

NEUROLOGICAL AND BEHAVIORAL EFFECTS OF PESTICIDES



Certain pesticides are neurotoxic chemicals that can have both short and long term impacts on human health. Studies indicate that pesticides can affect the central nervous system (CNS) and the peripheral nervous system (PNS) by either inhibiting acetylcholinesterase or interfering with nerve cell function or development. These effects can be measured by observing changes in neurochemistry, neuropathology, and behavior. This may include changes in visuospatial function, concentration, reaction time, learning, and short-term memory.¹

Organophosphates (OP's), which are domesticated versions of wartime nerve agents, and N-

methyl carbamates, damage neurological function in both insects and humans. The neurotoxic effects on humans may be acute or may result from chronic exposures to these pesticides. While high-level exposure to OP's can cause direct damage to the central and peripheral nervous system, low-level chronic exposures can cause subtle but significant and measurable effects on neurologic function and behavior. Children's developing central and peripheral nervous systems may be particularly vulnerable to neurotoxic pesticides due to the continued maturation of the central nervous system through adolescence.²

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CHILDREN'S NEUROLOGICAL DEVELOPMENT

Human case studies show that exposure to neurotoxic poisons during infancy can lead to severe impairment of motor and mental development.³ According to the National Research Council's report, *"Pesticides in the Diets of Infants and Children"* (1993), neurotoxic compounds at levels believed to be safe for adults could result in permanent loss of brain function if it occurred during prenatal or early childhood development.

Studies show that small single doses of an organophosphate on a critical day of development can cause permanent changes in neurotransmitter receptor levels in the brains of animals and changes in behavior. Some pyrethroids can also cause permanent behavior changes in animals exposed to small doses on a single critical day of development.⁴

Learning disabilities, attention deficit disorders, developmental delays and emotional and behavioral problems are among childhood disabilities of increasing concern. A study comparing preschool children in two farming communities in Mexico, one with heavy pesticide use, the other with little or no pesticide use, showed a variety of developmental delays in the pesticide-intensive community when compared to children living where less pesticides were used. These children had strikingly impaired hand-eye coordination, decreased physical stamina, short-term memory problems, difficulty drawing, and increased aggressive and anti-social behavior compared to their counterparts.⁵

1 Solomon, Gina (2000). *"Pesticides and Human Health: A Resource for Health Care Professionals."* Published by Physicians for Social Responsibility and Californians for Pesticide Reform. Available online at <http://www.sfbaypsr.org/publications.html>.

2 Wargo, John (1996). *"Our Children's Toxic Legacy: How Science and Law Fail to Protect Us From Pesticides."* Yale University Press.

3 Ecobichon et.al. (1990). *"Neurotoxic Effects of Pesticides," The Effects of Pesticides on Human Health. Advances in Modern Environmental Toxicology, Vol. 18, S.R. Baker & C.K. Wilkinson, Editors, Princeton Scientific Pubs.*

4 Greater Boston Physicians for Social Responsibility (2000). *In Harm's Way: Toxic Threats to Toxic Development.*

5 Guillette, Elizabeth Ph.D. (1998). *"An Anthropological Approach to the Evaluation of PreSchool Children Exposed to Pesticides in Mexico", Environmental Health Perspectives, Vol. 106.*

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