exposures of workers at the Life Science Products Company of Hopewell, Virginia. Initial concern has properly been focused on the results of toxicity and carcinogenicity tests on rats, rabbits, dogs, and mice and on the disease that Kepone produced in exposed workers. We would like to document our concern about the hazard of Kepone to aquatic organisms in the James River and the Chesapeake Bay.

On-site tests of organisms taken from the James River showed significantly high Kepone concentrations. These tests, conducted at the Virginia Institute of Marine Science and funded by the Environmental Protection Agency (EPA), revealed that concentrations in edible tissues of most fresh and estuarine fin- and shellfish commonly ranged from 0.1 to more than 1 microgram per gram. These concentrations exceeded allowable health limits for commercial and sport fisheries and forced closure of the river to some commercial and sport fishing. This year Kepone concentrations have increased in anadromous fishes as they spent more time in the river.

Further, after laboratory exposures at the EPA laboratory in Gulf Breeze, Florida, we found that Kepone, like other chlorinated insecticides, is highly bioaccumulative and persists in estuarine organisms. Oysters, grass shrimp, and fishes have bioconcentrated Kepone from 425 to 20,000 times the concentration in the surrounding water. Therefore, action levels for edible seafoods now in force might be reached by as little as 5 parts of Kepone per trillion parts of water (nanograms per liter). In Kepone-free water, oysters can depurate about 90 percent of the accumulated Kepone in 4 days, but fish may require more than 3 weeks to lose 30 to 50 percent. Five weeks after fertilization of sheepshead minnow eggs containing Kepone, the juvenile fish retained as much as 46 percent of the Kepone present in the eggs. Kepone can be accumulated by fish to concentrations that exceed those in their food.

Kepone is acutely toxic to estuarine organisms, but long-term bioassays reveal that the hazard to these organisms is greatly underestimated by the 96-hour tests. The concentrations in micrograms per liter, estimated to be lethal to 50 percent of the test animals in 96 hours (LC_{50}), were 6.6 for spot, 70 for sheepshead minnows, 10 for an estuarine mysid, 121 for grass shrimp, and more than 210 for blue crabs. Kepone was lethal to adult sheepshead minnows exposed to 0.8 microgram per liter for 28 days. A significant number of embryos from adults exposed to 1.8 micrograms per liter were abnormal and died. When embryos were exposed to 0.08 microgram of Kepone per liter of water, 36 days later, resulting juvenile fish were shorter than control fish and some exhibited scoliosis. Mysid shrimp exposed for 20 days to about 0.2 microgram per liter produced fewer progeny; with greater concentrations, their growth and survival were reduced. We are concerned because all concentrations tested thus far in long-term exposures of sheepshead minnows and mysids have reduced survival, reproduction, or growth.

The threat of an even greater impact of Kepone to aquatic organisms in the James River and expansion of this impact into the Chesapeake Bay, therefore, is real and it may continue for some years to come. It is essential that we use knowledge now available to attempt to make decisions that may minimize the future impact of this insecticide on the aquatic environment.

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Structured Water or Pumps?

In her reporting of the ion-water controversy (Research News, 18 June, p. 1220), Gina Bari Kolata is to be commended for her attempt to achieve a balanced presentation of opposing views on a hot argument. All the same, rebuttals to some lines of evidence disputed by the ion "pump" enthusiasts were incorrectly represented, while other telling data, rarely considered, did not surface.

According to the *Science* article, critics claiming that pumps are still feasible despite the thermodynamic conflict, continue to cling to the argument that Minkoff and I have not accounted for the radioactive labeling of the cellular phosphate pool even though we have shown that labeling of this pool occurs instantaneously (*1*). That the "pool would limit the rate at which the labeled phosphate would be