

Chairman Putnam and Members of the Senate Agriculture, Veterans, Broadband and Rural Development Committee,

I am writing, as a physician, in support of SF 3083, and to express concern about the known and potential deleterious human health effects of neonicotinoids.

Minnesotans in recent decades have had an enormous chronic exposure to neonicotinoids.

Since their development in the 1990s—and especially since 2010—neonicotinoids have become the most widely-used insecticide in the United States. The four most commonly used neonicotinoid insecticides are imidacloprid, acetamiprid, thiamethoxam, and clothianidin. The Minnesota Department of Agriculture (MDA) estimates that, in 2020, 40,000 kilograms of neonicotinoids were sold in Minnesota for agricultural use. Of this, 90% was neonic-coated seed, present on almost all the corn and half the soybean seeds (1). After approximately 5% is absorbed in the plant the rest goes into the soil and subsequently the surface- and groundwater. The MDA found neonicotinoids in 95% of flowing water sites that they frequently sampled around Minnesota between 2011 and 2022 (1). More concerning, a recent study found neonicotinoids in 10–41% of the springs and wells (i.e., sources of drinking water) sampled in Minnesota. Higher levels were found in Southeast and Central Minnesota (2).

Neonicotinoid insecticides are synthetic nicotine derivatives that bind selectively to the nicotine acetylcholine receptors (nAChR) in the nervous system of insects, causing death to a wide variety of insects. Initially it was thought that this selectivity to insects prevented any toxicity to humans or other mammals. However, there is increasing data that this is not the case.

If other mammals show toxicity from neonicotinoid exposure it is very likely that humans would also be affected. Indeed, the data shows this to be the case. Rodent ovaries exposed to neonicotinoids showed decreased reproductive ability with decreased follicular growth and decreased hormones (3). A study of female deer and fawns chronically exposed to levels of a neonicotinoid similar to surface-water levels were found to have smaller weight, less activity, smaller ovaries, and lower thyroid hormone levels (4). Of most concern are multiple studies that expose pregnant rats to neonicotinoids and study the effect on the brain and nervous system of the offspring. These studies have shown developmental neurotoxicity in the offspring (5, 6). Even the studies of pregnant rats submitted to the EPA by neonicotinoid manufacturers to obtain approval showed developmental neurotoxicity. The rat pups showed brain-tissue thinning, decreased auditory startle reflex, decreased motor activity, and effects on learning and behavior (7).

Data from epidemiological studies of pregnant women suggest toxicity of chronic neonicotinoid exposure. The risk of Tetralogy of Fallot (a cardiac birth defect) was 2.4 times higher in pregnant women with residential proximity to agricultural use of imidacloprid (8). The risk of anencephaly was 2.9 times higher in pregnant women with residential proximity to imidacloprid agricultural use (9). In another study in pregnant women, a significant association was found between low birth weight and

exposure to a metabolite of acetamiprid (10). The risk of autism spectrum disorder was 2.0 times higher in the babies of women who frequently used flea and tick collars (imidacloprid) on their pets during pregnancy (11).

In a group of non-pregnant Japanese patients with neurologic symptoms (memory loss, tremor), there was a significant association (14 times higher risk) of the prevalence of the symptoms and the urine levels of a metabolite of acetamiprid (12).

Studies on human cells studied outside the body also show effects of neonicotinoids. Two studies have shown chromosomal aberrations in human white blood cells exposed to neonicotinoids (13, 14). Concerningly, a study found that a metabolite of imidacloprid exhibited an effect on the nAChR of human nerve cells equivalent to that of nicotine (15).

In conclusion, the use of neonicotinoid-coated seeds is chronically exposing Minnesotans to neonicotinoids. There is good evidence that neonicotinoids are toxic not only to insects but to mammals as well. Especially vulnerable is the developing mammal brain. There are also growing epidemiologic associations of neonicotinoids with human toxicity, again most strongly associated with fetal neurotoxicity. In a way, the chronic exposure to neonicotinoids in Minnesota is enrolling all of us, unwittingly, in an experiment which is likely to ultimately show very significant toxicity from neonicotinoids. It is for this reason that we should support passage of their restriction as proposed in SF 3083.

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