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Science Collapse Disorder -- The Real Story Behind Neonics And Mass Bee Deaths

Colony Collapse Disorder—it sounds catastrophic and frightening. The Genetic Literacy Project's Jon Entine separates fact from fiction.

It's estimated that over the past five years, some 30 percent of bees in the United States have either disappeared or failed to survive to pollinate blossoms in the spring. That's about 50% more than the rate expected. The problem is direr in some other countries. In Spain, recent data indicate a loss close to 80% of beehives. On the other hand, in Canada and Australia, there is no sign of Colony Collapse Disorder.

What may be causing the die-offs and why the dramatic disparities from one region to another? Scientists have a number of hypotheses but the activist community has coalesced around one explanation: They blame it on neonicotinoids, also known as neonics, which are the widest used class of insecticide ever.

"It's time to ban dangerous neonicotinoid pesticides," declares *Mother Earth News*. "Bees need help now! Time to up the ante," declares the Pesticide Action Network announcing its suit against the Environmental Protection Agency. "EPA should cancel all uses of neonics where they can lead to harm for bees and other beneficial insects, and chemical manufacturers like Bayer and Syngenta that make neonics should use their resources to develop less harmful alternatives instead of

defending the neonics," writes Jennifer Sass of the Natural Resources Defense Council.

Birds, bats and insects all pollinate flowering plants, but the most celebrated pollinator is the honeybee, and for good reason. United States commercial beekeepers take millions of bee hives on the road each year to pollinate blueberries and papaya, almonds and apples, and a cornucopia of other fruits, vegetables and nuts. Close to one third of our food supply is linked to pollination. Without the bee our diet would be less nutritious and less tasty. Bee die offs are a serious issue and need to be evaluated. But the question remains: are neonicotinoids the culprit?

Fingering neonics

Neonics are a new class of systemic pesticide popular in the US, Australia, Europe and elsewhere to help corn, soy, cotton and canola farmers. They were adopted over the past 20 years as a less toxic replacement of organophosphate pesticides, which are known to kill bees and wildlife, and have been linked to health problems in workers. By universal agreement, neonicotinoids are extremely effective. Applied to the soil, sprayed on the crop or used as a seed treatment, they eventually reach the pollen and nectar, which is ingested by insects, discouraging pests from wrecking havoc on crops. The seed treatment lowers the amount used 10 to 20 fold, decreasing the need for open spraying of the plant, a genuine sustainability benefit.

Neonics were phased in without incident in the 1990s. But an age-old problem in the bee world—a periodic and unpredictable dramatic rise in bee deaths in one region or another—reemerged in 2004. Bee death rates approached 60% in California Beekeepers called it the vampire mite scare because of its likely link to varroa mites—parasites that feed on the bodily fluids of bees.

The explanatory narrative began to change in 2006, when new waves of bee deaths were reported around the world. Anti-biotechnology activists blamed GMOs. "There are many reasons given to the decline in Bees, but one argument that matters most is the use of Genetically Modified Organisms (GMO) and "Terminator Seeds" that are presently being endorsed by governments and

forcefully utilized as our primary agricultural needs of survival," argued the anti-globalization group Global Research, in what amounted to a rhetorical and circumstantial argument. But as GMOs have gained favor with the science community, the focus of activist groups shifted and a new culprit was identified: neonicotinoids.

Over the past few months, CBS News, NPR and Dan Rather have run powerful segments and the popular media in general has cheerleaded a recent lawsuit spearheaded by the Center for Food Safety and other anti-chemical groups demanding that the Environmental Protection Agency ban the insecticide. In less than a month, the *New York Times* ran a front-page article and editorialized twice on the subject, dismissing what it called "manufacturers' bland assurances" about its safety and all but calling for a ban.

History raises questions about the almost exclusive focus on neonics to explain the regional bee crisis. Periodic occurrences resembling what has come to be known as bee Colony Collapse Disorder have been documented as far back as 1869. In the last half century, the domesticated honeybee population has declined by about 50 percent, with incidents common well before the introduction of neonics, which was hailed by environmentalists because of their comparatively modest environmental footprint. The term CCD was originally used to describe the phenomenon when worker bees suddenly and mysteriously disappeared. The term, with its alarmist ring, was co-opted by activists in the mid 2000s to describe a new development—mass bee deaths.

The research on bee colony deaths is dicey—and often political. The science based view of this issue took a sharp turn in January when the European Food Safety Authority issued three studies raising questions about the potential role of neonics in this latest wave of bee deaths. The studies did not link the pesticides to the collapse of whole bee colonies, but did raise enough issues to lead to a vote last month for a 2-year precautionary ban by the European Commission. The ban was blocked, temporarily, by Germany, Britain and seven other countries, citing evidence that neonics were not the sole or likely the primary culprit, their impact still unclear. The EC plans an appeal.

Last year, one study showed that bumblebees exposed to high doses of the neonic imidacloprid in the lab, then released to forage in the field, had sharply reduced colony growth rates and produced 85 percent fewer queens to found new colonies. In another study, more than 30 percent of free-ranging honeybees whose brains were doused with the neonic thiamethoxam—which is not the way bees encounter the chemical in the real world— got confused, failing to return to the hive.

Real world contradictions

The results were so dramatic—and so contradictory of real life experience of some beekeepers in Canada, Europe and Australia who use neonics and where many bee colonies are thriving—that the United Kingdom's Department for Environment, Food and Rural Affairs (DEFRA) decided to reevaluate existing research. The agency pointed to the problem with much of the lab based data—it measures doses and application methods that farmers don't use. "The risk to bee populations from neonics, as they are currently used, is low." DEFRA concluded in March. "Laboratory-based studies demonstrating sub-lethal effects on bees from neonics did not replicate realistic conditions, but extreme scenarios.. … While this assessment cannot exclude rare effects of neonicotinoids on bees in the field, it suggests that effects on bees do not occur under normal circumstances. Consequently, it supports the view that the risk to bee populations from neonicotinoids, as they are currently used, is low," the study concluded.

Farmers are almost universally opposed to even a temporary ban absent definitive real world research, calling it reckless. As they note, because of the ban on organophosphates, there are no real alternatives to neonics, which everyone agrees have been extremely effective. Insecticides are used for a reason: to kill pests and make our food safer to eat. Without neonics or a suitable replacement, farmers could face losses estimated by one industry study as $5.78 billion per year in Europe alone—and many multiples of that if a ban is instituted in the United States and other major agricultural economies, with the costs passed on to consumers.

Understandably alarmed at the economic implications to consumers and to their bottom lines, Syngenta and Bayer, the two primary manufacturers of the chemicals, have proposed a plan to accelerate bee health research. They've also proposed adding new flowering margins around fields to provide pesticide-free bee habitats and monitoring for the presence of neonics in crops.

Industry is concerned as to what they see as a 'rush to judgment'—and should a "temporary" ban is instituted it will be difficult to unring the precautionary bell regardless of what new evidence might show. They point to real world contradictions that suggest that pathogens, parasites and habitat loss, which has been the driver of CCD for more than a century before the introduction of insecticides, are the likely prime cause this time as well.

Canada, the UK and Australia all provide provocative real world case studies. Canola is grown commercially mostly on the prairies in Canada, the largest single producer of canola in the world with more than 50,000 canola producers and 16 million acres. It's a nutritionally rich crop for bees. Some 80% of Canada's honey crop is from canola, amounting to 50 million pounds per year of Grade No 1 white honey. Approximately 300,000 colonies harvest open pollinated canola.

Despite the fact that neonicotinoids are widely used in Canada to protect canola from pests, Canadian bee populations have been largely unaffected and produce around 50 million pounds of canola honey. A large-scale Ontario field study funded by Bayer appears to back up the real life evidence challenging the activist doomsday scenario. It found no difference in colony health between hives exposed to neonics and those that weren't, in real life conditions. "The doses the bees are exposed to [in lab studies] are far above what a realistic field dose exposure would be," says Dr. Cynthia Scott-Dupree, head of the Ontario study. Canadian canola farmers say they have had 10 years of large scale use of neonics on canola with no observed ill effect.

Britain's rapeseed crop, which is similar to canola but has a high acid content and is generally produced for animal feed, has not experienced serious bee losses either. The DEFRA study noted that oilseed rape (OSR) "requires insect pollinators to support its productivity. The fact that OSR treated with neonicotinoids has been a productive crop for over a decade in the UK is itself evidence that pollinator populations, including bees, are not being reduced by the presence of neonicotinoids."

Varroa mites: The real culprit?

Australia presents the most striking dilemma for those isolating their attacks on neonics. On a per crop basis, it is one of the world's heaviest users of the pesticide—and has among the healthiest bee colonies in the world. Government records indicate there has not been even one adverse experience report from either the public or beekeepers concerning the use of neonics. The other thing

they don't see in Australia—but we do see everywhere else in the world where CCD is claimed—is the Varroa mite, the culprit in the 2005/06 bee death march.

While not deadly in themselves, these parasites act as a vector, attaching to honeybees and appearing to be "both a disseminator and activator of a number of bee viruses," according to a report on honeybee disease in Europe by the Food and Environment Research Agency. In countries experiencing bee decline, varroa is a feared and growing presence among beekeepers—even or especially if neonicotinoids are absent. For example, in upland areas of Switzerland where the pesticide is not used, bee colony populations are under significant pressure from the mites; and in France, declines in the bee population in mountainous areas (where neonics are uncommon) are similar to those in agricultural areas (where neonics are widely used).

At one point in Dan Rather's report, the President of the California Beekeepers Association, John Miller, opens a hive and picks out a bee with a red dot on its back. "That's a *varroa* mite," he explains. "That is Satan incarnate. That is the central challenge of beekeeping globally." The spreading problem of disease itself is compounded by the desperate efforts of beekeepers to extinguish the mites and other pests by dousing their hives with miticides and antibiotics, which would increase if there were no approved and effective pesticides. As Miller says, "You can imagine how hard it is to kill a bug on a bug. It's the hardest thing I've ever had to do."

Bee deaths are not to be taken lightly. But the technology-intensive agricultural industry certainly provides an easy target for those who want to "do something yesterday," without any regard to balancing costs and benefits and regardless of the long-term consequences. As the British Bee Keeper Association recently warned, rushing to ban neonics, when the evidence remains contradictory, could well do more damage than good, as other pesticides, some known to be more harmful to bees, would of necessity be reintroduced. The EPA is now addressing the issue, sending a research team to California where more than 1.6 million hives are needed every spring. Let science—and scientists—do their work.