

## Potato fields, pesticides and Parkinson's

Carleton researcher trying to establish links between weed and bug killers and neurodegenerative disorders

ANNE MCILROY  
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Steve Morris didn't notice his left arm had stopped swinging when he walked; a buddy pointed it out. But his symptoms, including a tremor in his left hand, soon worsened, and by the time the community college teacher went to see a doctor two years ago, he was pretty sure the diagnosis would be Parkinson's disease.

He was surprised, though, by the questions the neurologist asked after delivering the bad news. Had Mr. Morris grown up around farms? Had he ever worked on a farm? Did he ever drink from a well?

The answer to all three was an emphatic yes. Mr. Morris had spent his childhood in Florenceville, the heart of New Brunswick's potato country, and now lives in Woodstock, N.B., across the street from a potato farm. As a kid, he used to run outside to watch the spray planes and he remembers his father having to turn on the wipers to clear the pesticide residue off the windshield. His doctor thought there could be a connection.

"I'm not a neurosurgeon, so I can't find cause and effect. But I grew up surrounded by pesticides," the 52-year-old says.

Mr. Morris was encouraged this week when Ontario Premier Dalton McGuinty announced a ban on the sale and use of domestic pesticides and says it's a sign governments are starting to recognize the risk of using these kinds of chemicals.

While a lot of research on pesticides and disease has focused on cancer, including childhood cancers, there is growing evidence that exposure to weed and bug killers is linked to Parkinson's disease, a neurodegenerative disorder with a wide array of symptoms including tremors, stiffness, poor balance, loss of speech and diminished muscle control.

So far, most of that evidence is epidemiological; studies show that workers exposed to regular low doses of pesticides on the job, such as farmers, suffer from sharply higher rates of the disease.

In his lab at Carleton University, Shawn Hayley is trying to establish how pesticides cause the kind of brain damage seen in people with Parkinson's.

The disease occurs when most of the cells in a part of the brain called the substantia nigra die. Normally these cells produce the chemical dopamine, which allows the smooth, co-ordinated function of the body's muscles.

Obviously, not everyone who is regularly exposed to pesticides gets the disease. Genetics are probably a factor; a number of studies have suggested people with particular versions of a gene involved in dopamine transport may be more vulnerable. Other toxins may also play a role.

When doctors perform a postmortem on patients with Parkinson's, they can find the same kind of damage in almost every patient. The substantia nigra, located in the midbrain, is normally black. In people with Parkinson's, it is white, a sign that dopamine-producing cells have died.

If you give mice multiple injections of paraquat, a commonly used commercial herbicide, they develop a shuffling gait and move around less. When scientists look at their brains, they see the same whitening.

The pesticide activates immune cells in the brain known as microglial cells, Dr. Hayley says. They produce nasty chemical agents that cause inflammation and damage healthy cells.

Once the microglial cells have been activated, he says, they are more sensitive to subsequent exposures to pesticides.

But how does paraquat activate the microglial cells? Dr. Hayley had identified two messenger proteins that are involved. Both are cytokines, which are like orchestra conductors, bringing cells together and telling them how to perform. He also found preliminary evidence that blocking production of these two cytokines limits the damage. His findings could one day lead to drugs - possibly anti-inflammatories - that could protect people at a high risk of getting the disease.

Dr. Hayley gets about 15 per cent of his funding from Parkinson Society Canada and most of the rest from government granting agencies.

His theory is that multiple exposures to pesticides trigger the disease in people who are genetically predisposed to get it.

They are probably most vulnerable early in life, during developmentally sensitive times, he says, or late in life when the body's detoxification systems no longer work that well.

He, too, welcomed Ontario's new ban. It is a good idea to reduce our exposure to pesticides, he says, even if most gardeners use only low levels of herbicides and insecticides.

It makes sense to Mr. Morris, who hopes scientists like Dr. Hayley can figure out what role pesticides play in Parkinson's disease.

"I'm not angry, and I'm not looking to blame anyone. But in my mind, there is a connection."

## Parkinson's 101

An estimated 100,000 Canadians are living with Parkinson's disease, according to the Parkinson Society Canada. Here are a few facts about the progressive neurological disorder:

### AGE RISK

The average age of onset is 60, but it can occur in younger people.

### SYMPTOMS

It affects patients in different ways, but symptoms can include tremors, stiffness and difficulty with balance.

In some cases, the progression is slow, and takes 20 years or more.

Thirty to 40 per cent of patients develop dementia.

### TREATMENT

There is no cure, but a number of medications are available that can keep some of the symptoms, such as tremors, under control.

*Anne McIlroy*

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