Researcher develops bacteria that eat PCBs

By PETER WHELAN

An Environment Canada researcher has developed bacteria that breakdown PCBs, plus a method to help them attack the nearly unassailable chemicals.

The laboratory breakthrough appears to offer hope of better treatment for PCBs —polychlorinated biphenyls— already in industrial use.

However, initial reactions from Canadian and U.S. experts are that it probably will not weaken the international drive to ban PCBs from all use.

The discovery by Dr. Dixon Liu, a research microbiologist at the Canada Centre for Inland Waters in Burlington, was announced yesterday. It has yet to be assessed by his scientific colleagues.

PCBs have been implicated in birth defects, cancer and liver and kidney ailments. The virtual indestructibility that was a strong point in many industrial uses of the chemicals also became a major concern when PCBs escaping to the environment were judged to be dangerous.

Dr. Liu's bacteria helped by ultrasonic sound and a waste chemical from pulp mills, eat PCBs, leaving chemicals which he calls virtually harmless.

However, they attack the PCBs only in concentrations, and could not, for example, be set loose in the Great Lakes to pursue and destroy PCBs already there in this but alarming densities.

If the lab work transfers well to the field, the Liu process might replace the furnaces used to destroy PCBs at 2,000 degrees F, the only practical attack until now.

Ontario Hydro, which ships waste PCBs from electrical transformers to one of the few such furnaces available, near Lewiston, N.Y., might instead develop one or more bacteria feeders. "At least, these would be cheaper," Dr. Liu said in an interview.

The bacteria also might be set loose in sewage treatment plants to destroy PCBs commonly found there from untraceable sources. Dr. Liu's next step is to set up a pilot sewage plant within three months for tests at the Canada Centre.

Dr. Liu said the bacteria also show signs of attacking the pesticides chlordane and lindane, persistent chlorinated hydrocarbons also causing environmental concern. He will explore possibilities in this area too.

He selectively bred pseudomona bacteria, a family found in lake water and soil, to develop a taste for PCBs. Now they eat only PCBs, or starve.

But he needed another breakthrough: a method to let the bacteria really get at the PCBs. The bacteria work only on the surface of PCB globules and the clear, liquid chemical is insoluble in water.

Dr. Liu broke down the globules with ultrasonic sound into smaller droplets, then added a little of the pulp waste, sodium lignin sulphonate, to keep the PCB from flowing back together. The bacteria, turned loose, have much more PCB surface to attack, and do so with gusto.

In one week, a concentration of 200,000 parts PCBs per billion in water was eaten down to 15 parts. The PCB used, Aroclor 1254, is one of the few still in use. It is used as an electrical insulator in most warehouses and widespread in the environment.

Dr. Liu said he has yet to test fully all the byproducts of the bacteria's feeding, but is "pretty sure" they contain no as chlorinated benzene, another contaminant.

Michael Gilbertson, an Environment Canada biologist who heads an Ottawa-Ontario [illegible] from early reports, the Liu process sounds like a useful tool on the way to a total PCB ban. "But I'm not sure we have any change in that basic approach."

Since 1972, use of PCBs outside of totally enclosed systems such as electrical transformers has been halted through voluntary sales restrictions by the chemicals' only North American producer, Monsanto Co. of St. Louis.

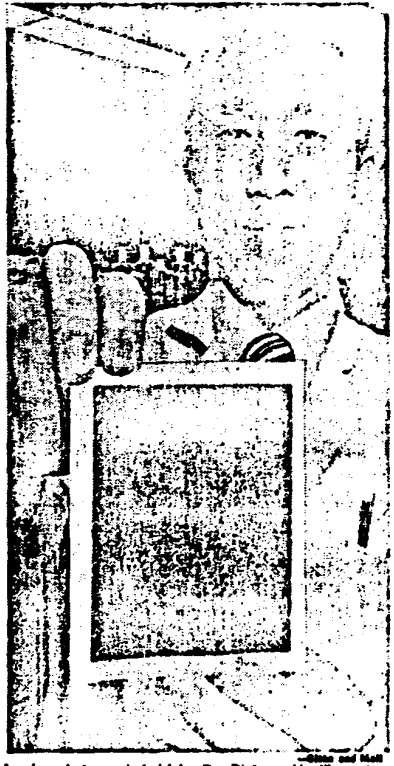
Monsanto has announced plans to stop all production, spurred by notice to industries from the U.S. Canadian and Ontario governments that all PCBs must be eliminated. But a full ban awaits development of electrical insulators as effective as PCBs, a process that could take years.

Treatment of unavoidable PCBs during this period is where the Liu process attracts interest.

A U.S. Government expert on PCBs said in an interview from Washington yesterday he is not excited about "another set of bugs eating PCBs." At least one U.S. company patented anti-PCB bacteria methods in 1973 and 1975. They use different bacteria from the Liu process but immediate comparisons were not possible.

The U.S.results had not cracked any basic problems and he would wait to see the Canadian findings, the expert said.

The U.S. government allows commercial sale of fish containing up to five parts PCBs per million. The Canadian Health Department set an interim limit of two ppm for fish in Canada, in the wake of studies showing that 2.5 ppm caused birth defects in Rhesus monkeys. The Ontario Health Ministry has urged no more than one meal a week of PCB-dosed coho salmon from the Great Lakes for men



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A microphotograph held by Dr. Dickson Liu illustrates the action of a bacteria, he has developed, on PCB.

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