FACT SHEET

March, 2003

Organophosphate Pesticides (OPs)

Organophosphate pesticides (OPs) are a class of chemicals that are neurotoxic to humans and animals, causing effects in the central and peripheral nervous systems. Some OPs can cause reproductive effects and damage DNA. OPs account for 50% of total pesticide sales in the U.S. for widespread uses. There are more than 40 different organophosphate pesticides registered for use in the U.S., and an estimated 77 million pounds of OPs are used annually, including 60 million pounds that are applied to crops.

Health Effects

OPs can cause adverse effects through a common mechanism. They affect the nervous system by inhibiting a critical enzyme called acetylcholinesterase, involved in nerve signaling. An appropriate balance of acetylcholinesterase is needed to help with muscle control, including muscles of the respiratory tract, heart, and arms and legs. At high levels of exposure OPs can disrupt this mechanism, which can result in chest pain, respiratory distress, incoordination, vomiting, damage to the central and peripheral nervous systems and death due to respiratory distress or cardiac arrest.

OPs can cause damage to the reproductive system (sperm defects in men, and decreased pregnancies and survival of offspring in animals) at high levels of exposure. Birth defects (gastrointestinal anomalies) have also been linked to chlorpyrifos and malathion (two OPs) exposure in humans. The Environmental Protection Agency (EPA) has classified the OP dichlorvos as a possible human carcinogen due to its ability to induce tumors in animals, while other OPs have not been give the same classification. The EPA has banned household use of the OPs diazinon and chlorpyrifos due to concerns over human health effects. OPs are on EPA's high priority list for review under the Food Quality Protection Act due to concern over their wide use and health effects in humans and laboratory animals.

Occupational exposures (building maintenance workers and agricultural workers) are of particular concern due to frequency of use and contact. Concerns over exposures to infants and children have been raised because there is mounting evidence that OPs can cause neurodevelopmental defects when exposure—even at low levels—occurs *in utero* or during critical stages of a child's brain development. Several studies have measured OPs in the meconium of new borns, indicating that exposures can occur *in utero*. In addition, several studies demonstrate that, for most of the OP metabolites measured, children aged 6-11 years have urine concentrations up to three times higher than those of adults aged 20-59 years. Children may ingest higher levels of OPs per body-weight as compared to adults because they have greater hand-to-mouth activity, eat and drink more per pound body-weight (and so may ingest more contaminants on food and in water) and do not eliminate OPs from their bodies as efficiently as do adults.

Common Uses

OPs are used as insecticides, fungicides, and herbicides and are applied to cotton, corn, wheat, and other agricultural crops. They are widely used as home pesticides. OPs are given orally to livestock and are applied to their skin, are used in flea collars and are applied to lawns and golf courses. OPs account for 50% of pesticides sold in the U.S., and more than 77 million pounds are used in the U.S. annually.

Alternatives

Alternative methods for controlling agricultural pests can reduce the need for pesticides. Integrated pest management (IPM) and organic farming, gardening and residential pest control strategies are two alternatives. IPM relies on using multiple non-chemical and chemical means to prevent and eliminate pests. Limited amounts of the safest possible pesticides are used only when necessary. Organic farming, gardening, and residential pest control rely on mechanical, physical, and biological strategies to prevent and eliminate infestations; pesticides are not used at all. For example, conditions leading to pest infestations can be abated by removing opened food from counters and blocking points of entry into residences.

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Additional Resources

Northwest Coalition for Alternatives to Pesticides: http://www.pesticide.org

Pesticide Action Network North America: http://panna.igc.org

Pesticide Management Programme, Cornell University: http://pmep.cce.cornell.edu/profiles/extoxnet/24d-captan/24d-ext.html