

The bees are dying, but can we really blame neonicotinoid pesticides for a global epidemic?



ASHLEY CSANADY | June 30, 2015 5:22 PM ET

What would happen if all the bees just died?

It's not just EpiPen manufacturers who would feel the sting. Anyone who likes flowers, or to eat fruits and veggies, would feel the hunger pangs.



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Professor Nigel Raine at the University of Guelph has devoted his research to understanding why pollinators are dying off. The simple answer? It's complicated.

Bees of all stripes, those that make honey and those that bumble, pollinate about one-third of every bite of food consumed on Earth. And they're in trouble.

Around the world entire colonies of bees have been dying off. It's a phenomenon known as colony collapse disorder.

Beekeepers, those who raise honeybees for pollen and sometimes ship them to farmers fields to pollinate, have woken up to find entire hives, tens of thousands of bees dead or missing.

The reasons are complex, a mix of climate change, urban sprawl and over-use of pesticides. But one family of chemicals has become the focus of concern and the cornerstone of government action. They're called neonicotinoids and they've been heavily restricted in Europe for years and as of July 1, Ontario will become the first jurisdiction to crack down on the use of the insecticide.

It's most commonly used on grain crops, and in a coating that protects the seed from the moment it's planted until it's harvested.

Ontario is looking to reduce its use by 80 per cent by 2017. It wants farmers to prove they need to use it and to undergo training about its safety and environmental effects. The province will also restrict how many pre-coated seeds can be sold, though farmers will be allowed to use up existing stock.

But grain farmers and others have questioned whether this pesticide, considered a bit of a wonder drug for ailing crops, is an easy target among many competing and complex issues. One group even [sought to prevent the new rules from taking effect in the courts](#).

To cut through the spin on both sides, the *National Post's* Ashley Csanady talked to Nigel Raine, who holds the inaugural Rebanks Family Chair in Pollinator Conservation

at the University of Guelph, about why the bees are dying and what you, your family and your governments can do to help.



Nicolas Armer/AFP/Getty Images

A bee collects pollen from a dandelion flower.

Q: *Is one pesticide really the cause of all these mysterious bee deaths?*

A: What we're facing is not just a Canadian problem, it's a global problem. There seems to be evidence from data sets around the world suggesting we have global pollinator declines.

There are a number of different factors in play there, and all of them have been looked at in some sense. Whether it's changes to land use and increased urbanization or intensification of agricultural land use — of which increased use of chemical pesticides is clearly one aspect.

Changes in land use also possibly removed sources of food ... and also critically where pollinators can nest.

There are also other factors at play: We know that pests and pathogens are really important.

A lot of focus has been placed on honeybees and in that context we know varroa mites are very important. These mites go around and bite into the bodies of bees as they develop in the hive and act as really good transmission of viruses between bees and also between colonies.

There are also viruses like deformed wing syndrome, which is just as its name suggest.

And there's some evidence these viruses we previously thought were for honeybees (can spread to other wild bees).

There's clearly changes in climate which (have affected the bees)... Also changes in seasonal patterns, changes when flowers come into pollen, and changes when bees and other pollinators breed. Bees can emerge too early and not have anything to eat.

Q: How do chemical pesticides factor in?

A: On the agrochemical side of things it's not just insecticides (like neonicotinoids)... but we're also talking about fungicides being used quite heavily and herbicides being used a lot... so that can have an impact on (pollinators') nutritional ability to balance their diets or even get enough food.

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There's a complex set of all these factors starting to come into play. Clearly honeybees and wild pollinators are not just facing any one of these at one time, it's the whole shebang. It's all of those things at the same time.

For example, some recent honeybee and bumblebee studies suggest that (using certain chemicals) can actually make pollinators more susceptible to certain viruses.



John Minchillo / AP Photo

Honey bees congregate on top of frames. They get the most buzz, but aren't the only pollinators dying off.

Q: *Where does the focus on neonicotinoids come from then?*

A: There's been a lot more focus on neonicotinoids as a class of pesticides, and I think the research around that has been for a good reason because this is a very different class of pesticides than we're used to dealing with.

Most traditional pesticides you apply in response to a pest threat ... so you spray them onto a crop when you see a pest pressure.

The difference with these neonicotinoids is most of their use is systemic and that's the root of exposure (for pollinators). The systemic use of these pesticides is quite different: (the chemical) is used as a seed coating or then can be used a soil drench (when the seeds are planted). These compounds are then taken up by the plant as it grows.

Pollinator conservation isn't just about pesticides. And it's certainly not just about neonicotinoids

When it germinates, it takes up some of the active ingredients of these pesticides through the roots up into the tissues of the plant. The idea is that then you have the active ingredient, the insecticide, in all of the plant tissues as it grows (to protect against) pests that might attack the plant in the very early growth state (when it's more vulnerable).

The downside of that is when the plant grows and flowers, you still have pesticide residue in the flower tissues and also the nectar and pollen, so the profile of exposure is very different. You have a situation where every time an insect goes to visit a treated crop flower, it's getting a small amount of this pesticide in the nectar it takes and into all the pollen it takes.

While these are very low dosages, there is some evidence from various scientific studies that these sub-lethal dosages can have impacts on behaviour, ecology and reproduction in some of these species.



Saul Loeb / AFP / Getty Images

Honey bees walk on a moveable comb hive in this file photo.

***Q:** Is that why some people, especially farming groups, question the science behind banning or restricting neonicotinoids?*

A: I think it's really important this is taken as part of a broader picture. Pollinator conservation isn't just about pesticides. And it's certainly not just about neonicotinoids. We have been using pesticides for a long time, and neonicotinoids are a different class of pesticides, they act in a different way, so the way in which we deal with them needs to bear that in mind. And the risks that do seem to be emerging for insect pollinators is a source of concern.

With scientific evidence there's always going to be some debate about the strength of evidence and the consensus of that information, and there's been a lot of debate about the scientific evidence (that neonicotinoids are to blame for bee deaths).

Until recently, much of the evidence of the impacts of neonicotinoids (came from) studies where scientists themselves have done artificial dosing of the bees based on

levels (observed in the field). Those have either been done in the laboratory or they have been done (partly inside and partly outside), where the bees have been dosed and then allowed out into the field.

They have generally shown impacts on various aspects of behaviour or colony development, or in some cases significant changes in reproduction.

The majority of studies where people have put bees out in the field near treated crops and tried to compare them with colonies not by treated crops, which is a complicated process, have reported no real differences in honeybees.

There have been some people who have been highly critical of that because they say when we put bees in the field there really isn't much of an impact. (But) there's certainly evidence from bumblebees and from solitary bees now that show that (neonicotinoids) are a source of concern.



Charlie Neibergall/ Associated Press

Almost all corn grown in Ontario is coated with a neonicotinoid pesticide before it's even planted.

Q: Does that mean what the Ontario government has done should be adopted nationwide? Or neonicotinoids should even be banned entirely?

A: The response in Ontario seems to be very much a response to a different part of the exposure profile. They seem to be responding to this correlation between high levels of honeybee colony deaths during or shortly after the planting period for corn in soy in 2012 and 2013.

(Experts) reviewed the data and they concluded there was linkage between the residue they were finding in these dead bees and the amounts of active ingredient that were coming out of planting equipment during that period of corn and soy planting.

As the treated seeds go through the machinery, some of that treated chemical (coating) the seed sloughs off coming through the machinery and comes out in the exhaust gases, so that's going out into the environment (and affecting pollinators and other insects).

It seems that those honeybee colonies were coming into contact with that at relatively high levels of exposure and that might have been causing this kind of acute mortality. It seems that the restrictions that have been proposed (in Ontario are a response) to those kind of acute incidents of specifically honeybee colony losses during those years.



Philippe Huguen/AFP/Getty Images

A honey bee as it gathers pollen from a sunflower in Godewaersvelde, France, which restricted neonicotinoid pesticide use well before Ontario.

Q: So neonicotinoids are an exacerbating factor then?

A: There is a lot of scientific evidence looking at different modes of exposure with different neonicotinoids in different bees.

I think there's another part of this when we talk about bees, we're not just talking about honeybees. That's one species of bee. In Canada there are 825 species of bee, about 43 bumblebee species, one honeybee and the rest are solitary bees. So not all bees are social.

Q: I didn't know that not all bees are social.

A: The majority of bees actually, about 95% of bee species are solitary. That's kind of the ancestral condition: you have a single female and a single male, the male effectively mates with the female and then does very little else but the female then works very, very hard. She has to go and do all the tasks, she has to go out and find nectar and pollen, which she mixes together into what we call "bee bread."

She then lays an egg on that ,and she puts that into a nest structure that she's made. It might be a gallery in some old rotten wood, it might be a system of tunnels underground.

She'll do that for a few weeks after which she will die because she'll just have exhausted herself. That's quite different, a single mother doing all that on her own, versus a honeybee colony, which at the smallest may be 3,000 to 5,000 members... and the Queen just produces eggs.

To extrapolate from what we know about honeybees and say that's true for all bees, and even beyond bees, is really very difficult.

A lot of the discussion I've read and been a part of have been focusing very much on honeybees and we have to be very careful that we don't just focus on those. They're very important as pollinators... but the wild bees are also really important and there have been a number of really high-profile studies highlighting the value of wild pollinators, of native bees, that we don't manage, in pollinating a whole variety of crops. They're important not just for maintaining wild plant communities but they're also very important for agricultural production.

Q: Does that mean addressing neonicotinoid use is important to all types of pollinators, but it's still just addressing part of the problem?

A: I think the government is responding in this way, they are looking for a reduction in the usage of these pesticides, which in corn has reached approximately 100% saturation.

(That means) pretty much all the corn that's planted in Ontario is treated with neonicotinoids at the moment. The problem there is, once you've treated the seed and you've planted it in the ground, whether you need that chemical or not, when those plants come up they will have those chemicals active in the tissues and they will have it in the nectar and the pollen, and it will come out during the planting period dust from the back of the planter.

What the currently regulation seems to be looking for is a justification by the end users of these treated crops (i.e. farmers) to demonstrate that they need to use them, that they

have sufficient pest pressure that these tools are useful and effective, rather than just using them prophylactically.

It's a move towards a reduction in use. It's not a ban, although I know it's being covered and treated and such.

It's quite different from the European moratorium that was put in place almost two years ago now, in which they actually suspended use of the same (group of chemicals).

There is a process by which (neonicotinoids) can be used (in Europe). A farmer can apply for derogation, say, "I have a big pest problem, I need to use these." The onus is very much on them to justify that they need to use it, whereas here it's kinda the same sort of story, but it's a gradual reduction they're looking for by 2017.



Albert F.W. Vick/Lady Bird Johnson Wildflower Center; James Gagliardi / Smithsonian Gardens

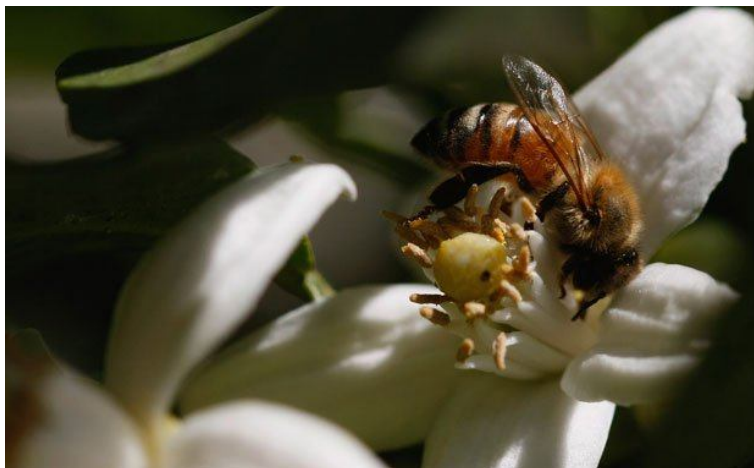
You can help restore bee populations by planting flowers that get them buzzing.

Q: Is there anything else individuals should be doing?

A: Pollinators need a good diversity of flowers. Many of these species require lots of different flowers to get a balance of nutrients from nectar and pollen (for) a balanced diet. If they have more of that they're going to be more resilient to many of these other environmental stress factors: pesticide exposure, parasites and diseases, stress due to climate change and adverse weather conditions.

So, from an individual perspective, planting more bee-friendly flowers on land that you can, in your yard or in community projects or in schools, to encourage bees and to help support them, (is one thing you can do).

Even simple things like not mulching your flowerbeds can be helpful, because many of these solitary bees nest underground. (But mulching) can prevent the bees from being able to burrow ... or once you mulch they may not be able to find their nest again.



David Silverman/Getty Images

A honeybee pollinates a flower in a citrus grove.

Q: What about governments?

A: There are pollinator friendly areas in the landscape, many of our provincial parks are very strong for pollinators, but they're kinda little pockets around. So connecting up that on a landscape scale and... making sure pollinators can get around areas of suitable habitat.

Commercial and even hobbyist beekeepers can move their colonies to somewhere there are flowers. But for the wild bees... some only fly 100 or 50 metres from their nesting site, so they're restricted if they're aren't any suitable flowers around.

Whereas, a honeybee colony may have a flight range of 15 kilometres (but) more realistically three to five kilometres. That's a big area they have of potential foraging sites.

So, thinking about embedding suitable habitats for pollinators across the landscape, in marginal areas of farmland, on the sides of roads, under power lines, along pipelines, along railways tracks... and thinking how they can be managed, how appropriate perennial plants can be encouraged there that are producing nectar and pollen.? How we can think about these kind of management strategies? It may not be a complete change in what we do but it might be just a change of focus of how we manage some of this marginal land, and thinking about if we have enough of that.



Todd Korol/Reuters

Oil, steam and natural gas pipelines run through the forest at the Cenovus Foster Creek SAGD oil sands operations near Cold Lake, Alta.

Q: *So what can people plant because not all varieties are great for pollinators?*

A: Making sure they're appropriate flowers. Thinking about native plants, primarily. Plants that are rich in nectar and pollen. So many of these derived hybrids that look really nice maybe have very big pompom type flowers, often these complicated bred flowers may have little or no nectar or may be multiple flowers so the bees can't get into them and actually get any rewards from them.

Some bee-friendly plants you could grow in your backyard or in some spare space at the cottage or farm include:

- Salvia (commonly known as sage)
- Bee balm (monarda/bergamot)
- Penstemon (beardtongues)
- Coneflowers (Rudbeckia/echinacea or anything in the aster family)
- Thyme
- Wild lupine
- Poppies
- Dahlias
- Goldenrod
- Heather

- Crocus

— *this interview has been condensed and edited for clarity and length*