

Can Pesticide Exposures Impact Mental Health?

By Ruth Berlin, LCSW-C

I've been a licensed psychotherapist for more than 50 years and the Executive Director of the Maryland Pesticide Education Network (MPEN) since 1994. Given my dual professional history, the issue of how pesticides impact human mental health has long been of concern to me.

Early in my career as a therapist, I worked in a New York psychiatric hospital on a locked unit for patients diagnosed with some form of psychosis. During my years on the unit, I and other unit staffers noticed times when it appeared all the patients on the unit would take a few steps backward, confusing the staff as to whether each of them was on the appropriate level of medication, and thereby, confusing their treatment plans. We sometimes thought there might be a full moon causing this unexplained general slip in our patients' well-being, yet rarely was there a full moon correlation. However, we did notice it sometimes happened when pesticides were applied, either indoors for pests or outdoor applications on our beautifully landscaped grounds. Still, it really didn't register then, that these were chemicals we and our patients were being exposed to, and how they may adversely interact with patient conditions and medications – potentially complicating diagnosis and treatment. Now we know pesticides can impact mental health.



Since the launch of MPEN's Toxic-Free Healthcare (formally IPM in Health Care Facility Project) in 2007, we have worked with Maryland health care facilities, including psychiatric facilities and facilities for children and adults with special needs. A growing body of research makes it clear that pesticides can impact mental, neurological and developmental health. They can also exacerbate existing mental, neurological, and developmental issues, and critically confuse diagnosis and treatment of related issues. Increasingly, research links pesticide exposures to impacts beyond the well-known short- and long-term effects on physical health. This is a critical issue, especially for schools and health care facilities, including facilities that specialize in addressing psychiatric, developmental, and neurological issues. Pesticide exposures have been linked to causing and exacerbating depression, anxiety, bi-polar disorder, aggression, psychosis, dementia, ADHD, and more. And of course, pesticides may also impact providers caring for these vulnerable populations, who may also have pre-existing issues, such as depression and anxiety. The article, [Links between Pesticide Exposures and Mental Health](#), authored by the Mental Health and Environment Working Group of the [Collaborative on Health and the Environment](#) (CHE) provides a clinical and concerning overview regarding mental health impacts from pesticide exposure:

A growing body of research supports the association between pesticide exposure and adverse human health effects, including depression, ADHD, anxiety, confusion, memory loss, lethargy, pervasive developmental disorders, unprovoked extreme agitation, anger, rage, and violence.

Epidemiological evidence suggests that mood changes after acute exposures can continue for many years and that repeated high exposures greatly increase the risk of mood disorders. Given that symptoms may not occur until after a period of repeated exposures, health care providers should consider both acute and chronic exposures when evaluating patients.

The article cites 36 studies addressing this issue ranging from 1947–2009. Since this article was published, there has been significant research conducted that has added to an ever-growing body of research on the issue.

In 2021, after 20 years of research, the US Environmental Protection Agency (EPA) banned the use of the baby brain-harming pesticide chlorpyrifos on food crops after they found it to be harmful at any detectable level. Prior to this EPA decision, Maryland banned ALL uses of this pesticide in our state. Chlorpyrifos is linked to serious adverse long-term neuro-developmental impacts. Recently, the EPA has begun to roll back these protections.

The federal Agricultural Health Study (funded by the National Cancer Institute and the National Institute of Environmental Health Sciences in collaboration with the United States Environmental Protection Agency), that addresses the impacts of pesticides on farmer families' mental health found that pesticide applicators with greater exposure were more likely to experience depression, and it also found links between depression and pesticide exposures in farm women [84, 85, 86](#).

Other studies conducted with communities living near agricultural fields – where residents have consistent exposures to pesticides – [found higher rates of health and mental health issues](#).

Pesticides used in agriculture are also commonly used for land care and indoor/outdoor pests. In addition, certain widely used classes of endocrine-disrupting pesticides, including synthetic pyrethroids which are often used for mosquito control, bed bugs, and more, can have an inverse reaction, whereby the lower the dose the more adversely impactful, countering the long-held belief that the "dose makes the poison"! This ground-breaking research underscores how we need to be vigilant when a pest control company a facility contracts with reassures an institution manager (and the public) that they are using the lowest "safer" dose possible, when in fact lower dose does not always mean it's actually "safer."

Given what we already know regarding pesticides and mental illness, we need to consider how pesticide exposures in our facilities, schools, homes and elsewhere may potentially seriously complicate

diagnosis and treatment of those with mental health issues.

The following are some notable additional studies.

Symptoms Related to Two Major Classes of Pesticides

Synthetic Pyrethroids (frequently used in mosquito control, and indoor applications):

- [This review](#) found that agricultural workers with higher levels of insecticide exposure showed reduced brain activation in areas of the prefrontal cortex responsible for working memory, attention, and cognitive flexibility, mainly associated with attention, processing speed (linked to hand-eye coordination), and motor coordination.
- [This study](#) correlates exposure to geriatric depression.
- [This study](#) identified higher rates of Autism Spectrum Disorder (ASD) among children whose mothers were exposed to pyrethroid pesticides during pregnancy. Maternal pyrethroid exposure was associated with a 57% greater likelihood of ASD in offspring (pooled OR = 1.57, 95% CI = 1.20 to 2.06).

Organophosphates and Carbamate Pesticides: Exposure to agricultural pesticides puts farmers at [six times greater risk](#) of exhibiting depressive symptoms, including chronic anxiety, irritability, restlessness, and sadness. Pesticide exposure from farms or commercially-managed fields [threatens](#) residential (non-occupational) populations living nearby, who are more likely to have high depressive symptoms

Pesticides Linked to Behavioral and Neurological Impacts including ADHD, Impulsivity, and Autism

- [Study confirms](#) pesticide exposure is associated with elevated risk of depressive symptoms in the general population
- [Prenatal exposure to per- and polyfluoroalkyl substances and risk of autism spectrum disorder in the California Central Valley, 2004–2010](#)
- [Environmental pollutants as risk factors for autism spectrum disorders: a systematic review and meta-analysis of cohort studies](#)
- [Prenatal exposure to organophosphate pesticides and autism spectrum disorders in 11-year-old children](#)
- [Scoping review of the relationship between glyphosate-based herbicide exposures and autism spectrum disorder](#)
- [Time after a peak-pesticide use period and neurobehavior among children and adolescents](#)
- [Domestic exposure to chemicals in household products, building materials, decoration, and pesticides: Guidelines for interventions during the perinatal period](#)

Depression and Anxiety in Adolescents:

- [Associations of acetylcholinesterase inhibition between pesticide spray seasons with depression and anxiety symptoms in adolescents, and the role of sex and adrenal hormones on gender moderation](#)
- [Chemical threats: Researchers are discovering potential links between chemicals in common household items and damage to developing brains](#)
- [Prenatal and Childhood Exposure to Organophosphate Pesticides and Behavior Problems in Adolescents and Young Adults](#)
- [Evaluating how occupational exposure to organophosphates and pyrethroids impacts ADHD severity in male adolescents](#)

Pesticides, Violence and Aggression:

- [Case control study of impulsivity, aggression, pesticide exposure and suicide attempts using pesticides](#) Pesticides lead to brain damage, mass shootings, violence, and hatred

"The widespread use of pesticides may be the biggest threat to mental health and humanity that we face at this time and for generations to come. If it is not addressed, it may dramatically alter the course of the human race and reshape the fabric of society itself forever."

Pesticides and ADHD:

- [The association of prenatal and childhood pyrethroid pesticide exposure with school-age ADHD traits in U.S. children](#)
- [Effects on children's growth and neurodevelopment](#)
- [Exposure to chlorpyrifos and pyrethroid insecticides and symptoms of Attention Deficit Hyperactivity Disorder \(ADHD\) in preschool children](#)