

Dear Chair Aron and Honorable Committee Members,

I, Dr. Pamela Youngquist, am writing to urge the passage of HB1086, Prohibiting the sale of certain agriculture seeds treated with neonicotinoids, favorably from your committee for the following reasons.

The nervous system is an integral part of the human body and includes the brain, spinal cord, a vast network of nerves and neurons, all of which are responsible for many of our bodily functions—from senses to movement. However, mounting evidence over the past years shows that chronic exposure to sublethal (low) levels of pesticides can cause neurotoxic effects or exacerbate preexisting chemical damage to the nervous system. The impacts of pesticides on the nervous system, including the brain, are hazardous, especially for chronically exposed individuals (e.g., farmworkers) or during critical windows of vulnerability and development (e.g., childhood, pregnancy). Researchers identify the role agricultural chemicals play in CNS impacts causing neurological diseases, like amyotrophic lateral sclerosis (ALS) and Parkinson's disease, dementia like diseases such as Alzheimer's, and other effects on cognitive function.

Research published, [Detection of Neonicotinoid Insecticides and Their Metabolites in Human Cerebrospinal Fluid - PMC](#), finds the presence of nine various neonicotinoids (neonics) and six neonic metabolites within human cerebrospinal fluid (CSF). CSF is an essential part of the central nervous system (CNS), especially for CNS development. Specific chemical biomarkers (measurable indicators of biological state), like pesticides, found in CSF are useful for diagnosing and evaluating numerous neurological diseases.

The study explores whether the presence of neonicotinoids and their metabolites in CSF is an indicator of adverse CNS effects. From April 2019 to January 2021, researchers gathered 314 CSF samples from patients aged one month to 89 years in the First Affiliated Hospital of Shantou University, Shantou, China using a clinical lumbar puncture. Ninety-nine percent of the 314 CSF samples contain at least one neonic. Of the 314 CSF samples, nine percent (28) have a single neonic compound, **84 percent (265) have between 2 and 6 neonics**, and six percent (19) have between 7 and 10 neonicotinoid compounds. Nine of these neonics in CSF samples are nitenpyram (NIT), thiamethoxam, imidacloprid, acetamiprid (ACE), thiacloprid, clothianidin, flonicamid, imidaclothiz, and sulfoxaflor. Additionally, six neonic metabolites are present in CSF: N-desmethyl-thiamethoxam, olefin-imidacloprid, 5-hydroxy-imidacloprid, N-desmethyl-acetamiprid (N-dm-ACE), thiacloprid-amide, and 6-chloronicotinic acid.

Over the past 20 years, neonicotinoids have served as an alternative for four major chemical classes of insecticides in the global market (organophosphates, carbamates, phenyl-pyrazoles,

and pyrethroids). These systemic agricultural pesticides are highly toxic, resembling nicotine, and affect the central nervous system of insects, resulting in paralysis and death, even at low doses. Like other pesticides, neonicotinoids readily contaminate water and food resources as traditional water waste treatments typically fail to remove the chemical from tap water, and the systemic nature of neonicotinoids allows the chemical to accumulate within plant products. According to the Centers for Disease Control and Prevention (CDC), nearly half the U.S. population encounters at least one type of neonicotinoid daily, with children ages three to five having the highest exposure risk. Health impacts of exposure to neonicotinoids can include neurotoxicity, reproductive anomalies, hepatic and renal damage, and an increase in gene expression linked to hormone-dependent breast cancer. Additionally, researchers identified that some neonicotinoids play a role in enzyme (aromatase) production that stimulates excess estrogen production, a known event in hormone-dependent cancer development for both women and men.

Beyond its link to human health effects, neonicotinoids are infamous for their well-documented role in driving mass pollinator declines. However, pollinators are far from the only victims of ubiquitous neonicotinoid contamination. In a recent avian risk assessment, the Environmental Protection Agency (EPA) scientists found that neonicotinoid levels in treated seeds exceed the agency's threshold of concern for certain birds by as much as 200-fold. A 2017 study, [U of S research reveals controversial insecticides are toxic to songbirds - News | University of Saskatchewan](#), confirmed that tiny amounts of neonicotinoids – the equivalent of just four treated canola seeds, for example – are enough to cause migrating songbirds to lose their sense of direction and become emaciated. Recent research, [Effects of Neonicotinoid Insecticides on Physiology and Reproductive Characteristics of Captive Female and Fawn White-tailed Deer | Scientific Reports](#), uncovered the endocrine-disrupting health impacts of imidacloprid (neonicotinoid) on white-tailed deer, adding to the concern of the same effect in humans.

These studies add to the growing research on pesticides and neurotoxic consequences of neonicotinoids. Although past studies on neonicotinoid toxicity focus on neurotoxicity among insects and aquatic invertebrates, we can see emerging evidence demonstrating these compounds also adversely impact the nervous system of animals, including humans as well. Not only does research find exposure to sublethal doses of chemicals affect hormone receptors (endocrine disruption), but neural receptors, such as connections between nerves, the brain, enzymes, and DNA are affected as well. Additionally this study, [Most common US pesticide may affect brain development similarly to nicotine | US news | The Guardian](#), demonstrates autism, mood disorders (depression) and degenerative neurological conditions among aquatic and terrestrial animals, including humans, exposed to pesticides. Pesticides themselves, mixtures of chemicals such as the defoliant Agent Orange (2,4-D and 2,4,5-T) and its dioxin contaminants and therapeutic hormones in pharmaceutical products, possess the ability to disrupt neurological function. Furthermore, studies suggest that pesticides formulants (adjuvants) such as POEA (polyoxyethylene tallow amine) have both neurological and endocrine-disrupting activity. POEA

is present in some glyphosate-based herbicides like Roundup and has higher nervous system toxicity than the active ingredient (glyphosate). Although the biological function and mechanism of neurotoxicity related to pesticide exposure is ambiguous, scientists note synchronized communication within and between cells that have a mechanism of action of “spamming” communication signals. The study concludes, “For continued global use of NEOs [neonics], mechanisms of toxicity, especially to the CNS in humans, need to be more rigorously investigated.”

The nervous system is integral to everyday human activities and the body’s ability to function normally. Pesticides themselves can possess the ability to disrupt neurological function. Pesticides’ impact on the nervous system, including the brain, are hazardous, especially for chronically exposed individuals or during critical windows of vulnerability and development.

Existing information, including all the studies mentioned, supports the clear need for a strategic shift away from pesticide dependency. This is why it is incumbent upon each state to regulate the sale and use of neonicotinoids for commercial and consumer use. Vermont and New York are prime examples of the available road map for this essential work to be done by having passed comprehensive legislation to ban the sale of neonicotinoid products and any neonicotinoid seeds for major crops across their states.

Farmers, Nurserymen, seed companies and suppliers, and retail chain stores will all quickly learn the alternatives needed to implement using and selling seed stock and plants without these dangerous chemicals. Consumers with state law in place become educated about the safety of the plant products and foods they purchase, empowering greater public health benefit.

The precedence has been set, we can easily follow the playbook now. Please pass HB 1086, Prohibiting the sale of certain agriculture seeds treated with neonicotinoids, favorably from your committee thereby ensuring its passage into law.

Thank you for your time and consideration.

Sincerely,

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