Icahn School of Medicine at Mount Sinai

Megan K. Horton, PhD, MPH
Department of Environmental Medicine and Public Health

One Gustave L. Levy Place
Box 1057
New York, NY 10029
T 212-241-5959

May 8, 2019

Re: HB 2619
Submitted to: House Rules Committee
Committee Position: In support of HB 2619

Dear Members of the Committee,

I am an Assistant Professor in the Department of Environmental Medicine and Public Health at the Icahn School of Medicine at Mount Sinai in New York. As an environmental epidemiologist, my research seeks to understand the relationship between early life exposure to environmental toxicants and adverse neurodevelopmental outcomes, including changes in children's brain structure and function. It is increasingly recognized that prenatal and early childhood exposures to environmental toxicants such as chlorpyrifos are contributing to the growing rates of neurodevelopmental disorders. Recent advances in brain imaging including magnetic resonance imaging (MRI) have opened unprecedented access to study the developing human brain and understand the impact of environmental chemicals on the typical developmental trajectory. Discussed in detail below, research conducted leveraging these advances demonstrates the persistent impact of prenatal chlorpyrifos exposure on children's brain structure. I am providing this written testimony as an environmental health expert and as a leading researcher in the studies addressing the adverse neurodevelopmental health outcomes associated with early life chlorpyrifos exposure. As a researcher at Columbia University, I contributed to the Columbia studies that you may hear opponents' question. I strongly support the passage of House Bill 2619 to ban all uses of chlorpyrifos in the state of Oregon. Consistent evidence across animal studies and epidemiological studies demonstrate that chlorpyrifos is a powerful developmental neurotoxicant and that early life exposure to chlorpyrifos is associated with persistent adverse outcomes in children including changes in brain structure. I believe this bill is essential to help protect the health of Oregon's most vulnerable populations, pregnant women and children.

The scientific evidence of neurotoxic dangers associated with chlorpyrifos exposure is extensive and consistent. Three recent epidemiologic studies demonstrate that exposure to chlorpyrifos during pregnancy is harmful to children's brains and that damage associated with early life exposure persists throughout childhood.[1-3] These three studies, based on different populations, located in distinct geographical regions of the US, with different routes of exposure, and using different biomarkers of exposure, have produced strongly convergent results. One study from the University of California at Berkeley reported reductions in IQ scores among the children of agricultural workers in the Salinas Valley.[1] The second study was undertaken at my institution, the Icahn School of Medicine at Mount Sinai, and found similar results in a New York City Hispanic population, whose exposures were largely residential.[2] The third study, also conducted in New York City by investigators at Columbia University among a population of African-American and Dominican children determined that prenatal chlorpyrifos exposure negatively impacted children's brain development.[3] These studies all support the need to protect children from early life exposure to chlorpyrifos.

Building upon these epidemiologic studies demonstrating associations between early life chlorpyrifos exposure with behavioral and cognitive outcomes in children, Columbia University undertook an MRI study to inform our understanding of the influence of prenatal and early childhood chlorpyrifos exposure on brain regions regulating behavior and cognition in children.[4] In this work, I and the other researchers evaluated the brains of 40 children, ages 5 to 11, whose mothers were enrolled during pregnancy into the Columbia University Mother's and

Newborn's Study. This is a non-clinical, representative community-based cohort enrolled from Northern Manhattan and the South Bronx in New York City. We compared the brain scans of 20 children with higher levels of chlorpyrifos exposure (as measured in umbilical cord blood collected at birth) to 20 age- and sex- matched control subjects with lower chlorpyrifos levels. The brain scans of children with higher chlorpyrifos exposure looked markedly different compared with those of children exposed to lower levels of chlorpyrifos. Changes were visible across the surface of the brain, with abnormal enlargements of some areas and thinning in others. The regions affected are associated with functions such as attention, decision making, language, impulse control and working memory. These changes in brain structure are consistent with the cognitive and behavioral deficits observed in children exposed to this chemical, as well as consistent with animal literature linking early life exposure to low levels of these chemicals to adverse neurodevelopmental outcomes.

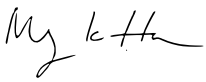
In addition, the high chlorpyrifos group also displayed disruption of normal sexual differences in brain structure – features that were preserved in the low chlorpyrifos group. Expected sex differences (i.e., enlargement of the right inferior frontal lobe) were reversed in the high chlorpyrifos group. These findings are consistent with animal models suggesting that chlorpyrifos exposure reverses normal sexual differences in learning, memory and emotional behaviors.

Notably, the adverse cognitive and motor outcomes and the brain abnormalities observed in these studies appeared to occur following low-level exposures to chlorpyrifos in non-occupationally exposed, community-based samples. These exposure levels are below EPA safety standards.[5] This suggest that the mechanisms underlying brain changes may involve other pathways and occur at lower levels than anticipated based on systemic toxicity. The current EPA safety standards do no protect vulnerable populations such as the developing infant and small child from the adverse impacts of this neurotoxicant.

This critical study demonstrates that residential exposure to chlorpyrifos in a non-clinical, community-based sample is associated with persistent changes in the morphology of brain regions that support cognitive and behavioral outcomes. These associations occur at levels below the threshold for systemic toxicity suggesting that the fetal and developing brain is uniquely vulnerable to this chemical. These findings, together with decades of animal and epidemiologic research confirm the toxic dangers posed by exposure to even low levels of chlorpyrifos.

The economic costs associated with neurodevelopmental problems cannot be ignored. It is estimated that, on average, it costs twice as much to educate a child with learning or developmental disabilities in the U.S. compared to the costs associated with educating children without these disabilities.[6] A recent analysis in the European Union reported that annual costs linked to the loss of IQ points and learning disabilities due to chemical exposures, including OP pesticides, were estimated to be $169.43 billion dollars.[7] The detrimental effects of the OP chlorpyrifos on health place children and other vulnerable populations at a clear disadvantage, limiting their ability to become contributing members of our society and resulting in economic consequences to our state and our nation.

In summary, the science is clear and consistent: chlorpyrifos is putting the health of our children and other vulnerable populations at risk. I strongly support the passage of House Bill 2619 to ban all uses of chlorpyrifos in the state of Oregon and urge our decision makers to not dismiss the use of sound science and the current weight of the evidence in decision-making to promote and ensure public health.



Megan K. Horton
Assistant Professor, Environmental Medicine and Public Health
Icahn School of Medicine at Mount Sinai

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Megan K. Horton, PhD, MPH *is an Assistant Professor of Environmental Medicine and Public Health at the Icahn School of Medicine at Mount Sinai.*

Dr. Horton is an environmental health scientist with expertise in environmental epidemiology, child neurodevelopment and pediatric neuroimaging. Following her doctoral training in environmental health at Columbia University, she completed a postdoctoral fellowship in neuroepidemiology where she learned to apply magnetic resonance imaging (MRI) to investigate the impact of prenatal exposure to pesticides and secondhand smoke on neuropsychological and behavioral function throughout childhood. In 2010, she received a prestigious NIH-funded career transition award to study co-exposure to endocrine disrupting chemicals (e.g., polybrominated flame retardants, perchlorate, pyrethroid insecticides) and structural and functional brain outcomes in a New York-based longitudinal birth cohort. This award included extensive training in study design and statistical approaches for linking early life exposures to complex chemical mixtures with neuroimaging data to evaluate changes in brain structure and function in children. Her work has been highlighted at national and international meetings.