

## SOMETHING IN THE AIR (AND THE WATER, AND THE FOOD...)

**E**NVIRONMENTAL LINK to Parkinson's Risk Examined"... "Pesticide Residues Seen Too High in Children's Food"... "Seattle Study Detects Organophosphate Metabolites in Toddlers"...

These recent headlines illustrate the intense interest in the health effects of pesticide exposure. As a health-care provider, you may get questions from your patients about this topic as well. This article reviews the clinical presentation and epidemiology of pesticide exposure, reviews available laboratory tests, and describes resources to address patients' concerns.

### HEALTH EFFECTS OF PESTICIDES

The general term "pesticides" includes insecticides, herbicides, fungicides and other products used to control a variety of pests. The acute health effects of exposure to some commonly used pesticides are summarized in the table (verso).

The enormous range of new and existing pesticide products are challenging even to pesticide toxicology specialists. In addition, non-pesticide ingredients, such as solvents, can cause various non-specific symptoms.

There is great public concern about the possible association of pesticide exposure to chronic diseases, including cancer and Parkinson's disease, and developmental disorders. However, most research on these potential links has been inconclusive. A recent study pooled data from five previous investigations of the relationship between breast cancer and exposure to chemicals which may act as environmental estrogens: DDE (a metabolite of the organochlorine insecticide, DDT) and polychlorinated biphenyls (PCBs). Extensive analysis did not support an association of breast cancer risk with plasma/serum concentrations of either compound.<sup>1</sup>

The possible link between pesticide (particularly 2,4-D) exposure and non-Hodgkin lymphoma (NHL) is still under debate. A case control study of children found an association between overall

pesticide use and NHL<sup>2</sup>, however, exposure was only approximated (based entirely on parent recall), and all pesticides were grouped together, so no mechanism can be identified. A mechanism has been identified for a possible link between Parkinson's disease and various pesticides, including paraquat and maneb, and rotenone, a fungicide derived from plants.<sup>3,4</sup>

### PESTICIDE EXPOSURE IN OREGON

Oregon is one of only nine states that routinely collect data on acute pesticide poisonings. Roughly 50–100 suspected incidents are reported each year, affecting from 90–150 people. We know from anecdotal reports that not all exposures are captured in our system.

Women reported 57% of the pesticide-related illnesses and injuries (PRII) in 1997–98. The most commonly reported symptoms were fairly non-specific: headache, nausea and difficulty breathing or cough were each reported by about half of cases. Dermatologic problems were reported by more than one-quarter of affected individuals in 1998. Most years 50–65% of cases seek medical care, but in 1998, more than 80% sought care; less than 4% were hospitalized.

Higher numbers of PRII are reported in the most populous areas, however higher rates of the most likely cases occur in more rural areas. About half of all reported exposures occur in or around the home; yet most of these involve minor symptoms and the relationship between the pesticide exposure and illness cannot be confirmed. People who work directly with pesticides, particularly concentrated products, are at highest risk, and account for most of the confirmed cases. Concern and anxiety are often higher when people don't know spraying will occur, are unfamiliar with the chemicals, and have no control over the activity.

### TESTING FOR PESTICIDE EXPOSURE

While some pesticides break down rapidly, others may leave residue on foods. Because exposure is difficult to assess, the USDA collects data on such residues to estimate dietary exposure. One program testing produce most commonly consumed by children, found that less than 0.2% of foods had excessive residues in 1994–98. They also found that 25% of the children's diet samples had detectable levels of pesticides which are potentially carcinogenic.<sup>5</sup> Researchers are studying the possible health risks of these residue levels.

Biomonitoring can directly measure the body burden of pesticide exposure, but such testing is still limited. Cholinesterase (ChE) blood enzyme levels have been the most widely used biological test of the effects of organophosphate (OP) insecticides. ChE levels may be difficult to interpret, since they have a wide reference range which overlaps with the ranges seen among exposed persons. Sample timing must also be considered, as ChE levels in plasma recover within a few days, and in red blood cells up to a month or so later.

Another group of biomarkers for exposure to OPs are the dialkylphosphate (DAP) metabolites, excreted in the urine. About 75% of the registered organophosphate pesticides produce DAP metabolites, usually within a few days of exposure. In 1999, six DAP metabolite concentrations were measured in the urine of a national sample of the US population. Half of the people tested had measurable levels of all six DAPs, but whether these levels are a cause for health concern is not yet known.<sup>6</sup>

A 1998 Seattle study conducted similar biomonitoring in 110 children ages 2–5 in urban and suburban communities.<sup>7</sup> Children in families with a garden had higher DAP levels. Only one child did not test positive for at least one

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metabolite—the parents reported buying exclusively organic produce and did not use any pesticides at home. Further research will help determine a reference range for urine metabolites, identify high-risk groups, and ascertain whether public health efforts are reducing exposure levels over time.

Except for ChE, laboratory testing for pesticide exposure is not widely available. For more information about potential testing, contact a medical toxicologist at the National Pesticide Telecommunications Network (NPTN) at 800/858-7377.

### RESOURCES FOR PATIENTS AND PROVIDERS

Oregon has a state program to help people with suspected acute pesticide-related illness or injury. Affected people and their health-care providers can get confidential assistance from the Health Division, including in-depth environmental or occupational history, pesticide product identification, diagnosis and treatment information, and clean-up and prevention recommendations. Upon request, we can also make referrals to and work with state enforcement agencies.

The Health Division collects data on incidents to identify prevention opportunities. We educate school personnel about safe pesticide use and handling. On our recommendation, the state Department of Agriculture worked to change labeling of a mildewicide paint additive (TBTO) that had caused multiple illness complaints when incorrectly used indoors; no further cases have been

reported since the label was changed. Our data are also used nationally. Oregon data have been used by EPA to identify and reduce pesticide-related risks. For example, our state data have consistently shown that OP pesticides, particularly chlorpyrifos (Dursban) and Diazinon are more commonly associated with illness reports than other products. EPA recently entered into agreements with the manufacturers to dramatically reduce the use of chlorpyrifos and Diazinon—particularly in homes.

If you suspect pesticide poisoning, don't forget that resources are available for you and your patients. Also, with more information about exposures and health effects, we can better target state and even national pesticide poisoning prevention efforts.

### RESOURCES

- Immediate medical information: Oregon Poison Center (new national number!) 800/222-1222
- Report a suspected pesticide poisoning and/or access resources: OHD 503/731-4025
- Pesticide information for health care providers: National Pesticide Telecommunications Network (NPTN) 800/ 858-7377

- *Recognition and Management of Pesticide Poisonings*—a comprehensive manual from EPA: on-line from EPA <http://nptn.orst.edu/>; hard copy from OHD: 503/731-4025
- On-line, interactive case study in pediatric environmental health: University of Illinois-Chicago School of Public Health [www.uic.edu/sph/glakes/kids/case1/about.htm](http://www.uic.edu/sph/glakes/kids/case1/about.htm).

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CHEMICAL CLASS (PRODUCT NAMES)	ACUTE POISONING SYMPTOMS
<b>Organophosphates</b> (chlorpyrifos, diazinon, malathion, dichlorvos)	Headache, dizziness, fasciculations, nausea, diarrhea, respiratory depression, hypersecretion, miosis
<b>N-methyl carbamates</b> (carbaryl, propoxur, aldicarb)	Same as organophosphates, but more transitory
<b>Pyrethrins (biologic), pyrethroids</b> (permethrin, cypermethrin, fenvalerate)	Allergic rhinitis or asthma, throat irritation, contact dermatitis, paresthesia (skin contact), dizziness, headache
<b>Chlorophenoxy compounds</b> (2,4-D, MCPA)	Irritation of skin and mucous membranes, less commonly vomiting, headache, confusion
<b>Other herbicides</b> (triclopyr, glyphosate, atrazine, imazapyr)	Mostly mild irritant effects to eyes, skin and upper respiratory tract