

Studies lean towards pesticide safety

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Are lawn and garden pesticides safe?

Take 2,4-D, the primary killing ingredient in popular weed 'n' feed products and spot-spray weed killers. It is the most widely used and most thoroughly investigated herbicide on the planet.

The World Health Organization, the U.S. Environmental Protection Agency, the European Commission and others say there is no conclusive evidence 2,4-D causes cancer or genetic mutations when used according to directions.

Health Canada is about to join that chorus.

After scientifically re-evaluating the potential health risks of 2,4-D for two decades, Health Canada's Pest Management Regulatory Agency (PMRA), responsible for protecting Canadians from excessive risks to pesticides, is poised to announce that 2,4-D and other phenoxy herbicides are safe when handled properly, the Citizen has learned.

But safety is not solely a scientific judgment. Science describes what does and does not happen under certain conditions. Attaching value to that information is a social and political judgment. Whether cosmetic pesticides are the lethal urban menace some portray them to be depends on which side of the debate you stand.

Close to 70 Canadian municipalities big and small have, over the last dozen years, drastically limited non-essential domestic use of pesticides, including herbicides, insecticides and fungicides. Now Ottawa councillor Alex Cullen wants to outlaw non-essential uses here starting next spring. He is joined by Dr. Robert Cushman, Ottawa's medical officer of health.

"We've learned from an earlier generation of pesticides, often we don't recognize the harm until much further down the road," Dr. Cushman says. "Products that are out there on the market today, we don't know enough about them, it's going to take a generation to figure it out."

Mr. Cullen's call to action follows this spring's release of an influential report from the Ontario College of Family Physicians. A team of medical researchers analyzed about 250 previously published epidemiological studies on possible adverse effects of pesticides on human health. They concluded "consistent positive associations" between pesticides, including 2,4-D, and cancers, reproductive problems, neurotoxic effects and other serious illnesses.

The pesticide industry and some scientists and academics accuse the physicians' review of bias. They say it relied on a relatively small number of human health studies that primarily suggested positive associations with pesticides and that it treated pesticides as a homogeneous group. Lumping them all together as "bad," they say, is like saying all prescription medicines are bad.

They believe much of the growing anti-pesticide furor is fear-mongering and falls into the school of thought that believes, if you look for a problem and can't conclusively pinpoint it, maybe there's no problem. (The other school says absence of proof is not proof of absence.)

"Health Canada says that they're safe to use," and the physicians' group is "unnecessarily frightening people," says Debra Conlon, executive-director of the Urban Pest Management Council, part of CropLife Canada, representing Canada's pesticide industry.

She is joined by an increasingly vocal minority of people who work in the health sector who question the need to ban cosmetic uses. Chief among them is Dr. John Blatherwick, medical officer of health for the Vancouver Coastal Health Authority.

"This is not a major health problem," he says flatly. "If you look at all the things that cause illnesses, it's not on the horizon at all. This is just something that people seem to feel. Because it's called pesticide, it must be bad."

There are 525 federally licensed active pesticide ingredients, "and they're regulated as safe to use as approved. So what you've got is municipalities jumping in, no testing, no anything, just saying 'Well, they must be bad,' and banning everything."

Dr. Ray Copes, director of environmental health for the British Columbia Centre for Disease Control, believes the real issue is the overuse of pesticides, especially weed 'n' feed products.

"If you do have a weed problem in your lawn, deal with that, rather than treating the entire 6,000 square feet with one product which contains both fertilizer and herbicide. Selected application of the herbicide to the weedy area makes sense. To argue that 2, 4-D can't ever be used because of possible health risks seems a bit of a stretch."

Ariel Fenster, a chemistry professor and a founding director of McGill University's Office for Science and Safety, says "where we have had problems with pesticides were not for long-term toxicity like cancer, birth defects and the like. They were essentially cases of acute (immediate) toxicity, and that was because of mishandling."

Adds Rob Witherspoon, director of the University of Guelph's Turfgrass Institute and Environmental Research Centre: "It seems to me there's not a lot of logic applied to the anti-pesticide side, looking at the science. We're concerned about applying pesticides on our lawns and our golf course and our parks, but we also apply pesticides on our food and we consume the food." (In fact, the vast majority of pesticides in Canada are used in agriculture.)

Yet it is impossible to ignore the persuasive body of science linking human illnesses to pesticides. What is not so clear is whether pesticides alone are responsible or whether they are just another toxic straw in the heap of chemicals on humanity's back.

Complicating the scientific uncertainties is the divide over which scientific discipline -- toxicology or epidemiology -- should hold the most influence over determining health hazards from pesticides.

The PMRA, U.S. EPA and other leading regulatory agencies rely heavily on the cause-and-effect science of toxicology, of how poisons affect humans and animals. Laboratory rats, mice, dogs and other animals are exposed to enormous amounts of pesticides to determine what levels, if any, cause illness, disease and death.

Epidemiology, meanwhile, investigates the distribution and causes of disease.

Supporters of the toxicological approach acknowledge epidemiology is good for spotting health problems in a given population -- cancer among farmers, for example. But it falls short, they say, in accurately relating an illness back to a specific cause and exposure level.

Was the farmer's disease caused by pesticides -- which one? how much? -- or smoking, air pollution, diesel fumes, wonky genes or a multitude of other factors?

It is like trying to listen to a symphony on the subway. "It becomes very hard to sort out," says Mary Mitchell, a toxicologist in the PMRA's health evaluation division. As a result, she says, the physicians' review of epidemiologic studies, "made very few linkages to specific pesticides.

"And for specific pesticides where they did make linkages, for example 2,4-D, all I can say is every regulatory agency in the world has looked at toxicology data and most of them have also looked quite thoroughly at the epidemiology data on 2,4-D, and there's no regulatory agency to my knowledge that considered 2,4-D to be a human carcinogen."

In its assessment of 2,4-D to be made public this summer, "we're going to say that any risks are well within acceptable ranges, basically meaning, if there's any risk at all, it's very small."

Other health experts counter that animal toxicological studies can't possibly mimic long-term human exposures to pesticides and that they only test a single pesticide at a time.

"It's one animal, one chemical," says Dr. Marg Sanborn, a member of the family physicians' research team, a practising family physician and assistant professor of family medicine at McMaster University.

Toxicology "doesn't really reflect well the real-life exposures that people have, where they (may) have genetic predispositions, where they're exposed to multiple pesticides, where they're exposed over years.

"In occupational settings, it's pretty rare for people to only be spraying one thing. In gardens it's the same thing, it's fungicide for the roses and herbicides for the lawn, something else for the fruit trees. Most of the real life exposures are multiple.

"Somehow, when it comes to this area, people want to emphasize the animal studies and give them primacy over studying humans in real life situations."

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The basic equation regulatory agencies, including the PMRA, use to determine the magnitude of risk a particular pesticide poses is: Hazard + Exposure = Risk

On the hazard side of the equation, the PMRA reviews a broad range of animal toxicological studies as well as some epidemiological studies. Because of the huge costs involved, most of the toxicology studies are commissioned by the pesticide industry with government-certified laboratories in Canada and the U.S. using the strict protocols of Good Laboratory Practices.

Government chemists, toxicologists, physicians and other risk assessors review the studies for short-term and lifelong toxicity in lab animals dosed with far higher levels of pesticides than what

people might reasonably experience. They also look at reproductive effects -- proof of absence of birth defects is required before a pesticide is given approval -- immuno-toxicity and endocrine disruptions, among other things.

For each pesticide, researchers identify the dosage level at which there is no observed adverse effect.

On the exposure side of the equation, they identify and quantify all possible exposures to the specific pesticide to be registered (licensed). That includes exposures from food, drinking water, lawn and garden uses, including exposures children might encounter while playing on a lawn soon after being treated.

They also calculate for differences between animals and humans and for physiological differences between children and adults. And they test for efficacy, stage field trials for effects on the environment, and the potential synergies between various active and inert ingredients as they appear in the final products consumers buy.

(A notable exception to that end-product synergic testing is with weed 'n' feed products. The PMRA approves all of the individual active pesticide ingredients under the Pest Control Products Act. But because weed 'n' feeds are classified as fertilizers, the Canadian Food Inspection Agency is responsible for testing the fertilizer components under the Fertilizers Act. Yet no one, the Citizen has learned, tests the final, end-use weed 'n' feed products for possible hazardous synergies between their various chemical compounds. Pressed on the issue, a PMRA spokeswoman said officials from the agencies are "right now, in discussion to determine who should be doing what to cover this factor with weed 'n' feed.")

In the end, a pesticide is only registered if the potential level of exposure from all sources and routes is at least 100 times below the dose that causes no effect in animals. In many cases, the threshold is set at or closer to 1,000 times below the dose at which there is no observed adverse effect.

But Meg Sears, chief scientific adviser for the Coalition for a Healthy Ottawa, says the regulatory process does not weigh risk and benefit sufficiently.

"If there's a benefit (to using pesticides) such as food production, then I can see that there's definitely a benefit. However, if the benefit is just to get rid of a dandelion, I don't think it merits having a risk," however small.

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The science around pesticides is never static.

Swiss chemist Dr. Paul Muller won the 1948 Nobel Prize in physiology/medicine for his discovery that the chemical compound DDT was highly effective at killing insects, especially malaria-carrying mosquitoes. Twenty-one years later, DDT was banned in Canada (and later other countries) and is considered one of the most environmentally-dangerous chemicals ever unleashed on the planet.

In 1998, the PMRA began a re-evaluation of 401 pesticides registered prior to 1995 to ensure they meet updated safety standards. The re-evaluations of most lawn products are to be

completed by the end of this summer, part of plan to re-evaluate every pesticide in Canada at least once every 15 years.

As of May 1, 135 PMRA re-evaluations of active pesticide ingredients had been completed. Of the 95 decisions made public so far -- the raw data is not publicly available for peer review -- 65 have had certain uses discontinued or are to be phased out altogether.

Of those, seven failed to meet the PMRA's new standards for occupational and environmental risks.

The 58 others were voluntarily discontinued by their manufacturers who opted not to supply the new and expensive data required for government re-evaluation. In many cases, the PMRA says the pesticides had been replaced by newer products and were either no longer being sold at all or, in such small quantities that their makers couldn't justify the huge expense of having them re-evaluated.

Another 27 products have been accepted for continued use, but with modifications to the ways in which they can be used.

As part of the re-evaluations, the agency has been doing a special review of eight common pesticides for domestic turf uses.

Three are popular organophosphate pesticides homeowners have used for decades, typically as insecticides. Their effects on bugs are similar to their effects on humans and wildlife: they attack the central nervous system.

As a result of re-evaluation, diazinon is being phased out for domestic uses by the end of the year and, for commercial uses, by the end of 2005. Malathion is also to be phased out for lawn spreader turf uses. And domestic uses of chlorpyrifos, widely used in homes against cockroaches, fleas, termites and in some pet flea and tick collars, was phased out in 2001.

Meanwhile, the popular phenoxy herbicides, dicamba, MCPA and carbaryl, have or are being re-evaluated, along with 2,4-D. The re-evaluations include assessing the compounds for a potential and deadly manufacturing byproduct -- chlorinated dioxins, the persistent, bio-accumulative toxic substances linked to cancers, reproductive, immunological and neurological problems.

"Under label-use conditions, our re-evaluation does not indicate they'll cause any adverse effects at all," says Ms. Mitchell. An official announcement is expected this summer.

The agency already recently announced that a fifth phenoxy herbicide, mecoprop, common in many weed 'n' feed products, is being voluntarily discontinued by its makers. The decision came after the agency asked the mecoprop industry to submit new health and environmental data needed for re-evaluation. Instead, the companies decided to withdraw the product and have received initial approval for a new version of mecoprop. Retailers and consumers, however, will be allowed to sell and use the older mecoprop until 2010.

Ms. Sears, who holds a doctorate in chemical engineering, believes the current formulation of mecoprop won't pass the new government safety tests "and the industry knows it, so they're withdrawing it. But were still selling it for another five years."

As well, "this summer you can still put diazinon on the lawns and gardens in Ottawa and diazinon is the insecticide that was (found in Ottawa surface water) at twice the level for protection of aquatic species last year."

The PMRA, she says, "is not protecting our health."

Canada's Commissioner of the Environment and Sustainable Development, Johanne Gelinac, also has been highly critical of the agency, which employs 500 people on an annual budget of \$38 million.

In an October report to Parliament, she cited the agency's slow pace in re-evaluating older pesticides against current standards; concerns that new pesticides are not fully evaluated; new, possibly safer, products are not getting to users as fast as they should; and, PMRA information on the use and impacts of pesticides is incomplete, in some cases because "the government lacks the tools to monitor the use and presence of pesticides in the environment and on food."

John Worgan, director of the PMRA's re-evaluation management division, defends the agency and says it has one of the most rigorous science review programs for pesticides in the world. "We look at all of the available data for compounds like 2,4-d. It's very extensive, by very highly qualified scientific personal. We make our decisions based on the science."

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Dr. Carol Burns, senior epidemiologist for The Dow Chemical Company that has produced 2,4-D since the 1940s, led a study to determine the potential health hazards to 1,517 Dow employees who produced the pesticide from 1945 to 1994.

The work, published in the journal of Occupational and Environmental Medicine in 2001, concluded there was no link between 2,4-D and mortality or malignant neoplasms, including cancerous tumors. It also found no significant risk for non-Hodgkin's lymphoma (cancers of lymphoid tissue) an issue that has been hotly debated for more than a decade.

The Ontario physicians' review looked at 27 previously published, peer-reviewed studies about pesticides and non-Hodgkin's lymphoma. Dr. Burns' study and another were excluded. Their methodology was deemed inadequate.

"Moreover," the physicians' report states, "Dow Chemical funded both studies."

Dr. Burns bristles at the connotation.

"If you want to attack the science, you should reflect the science that is published, evaluate it any way you wish, but report all of it that's out there. It (the physicians' review) is by no stretch of the imagination a comprehensive review.

"Ironically, in their kidney cancer review (of possible pesticide links), they included a study done by Dow Chemical by one of my colleagues, which has the exact same methodology," but a far smaller sample size of 770 participants, half of her sample size. It, though, had a positive finding with kidney cancer and pentachloro-*n*-butylphenol.

"The real problem for Canada as a free society is, if a ban is enacted in the absence of the science as we know it, if you ignore your regulatory community, you ignore the body of literature and just pick a few studies that create a lot of emotion, my question is what's next?

"If science is completely ignored, what is the next action? Is Chlorox bleach next? Is hairspray next? Is perfume next?

"What liberties will be chipped away because we have decided we will ignore science because we don't like who funds it, we don't like who conducts it and we don't like who interprets it."

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Scientific studies concluding safety of 2,4-D

The following selection of published scientific studies conclude 2,4-D, one of the most widely used herbicides in North America, poses no undue health hazard.

'A conclusion that 2,4-D has little potential for carcinogenic effect is supported by the absence of effects in animal carcinogenicity assays, the absence of genetic effects of 2,4-D, the behaviour of the herbicide in the body and the biologically inconsistent and ambiguous results of epidemiology studies.'

Risk To Workers Using 2,4-D Formulations, 2003, Forest Practices Branch, B.C. Ministry of Forests.

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'The extensive database of metabolic, toxicological and epidemiological studies on 2,4-D has provided no evidence that 2,4-D poses any health risk to humans when used according to label directions.'

Phenoxy Herbicides, 2001, Ian C. Munro, principal, Cantox Health Sciences International, former director of the Bureau of Chemical Safety and director-general of the Food Directorate, Health Protection Branch, Health Canada.

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'Epidemiological studies have suggested an association between the development of soft-tissue sarcoma and non-Hodgkin's lymphoma and exposure to chlorophenoxy herbicides, including 2,4-D. The results of these studies are not, however, consistent: the associations found are weak, and conflicting conclusions have been reached by the investigators.'

Pesticide residues in food. 1996: toxicological evaluations, joint report of the Food and Agriculture Organization of the United Nations and the World Health Organization.

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2,4-D 'should remain classified as a Group D -- Not Classifiable as to Human Carcinogenicity. That is, the evidence is inadequate and cannot be interpreted as showing either the presence or absence of a carcinogenic effect.'

U.S. Environmental Protection Agency, 1997.

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'Most risk associated with occupational or bystander exposure to 2,4-D are low, especially when compared to other risks taken in life. However, public perception regarding 2,4-D and for that matter, pesticides in general, is extremely negative, despite the low values of these calculated risks.'

The Canadian Centre for Toxicology in a 1991 research report submitted to the Ontario government.

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'There is inadequate evidence of a casual relationship between exposure to chlorophenoxy herbicides and the development of Non Hodgkin's lymphoma and other cancers in humans at this time, and the available data could not be interpreted as showing the presence or absence of a carcinogenic effect.'

2003 report on phenoxy herbicides, the Environmental Risk Management Authority of New Zealand.