

PESTICIDES SUPPRESS IMMUNE SYSTEMS

Study finds DDT may spur disease

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Scientists have discovered that tiny amounts of cholinergic pesticides, such as Malathion, organophosphates and carbamates [i.e., at trace levels of less than 1 ppm or 75 ppb] can seriously damage and suppress the immune system of amphibians and mammals for several weeks so that they are less able to fight off simple infections from viruses and bacteria.

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-Immunologist Brian Dixon, University of

Waterloo

Frogs given trace amounts of DDT and other pesticides experience a near total collapse in their immune systems, a finding that could help explain the puzzling rise in human autoimmune diseases such as asthma and allergies, according to Canadian researchers who made the discovery.

The scientific team also says the work could shed light on the global decline in amphibians, animals that may no longer have strong enough immune systems to survive exposures to everyday viruses and parasites.

The pesticides had an effect on frogs identical to cyclophosphamide, a drug used on human transplant recipients to suppress their immune systems so they don't reject their new organs.

Frogs and mammals essentially have the same type of immune system, so the finding could have widespread implications for humans, who also have elevated pesticide exposures.

"There is a lot of immune dysfunction going on that could be due to environmental chemicals," said Brian Dixon, an immunologist at the University of Waterloo who worked on the project.

Mr. Dixon said he was "shocked" that negligible amounts of pesticides were so biologically active and could mimic one of the most powerful drugs in the arsenal of modern medicine. "That was the whole take-home message," he said. "The pesticides act exactly the same way as a medical drug they will give to suppress your immune system."

In recent decades, frog species have inexplicably died out in many habitats in which they were

once plentiful, while in other areas they have been suffering from horrific physical defects, such as growing extra limbs.

The findings on immune-system impairment have received peer review and will be published in a research journal later this year.

In laboratory experiments, the team injected northern leopard frogs - shiny, brown-green amphibians common in Canada's swamps and forests - with tiny, sub lethal doses of DDT, dieldrin or Malathion. For comparison purposes, some other frogs were given the immune-suppressing drug cyclophosphamide.

DDT and dieldrin, two deadly insecticides on the United Nations' list of the most toxic substances ever produced on Earth, have been banned in Canada, but they resist decay and continue to be found throughout wildlife in Canada and in human tissues decades after they were in widespread use.

Malathion is still widely used on crops in Canada and for mosquito control. It is often sprayed from planes in large-scale efforts to control mosquitoes, such as recent programs to control the West Nile virus in New York City and to knock down populations of the insect in Winnipeg.

Health Canada's Pest Management Regulatory Agency is reviewing its registration for Malathion, while regulators in the United States have recently given it a clean bill of health for mosquito control.

The pesticide research project was funded by Health Canada and Environment Canada.

The experiments found that frogs injected with DDT, malathion or cyclophosphamide had only 1 per cent to 2 cent of normal antibody production, while dieldrin led to 30 per cent of normal production, two weeks after exposure. It took frogs 20 weeks of living in a pesticide-free environment to have their immune systems return to normal.

In human terms, impaired immune systems could lead to people dying of common colds or other infections that a healthy person would be able to resist easily. Frogs live in bacteria- and parasite-infested environments, and consequently may not be able to shake illnesses because of their weakened immune systems, according to the research.

In their experiments, the researchers also tested wild leopard frogs from a number of locations in Ontario and found major differences in their immune systems, depending on their exposure to pesticides.

Specimens collected near Point Pelee National Park in Southwestern Ontario had weaker immune systems, compared with those from regions of the province, such as around Collingwood, less polluted by agricultural chemicals.

Point Pelee is a DDT hot spot because a children's camp in the park was once heavily sprayed to kill mosquitoes and it lies near one of Canada's largest concentrations of farms. The research project was prompted partly to investigate the mysterious disappearance of leopard frogs in Point Pelee, to see if it was linked to DDT.

Many experiments use exceptionally high chemical doses - hundreds of times normal environmental exposures - to cause deleterious effects, but the frog tests were conducted with doses of less than one part per million, similar to the DDT levels found in many animals.

The dose of one ppm is minute - the equivalent of the passage of only one minute of time over a two-year period. After making their discoveries, the researchers started giving frogs ever-smaller doses of the chemicals to find the level that does not have an adverse effect. With DDT, even as little as 75 parts per billion, a small fraction of what was used in their original experiments, caused immune-system malfunction.

In the 1970s, as DDT use in North America was winding down, concentrations of the chemical in human breast milk ranged from 50 parts per billion to 200 ppb