

Can soil bacteria solve PCB disposal problems with bioremediation?

Quebec researchers are trying to turn common soil bacteria into PCB neutralizers. While there are some 209 compounds making up the PCBs (polychlorinated biphenyls), there are currently four natural enzymes that can give bacteria the power they need to at least partially break down 30 or 40 of these compounds.

Dr. Lindsay Eltis, assistant professor of biochemistry at Laval University, leads a team that is examining two of these enzymes. Dr. Michel Sylvestre, biotechnology professor at the Institut national de la recherche scientifique - Santé, in Montreal, heads a team examining the other two. They are assisted by Dr. Justin Powlowski at Concordia University and Dr. Victor Sniekus at Queen's University.



PCB site clean up.

The two teams hope to discover how these enzymes enable bacteria to break down some PCB compounds but not others. After examining the enzymes, the groups plan to modify them so they will be able to degrade many of the other hundred-and-some PCB compounds.

Bioremediation is the process of unleashing living organisms, or their products such as enzymes, onto toxic chemicals. Over thousands of years, bacteria evolve and develop the ability to degrade compounds. The two groups are trying to speed up this process.

PCBs were used in everything from electric transformers, to ink, to cosmetics. They were banned in Canada in 1979 after researchers realized how persistent PCBs really were.

They are also hard to get rid of. PCBs are now burned or buried, but there have been leaks. And if they are not burned at a high enough temperature, that burning can produce toxic by-products.

"But if you use natural bacteria, you don't have to transport contaminated soil or burn PCBs," says Dr. Eltis. "This would cost less and there would be no toxic by-products....In essence, we hope to be able to reduce pollution cleanly and affordably."

The Natural Sciences and Engineering Research Council (NSERC) funds this research, both through a three-year strategic project grant of \$870,000, and through a four-year research grant of \$120,000. Dr. Sylvestre has been working on PCB degradation for over 20 years and says they have been progressing quickly through NSERC funding.

Dr. Sylvestre says once they can show bioremediation works on PCBs, they will also be able to try it on other stubborn and toxic pollutants like polycyclic aromatic hydrocarbons (PAHs) or dioxins and furans. PAH is produced by fuel combustion and is often found in smog. Dioxins and furans are by-products of industrial chemical processes.

Dr. Sylvestre says one way of destroying PAHs would be to put modified enzymes in car filters so the toxic by-products would be devoured before making it out into our air. He says such filters could also be put into factory smokestacks to destroy dioxins and furans. *This article has been abridged.*
