

## ***Webinar Highlights***

### **New Science on Neonicotinoids: Reproductive & neurodevelopmental health effects**

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Neonicotinoids (neonics) are the most widely used class of insecticides in the US and worldwide. They are known to be a major contributor to pollinator declines. Recent scientific evidence shows impacts on human and wildlife health as well.

In this webinar, **Dr. Jennifer Sass** provided an overview of scientific evidence on the neurodevelopmental and reproductive health effects of neonicotinoids. **Dr. Jodi Flaws** discussed her research on the effects of one neonicotinoid, imidacloprid, on the health of the male and female reproductive system in laboratory animals. She also discussed her recent review of existing literature on reproductive effects of neonicotinoid pesticides, including both male and female impacts.

**Featured Speakers:** Jennifer Sass, PhD, a Senior Scientist at the Natural Resources Defense Council (NRDC) and Jodi Flaws, PhD, Professor in Comparative Biosciences at the University of Illinois-Urbana/Champaign, speaking May 7, 2026.

*This fact sheet has been created by CHE based on information presented in a CHE webinar. Selected quotes in bold are from the webinar speaker(s). For the full set of resources provided by the webinar presenters, see the [webinar page](#), where you'll also find associated Slides & Resources.*

### **The Problem**

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Sass shared that epidemiological studies have shown health effects in people who have been exposed to neonics, including memory loss, finger tremors, and altered metabolism. Neonics pass easily from a pregnant mother to the fetus, which can expose the fetus during vulnerable development times. Infants can also be exposed through breast milk. Neonics could also harm adult reproductive systems.

Many neonics are used as seed coatings, particularly for conventional corn and soy production. The seeds are pre-treated before they are planted. When plants are grown from these seeds, the neonics get distributed throughout the plants. As a result, there is no way to wash them off

of produce. Humans are exposed by eating contaminated food, as well as through drinking contaminated water and also through contact with pets that are exposed through commercial flea and tick collars.

Neonics are structurally similar to nicotine. Much of the research that Flaws shared focuses on the neonic imidacloprid (IMI). Compared to the other neonics, IMI has the highest detection frequency on produce and is also present in drinking water throughout the US and in other countries.

### **Neurotoxicants**

By design, neonics are neurotoxicants. Neonics bind to nicotinic acetylcholine neuroreceptors. This blocks neurotransmitters from reaching the postsynaptic neurons that they would normally bind to. This binding to neuron receptors is what makes neonics neurotoxic. In insects, this results in overstimulating the insect nervous system and eventually causing paralysis and death.

It was previously thought that neonics would not be harmful to mammals, despite being highly neurotoxic to insects. Research in recent years has called this into question. It was once thought that mammals did not have the targeted receptors. We now know that mammals do have these receptors. It was also thought that certain neonics, such as IMI, had a much higher binding affinity for these receptors in insects than in mammals. We have since learned that IMI can be metabolized in the liver into different metabolites. These IMI metabolites can have a higher affinity for the mammalian receptors than IMI.

### **Reproductive toxicants**

Flaws described research into whether or not IMI and other neonics might be reproductive toxicants in mammals. She explained that neonics are able to reach reproductive tissues, including ovarian follicles. Follicles contain unfertilized eggs. Follicles also play an important role in producing reproductive hormones. Research shows that the ovary itself has receptors that could bind IMI and other neonicotinoids.

Flaws' research found evidence that ovarian follicles metabolize IMI. The same metabolic enzymes that metabolize IMI in the liver are also found in the ovary. The enzymes in the ovary convert the IMI to intermediate metabolites before eventually converting it to the metabolite 6-chloronicotonic acid (6CNA). This process could be producing compounds in the ovaries that are more toxic than IMI.

Flaws' research then looked into whether IMI and its metabolites are toxic to the ovary. An intermediate metabolite that they focused on was desnitro-imidacloprid (DNI). To assess toxicity, the researchers looked at any impacts on follicle growth or hormone levels *in vitro*. Exposure to DNI was found to inhibit follicle growth and increase the rupture of the follicles. They also found impacts on hormone levels. IMI increased secretion of progesterone, while DNI decreased secretion of progesterone, testosterone, and estradiol.

The researchers also found *in vivo* evidence with mice that IMI reduces follicle numbers, which would lead to decreased fertility. More long-term research is needed here to measure the impacts over time.

Studies have found evidence that the other neonics also affect both male and female reproductive systems. Several studies have shown that **acetamiprid** reduces fertility in rodents and leads to precocious puberty. Rodent studies have shown that exposure to **clothianidin** increases the number of stillborn pups. In female rodents, **thiacloprid** has been shown to cause uterine tumors and ovarian luteomas. Studies have also shown associations between each of these neonics and negative impacts on male fertility.

Human studies have found widespread exposure to mixtures of these neonics. Epidemiologic studies are showing associations of these mixtures of neonics with problems during pregnancy that could lead to fetal growth restriction and problems in the offspring.

**“There are also studies showing that exposure either during pregnancy or during adolescence has been associated with precocious puberty in both boys and girls.”**

Two recently released factsheets highlight these and numerous other health risks from neonicotinoids, one from [U.S. Right to Know](#) and one from [Natural Resources Defense Council](#).

## Recommendations

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Research continues to show that neonics are not as safe for mammals as originally thought. They are also highly toxic to invertebrates, including beneficial ones such as bees, butterflies, and aquatic organisms.

A [2024 review](#) of acute human poisoning incidents concluded “Given the evidence of neurotoxicity, EPA should use its legal authority to cancel unsafe products and unnecessary uses – including from seed treatments, and residential pet and lawn care products – to prevent further human suffering.”

## To Find Out More

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- Watch the May 7, 2026 webinar: [New Science on Neonicotinoids: Reproductive & neurodevelopmental health effects](#)
- Read Flaw's presentation slides: [The Effects of Neonicotinoid Pesticides on Reproductive Health](#)
- Read the U.S. Right to Know factsheet on neonicotinoids: [Neonicotinoid health risks: widespread exposure, growing evidence of harm](#)

## About the Speakers

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**Jennifer Sass, PhD** is a Senior Scientist at the Natural Resources Defense Council (NRDC). She brings to her job a highly specialized expertise in U.S. chemicals policy. Much of her work is focused on understanding and explaining the science behind toxic chemical regulation and on advocating for regulations that are consistent with science, health policy, and environmental law. She frequently provides testimony and scientific briefings for members of Congress and federal advisory committees. She has a master's degree and a PhD in anatomy and cell biology from the University of Saskatchewan and has done postdoctoral work in toxicology at the University of Maryland. She is based in NRDC's Washington, D.C., office.



**Jodi A. Flaws, PhD** is a Professor in Comparative Biosciences at the University of Illinois-Urbana/Champaign. She received a PhD in Physiology from the University of Arizona. Dr. Flaws has performed postdoctoral research at Johns Hopkins University and the University of Maryland. Her research program is mainly focused on determining the mechanisms by which environmental chemicals affect the development and function of the ovary. She has published over 350 peer-reviewed papers that have involved extensive participation and authorship by graduate students, postdoctoral fellows, veterinary medical students, and undergraduate students. She is the recipient of the Department of Epidemiology and Preventive Medicine, University of Maryland Student Mentoring Award, the Patricia Sokolove Outstanding Mentor Award, the Dr. Gordon and Mrs. Helen Kruger Research Excellence Award, the Pfizer Animal Health Award for Research Excellence, the University Scholar Award, the Women in Toxicology Mentoring Award from the Society of Toxicology, and the Society for the Study of Reproduction Trainee Mentor Award.