Neonicotinoid Toxicosis

College of Veterinary Medicine

BASICS

Neonicotinoids are a class of synthetic insecticides widely used in agriculture, particularly as seed treatments for corn and soybeans, and veterinary medicine in flea and tick treatments.

Neonicotinoids are highly toxic to insects, but exposure is a health concern for all animals, including humans. Animals that **CONSUME INSECTS OR CROPS** may be at highest risk for exposure. Sensitivity to neonicotinoids varies according to species, health status, age, and sex.

Neonicotinoids are applied to soil or seed coats and taken up in all parts of the plant. These insecticides persist in the environment and can travel long distances in runoff, contaminating new areas and water bodies. Wildlife are most commonly exposed to neonicotinoids through **INGESTION** of contaminated food or water. Pets and their owners can be exposed through flea and tick treatments, including collars and ointments, that contain neonicotinoids.

Neonicotinoids can have both lethal and sublethal health effects. They interfere with the central nervous system. **CLINICAL SIGNS** include incoordination, salivation, vomiting, pupil dilation, seizures, and other signs of neurotoxicity. Neonicotinoids can also impair reproduction and development, suppress the immune system, disrupt endocrine and kidney function, and possibly increase cancer risk.

DIAGNOSIS of neonicotinoid toxicosis is confirmed by measuring neonicotinoids and their breakdown products in urine. However, urine levels associated with toxicosis are not well-established, and cases may go undiagnosed due to their often sublethal nature.

There is **NO TREATMENT** for neonicotinoid toxicosis in wildlife. Supportive care can be given. For skin exposure, animals should be washed with water and a mild soap.

The NYS Wildlife Health Program | cwhl.vet.cornell.edu
A partnership between NYS Dept. of Environmental Conservation and Cornell Wildlife Health Lab

OCT 2023

DETAILS

Starting with the insecticide imidacloprid in 1991, neonicotinoids have become widely popular for use in agriculture and animal health products due to their broad-spectrum effectiveness against insect pests. However, neonicotinoids have been implicated in population declines of several insect species, notably bees, and these pesticides have been found to harm humans and other animals, including wildlife and pets.

Neonicotinoids are commonly applied directly to seed coats or delivered to plants via irrigation, but they can also be broadly sprayed on crop fields. Up to 98% of applied neonicotinoids may not be incorporated into the plants themselves, instead entering the environment, where they can travel through run-off, eventually contaminating untreated fields and water bodies.

Exposure to neonicotinoids can occur through ingestion of contaminated food or water, inhalation, or skin contact.

SPECIES AFFECTED Neonicotinoids are widely used and can be found in a variety of ecosystems, negatively impacting wildlife species.

In white-tailed deer, neonicotinoids can contribute to decreased thyroid hormone concentrations, activity levels, fawn survival, and body and organ weight.

Exposure to low levels of neonicotinoids can cause weight loss and impair songbirds' sense of direction, both of which impair migration and breeding. Negative effects on reproduction and development in birds contribute to increased developmental abnormalities and reduced chick survival, eggshell thinning, and lower fertilization and hatching success. Toxic effects of neonicotinoids have been linked to population declines in grassland and insectivorous birds, including sparrows and flycatchers.

In addition to directly harming wildlife, neonicotinoids can have indirect effects by removing important organisms, including insects, from ecosystems. Neonicotinoid use has been linked to sizable declines in zooplankton biomass, contributing to greatly decreased fishery yields. Throughout the world, neonicotinoids have been implicated in declines in native pollinator species, including honeybees, which are essential for the stability of ecosystems and food systems.

PRECAUTIONS AND PREVENTION To reduce exposure for yourself, pets, and wildlife, check if seedlings at garden stores contain neonicotinoids, avoid using these insecticides on your property, and choose flea and tick treatments that do not contain neonicotinoids. Regulations on neonicotinoid use vary by state.

Below: Garden center flats of sweet corn seedlings. As a precaution, check to see if they contain neonicotinoids before buying, and try to avoid using these insecticides when possible.