Home Pesticide Chemical May Hurt Kids' Cognition

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Prenatal exposure to a chemical designed to enhance the effect of household insecticides may harm neurodevelopment, data from a prospective cohort study of children found.

Data analyzed for almost 350 children found that each unit increase in exposure to piperonyl butoxide -- a chemical mixed with pyrethroid pesticides to improve its efficacy -- was associated with a 1.32-fold increase in the odds of delayed mental development at age 3 years (P<0.01), according to Megan Horton, PhD, of Columbia’s Mailman School of Public Health in New York City, and colleagues.

The most highly exposed children had a more than threefold increased likelihood of slowed mental development (OR 3.11, 95% CI 1.38 to 6.98), Horton and co-authors reported online ahead of the March issue of Pediatrics.

Although the effects associated with exposure were modest, the researchers wrote, "they were comparable in magnitude to reports from studies of other prenatal neurotoxicants that affect development in young children."

They added, however, that "these findings should be considered preliminary and may be useful for generating future hypotheses."

The use of residential pesticides has shifted in recent years from organophosphorus insecticides -- which have been associated with impaired neurodevelopment -- to pyrethroid insecticides -- which have not been evaluated extensively for potential developmental toxicity.

There is concern, however, because pyrethroid insecticides are detoxified in the body by cytochrome P450 enzymes, and piperonyl butoxide inhibits this pathway, "thus delaying the detoxification of active pyrethroid parent compounds," according to background provided by the researchers.

Exposure to piperonyl butoxide has also been shown to generate reactive oxygen species, lending support to the possibility that oxidative damage could be a mechanism for altered neurologic development.

In the current study, Horton and her colleagues assessed exposure to piperonyl butoxide in personal air collected during the pregnancies of 348 black and Dominican mothers and to the common pyrethroid pesticide, permethrin, in personal air and maternal and umbilical cord plasma.

The mothers, from low-income neighborhoods in New York City, were participating in the Columbia Center for Children’s Environmental Health (CCCEH) Mothers and Newborns cohort.

The researchers assessed the cognitive and motor development of the offspring at age 3 years using the Bayley Scales of Infant Development.

After adjustment for gender, gestational age, ethnicity, maternal education, maternal intelligence,
quality of the home caretaking environment, and prenatal exposure to environmental tobacco smoke, children with high prenatal exposure to piperonyl butoxide (greater than 4.34 ng/m3) scored 3.9 points lower on the mental development index of the instrument ($P=0.04$).

There was no association between exposure and the psychomotor development index.

"This finding is worrisome because mental development index scores are more predictive of school readiness," Horton and her colleagues wrote.

Prenatal exposure to permethrin -- measured either in personal air or plasma -- was not associated with either mental or psychomotor development.

The authors noted, however, that permethrin is rapidly metabolized, complicating its detection. Horton and her team acknowledged that their study was limited by possible residual confounding from unmeasured factors and by the lack of measurement of piperonyl butoxide exposure in blood or urine samples.

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The authors reported that they had no conflicts of interest.

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**Source reference:**