Chemicals Implicated

While research is underway to determine the cause of Colony Collapse Disorder (CCD), pesticides have emerged as one of the prime suspects. Recent bans in Europe attest to the growing concerns surrounding pesticide use and honeybee decline.

Neonicotinoids

Neonicotinoids are a relatively new class of insecticides that share a common mode of action that affect the central nervous system of insects, resulting in paralysis and death. They include imidacloprid, acetamiprid, clothianidin, dinotefuran, nithiazine, thiacloprid and thiamethoxam. According to the EPA, uncertainties have been identified since their initial registration regarding the potential environmental fate and effects of neonicotinoid pesticides, particularly as they relate to pollinators. Studies conducted in the late 1990s suggest that neonicotinic residues can accumulate in pollen and nectar of treated plants and represent a potential risk to pollinators.

There is major concern that neonicotinoid pesticides may play a role in recent pollinator declines. Neonicotinoids can also be persistent in the environment, and when used as seed treatments, translocate to residues in pollen and nectar of treated plants. The potential for these residues to affect bees and other pollinators remain uncertain. Despite these uncertainties, neonicotinoids are beginning to dominate the market place, putting pollinators at risk.

The case of the neonicotinoids exemplifies two critical problems with current registration procedures and risk assessment methods for pesticides: the reliance on industry-funded science that contradicts peer-reviewed studies and the insufficiency of current risk assessment procedures to account for sublethal effects of pesticides.

- **Imidacloprid**

  Used in agriculture as foliar and seed treatments, for indoor and outdoor insect control, home gardening and pet products, imidacloprid is the most popular neonicotinoid, first registered in 1994 under the trade names Merit®, Admire®, Advantage TM. It is moderately toxic and is linked to neurotoxic, reproductive and mutagenic effects. It has been found to be highly toxic to bees and other beneficial insects. It is also toxic to upland game birds, is generally persistent in soils and can leach to groundwater.

  Studies show that imidacloprid, like other chemicals in its class, produces sublethal effects in honeybees, which include disruptions in mobility, navigation, and feeding behavior. Decreased foraging activity, along with olfactory learning performance and decreased hive activity have also been observed.

  Imidacloprid has been scheduled for registration review, to be completed in 2016. According to EPA, the agency does not have adequate data to understand the potential exposure of imidacloprid to terrestrial invertebrates that may be exposed to imidacloprid through reliance on plant flower parts for habitat or diet. The agency is currently requesting field residue test data for imidacloprid residues in leaves, nectar and pollen.
  - o **Imidacloprid on the Pesticide Gateway**
  - o **Imidacloprid Registration Documents**

- **Clothianidin**

  In 2008 a massive bee die-off occurred in Germany which was subsequently associated with clothianidin. Germany moved to ban clothianidin and other neonicotinoids pending further investigation. Clothianidin was given conditional registration in the US in 2003, without sufficient data to support its registration. Among the current data gaps include field tests for honeybees. A study was submitted in 2007 to EPA in support of this registration criteria was recently deemed inadequate.

  A leaked EPA memo from November 16, 2010 identified a core study underpinning the registration of clothianidin as unsound after the agency quietly re-evaluated the pesticide just as it was getting ready to allow a further expansion of its use. Beyond Pesticides and Pesticide Action Network North America (PANNA) wrote a **letter to EPA** following this leaked memo urging the agency to remove this pesticide from the market. Read **EPA's official response to our letter**, which rejects immediate action on removing this chemical which is toxic to bees. See also what the agency **initially said to the press**, and our **chronology of events on clothianidin** in response.

  You can read the paper trail on clothianidin through each EPA memo below:
  - o **EPA Memo**, 11-16-10
  - o **EPA Memo**, 11-16-07
  - o **EPA Memo**, 6-12-07
  - o **EPA Memo**, 3-11-04
  - o **EPA Memo**, 4-10-03

  Clothianidin is neurotoxic and is highly toxic to bees and other non-target insects. Efforts are now underway to have this chemical removed from the market.
  - o **Clothianidin on the Pesticide Gateway**
  - o **Clothianidin EPA factsheet**
  - o **Clothianidin Registration Documents**

- **Acetamiprid**
  - o **Acetamiprid on the Pesticide Gateway**
  - o **Acetamiprid EPA Factsheet**

- **Thiacloprid**
  - o **Thiacloprid on the Pesticide Gateway**
  - o **Thiacloprid EPA factsheet**

- **Thiamethoxam**

Other Pesticides Implicated:

- **Fipronil**

  Widely used for indoor and turf pest control, fipronil is a new generation of insecticide that is highly toxic to insects. It is moderately toxic and has been linked to hormone disruption, thyroid cancer, neurotoxicity and reproductive effects. Fipronil has been shown to reduce behavioural function and learning performances in honeybees.
  - o **Fipronil on the Pesticide Gateway**

- **Synthetic Pyrethroids**

  This class of chemicals has also been shown to impair bee learning and foraging behaviour.
  - o **Bifenthrin**
  - o **Deltamethrin**
  - o **Fluvalinate**
  - o **Permethrin**

- **Endosulfan**

- **Spinosad**

Studies implicating these pesticides in bee decline and CCD can be found in the **Research** webpage.