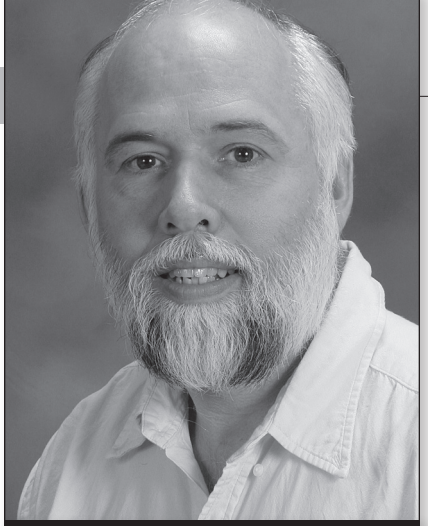
# Environmental Protection Grinds to Halt With Neonicotinoid Pesticides



**Craig M. Pease, PH.D.,** is a scientist who teaches at the Vermont Law School Environmental Law Center. He can be reached at cpease@vermontlaw.edu.

Bees are most intriguing creatures. Type "bee behavior" into Google Scholar, and start reading abstracts. That search returns over 450,000 results. Find near the top L. Tison and colleagues' 2016 paper "Honey Bees' Behavior Is Impaired by Chronic Exposure to the Neonicotinoid Thiacloprid in the Field." The authors report "foraging behavior, homing success, navigation performance, and social communication were impaired." Once again, science has been caught in a regulatory war, this time over neonicotinoid pesticides.

EPA's efforts here are quite the regulatory *Odyssey*. When and if they finish, the decade it took Odysseus to get home is going to look like a sprint. The Federal Insecticide, Fungicide, and Rodenticide Act was passed in 1972, albeit with statutory history and amendments both before and after. In 1994, EPA registered its first neonicotinoid pesticide, imidacloprid. Today, it is arguably the most widely used pesticide in the world. In the early 2000s, the agency registered additional neonicotinoid pesticides.

**The EPA bureaucracy and its pesticide activity is a complex, slow-moving system**

The Pesticide Registration Improvement Act of 2007 required EPA to undertake a "registration review" of all pesticides then registered under FIFRA, and to complete those by 2022. Last year, EPA released its draft risk assessment of imidacloprid and initiated its review. EPA plans to release additional neonicotinoid risk assessments and undertake their reviews over the next few years.

In light of the widespread use of these pesticides, their importance for controlling pests of food crops like corn and soybeans, the pervasiveness of low-level residues of them in the environment, and abundant evidence of their harm to animals and ecosystems, litigation is certain to follow. Regardless of any science, there will be no easy or fast resolution to this conflict. Too much is at stake.

We already know much about neonicotinoid pesticides — how they kill, at what levels, and how they alter the bee nervous system, behavior, and communication. Though I might add that this science was not paid for by EPA, as that regulatory agency's modus operandi is to parasitize science funded and undertaken by others.

As one example of our knowledge, discerning readers will notice neo-*nicotin*-oid, recognizing in these pesticides something like nicotine, the principle addictive chemical in tobacco. Indeed, nicotine and the neonicotinoid pesticides attack the central nervous system at the same place.

In part, animal nervous systems operate with electric signals. When a nerve cell is excited, an electrical signal gets transmitted down its length, as electric signals travel through the wires in your home.

Yet in one way, animal nervous systems do not operate with electric signals. Rather, when an electric signal arrives at the end of one nerve cell, it triggers the release of a chemical, technically known as a neurotransmitter. Then, like the baton that mediates a handoff between two runners in a relay, this neurotransmitter forwards the neural signal from the first nerve cell to the second nerve cell.

Acetylcholine is one such neurotransmitter. And both nicotine and neonicotinoid pesticides bind to the same receptor on the second nerve cell as does acetylcholine. Thus, nicotine and neonicotinoid pesticides mimic a naturally occurring biological chemical at the core of animal nervous systems. Likewise, endocrine disruptors mimic naturally occurring hormones. There are lots of complications and subtleties. But the idea is simple.

Neonicotinoid pesticides kill by launching a denial-of-service attack on the insect central nervous system. They block the transmission of natural nerve signals, by binding to the acetylcholine receptor. At non-lethal levels, neonicotinoid pesticides act more like spam, mimicking natural neural signals, resulting in wasted effort, poor neural processing, and miscommunication. That is what is happening to an unintended recipient, bees, who are essential to ecosystems and to much of modern agriculture.

What should we conclude from the immense scientific literature on both bees and neonicotinoids, and the inherently irresolvable conflict between using these pesticides to grow food for 7.4 billion people and environmental protection? More importantly, what should we conclude from the glacial pace of EPA regulatory action and related litigation?

One framework is M. Scheffer and colleagues' 2008 *Nature* paper showing that when complex dynamic systems approach a qualitative change, or tipping point, they slow way down. The EPA bureaucracy, and its neonicotinoid pesticide regulatory activity, is a complex system, and it has ever-slowing dynamics.