Kids at Risk: Pesticides & Children's Health

Children are especially vulnerable to the health impacts of pesticides. Health professionals, educators, and public health advocates agree that school pesticide use can grievously affect their immediate and long-term health. Since the pioneering resolution of the California State Parent Teacher Association in 1972, the National Parent Teacher Association, the National Education Association, and many other organizations have joined in its call for reduced school pesticide use.

The California Medical Association and the American Academy of Pediatrics, District IX, passed resolutions in 1999 recommending school pest control programs that preclude use of highly toxic pesticides, reduce overall pesticide use, and involve parents in pest management decision-making.[1] As a result of health concerns raised by health professionals across the country, the U.S. EPA has begun assessing pesticides for their health effects on children. The agency recently ordered the phaseout of two popular home and school use pesticides—chlorpyrifos (Dursban) and diazinon—because of their effects on children's nervous systems.

Pesticides harm human health

Pesticides are linked to a variety of acute and chronic health effects. Acute symptoms include headache, nausea, diarrhea, dizziness, skin rash, asthma attack, and respiratory irritation. These symptoms often appear similar or identical to illnesses from other causes such as "the flu," resulting in frequent misdiagnosis of pesticide-related illness. Chronic effects of pesticides may remain undetected for weeks, months, or even years after exposure. Multiple scientific studies, however, link pesticides to cancer, birth defects, nervous system disorders, and immune deficiency.

Children are especially susceptible to pesticide exposure

Children are not "little adults." Children's vulnerability to pesticide exposure is increased by their greater cell division rates and being in the early stages of organ, nervous, reproductive, and immune system development.[2] Pesticide concentrations in their fatty tissues may be greater because their fat as a percentage of total body weight is lower.[3]

A 1993 National Research Council of the National Academy of Sciences report shows that children are more susceptible than adults to the health effects from low-level exposures to some pesticides over the long-term.[4] Animal studies also suggest that the young are more vulnerable to the effects of some toxic chemicals. A review of 269 drugs and toxic substances, including a number of pesticides, reveals lower lethal doses in new-born rodents than in adult rodents in 86% of cases.[5]

Children are likely to receive relatively greater pesticide exposure than adults

In addition to being more vulnerable to pesticide toxicity, children's behavior and physiology make them more likely than adults to encounter pesticides. For example, most pesticide exposure is through the skin—the largest organ—and children have much more skin surface area for their size than adults.[6] Similarly, their higher respiratory rate means they inhale airborne pesticides at a faster rate.[7]

Children's characteristic contact with floors, lawns, and playgrounds also increases exposure. Very young children frequently put fingers and other objects in their mouths, risking even greater exposure. The breathing zone for children is closer to the floor, where pesticides re-enter the air after floor surfaces are disturbed. Finally, children may bring home more than their homework—they may track school pesticides into their homes, presenting additional opportunity for exposure.

Childhood exposures can come from pesticide residues in dust and carpets

Although pesticides contaminate air, soil, food, water, and surfaces, studies that examine children's pesticide exposure indicate that the largest number and highest concentrations of chemicals often accumulate in household dust.[8] Because children's breathing zones are closer to the ground, they incur greater exposure to pesticides in carpets and dust than adults.

Carpets are long-term reservoirs for pesticides sprayed indoors.[9] Research assessing pesticide exposure from home carpet dust found an average of 12 pesticides in carpet dust samples, compared with 7.5 in air samples from the same residences. Moreover, 13 pesticides found in the carpet dust were not detected in the air. Diazinon appeared in nine of 11 carpets tested.[10] Carpet cleaning may release pesticides into the air, providing another opportunity for inhalation.[11]

Pesticide residues often refuse to go away

School districts frequently attempt to reduce exposure risk by applying pesticides after-hours, while students are not present. However, numerous studies indicate that pesticides may remain potent indoors for days, weeks, even months after application. Sunlight, rain, and soil microbes are not present to break down or carry away indoor pesticides, which thus persist much longer than in the outdoor environment.[12] Some pesticides can linger indoors for months and years. Indoor air concentrations of several kinds of pesticides may be more than 10 to 100 times higher than outdoor concentrations.[13] Even non-persistent pesticides last much longer indoors because they are not exposed to sunlight and water.[14] For example, one study detected air levels of diazinon 21 days after application at 20% of levels immediately after application.[15]

Not all indoor dust residues stem from indoor use. One study showed residues of 2,4-D and dicamba—herbicides used by some California school districts—could be tracked inside on shoes. Untreated areas, including lawn area and carpets, showed levels of 2,4-D, most likely due to spray-drift from nearby applications. Researchers estimated that residues of 2,4-D can persist in household carpet dust as long as one year.[16] Another study showed that after a single spray application in an apartment, chlorpyrifos continued to accumulate on both plush and hard-plastic children's toys, as well as on surfaces, for two weeks.[17]

When our children's health is at stake, we had better be safe than sorry. Given the serious health risks of childhood pesticide exposure, many school districts in California and nationwide are adopting least-toxic pest control practices.

1. See *Resolution to the CMA House of Delegates,* passed by CMA 29 March 1999 and adopted by California District IX, American Academy of Pediatrics, February 1999.

2. National Research Council, *Pesticides in the Diets of Infants and Children* (Washington, DC: National Research Council, National Academy Press, 1993); Watanabe et al., Placental and blood-brain barrier transfer following prenatal and postnatal exposures to neuroactive drugs: Relationship with partition coefficient and behavioral teratogensis, *Toxicol. Appl. Pharmacol.* 105 ([1990]1): 66–77; Repetto and Baliga, *Pesticides and the Immune System* (Washington, DC: World Resources Institute, 1996).

3. J. Wargo, *Our Children's Toxic Legacy: How Science and Law Fail to Protect Us from Pesticides* (New Haven, CT: Yale University Press, 1996).

4. National Research Council, *Pesticides.*

5. R. Wyatt, Intolerable risk: The physiological susceptibility of children to pesticides, *J. Pesticide Reform* Fall (1989).

6. Mott, *Our Children at Risk: The Five Worst Environmental Threats to Their Health* (Natural Resources Defense Council, November 1997), 5, citing *Principles for Evaluating Health Risks from Chemicals during Infancy and Early Childhood* (no author or date provided), 56; see also T. Schettler, *Generations at Risk: How Environmental Toxins May Affect Reproductive Health in Massachusetts* (Boston, MA: Greater Boston Physicians for Social Responsibility and MASSPIRG, 1996), 50.

7. Mott, *Our Children at Risk,* 5.

8. Schettler, *Generations at Risk,* 51, citing R. Whitmore et al., Non-occupational exposures to pesticides for residents of two U.S. cities, *Arch. of Env. Contam. and Toxicol.* 26: 1–13. See also, W.R. Roberts et al., Development and field testing of a high volume sampler for pesticides and toxics in dust, *J. Exposure Anal. and Env. Epidemiol.* 1 ([1991]2).

9. N. Simcox et al., Pesticides in household dust and soil exposure pathways for children of agricultural families, *Env. Health Persp.* 103 (1995): 1126–34.

10. R.W. Whitmore et al., Non-occupational exposure to pesticides, *Arch. of Env. Contam. and Toxicol.* 26 (1994): 47–59.

11. E. Esteban et al., Association between indoor residential contamination with methyl parathion and urinary para-nitrophenol, *J. Exposure Anal. and Env. Epidem.* (1996): 384.

12. Simcox et al., Pesticides, 1126.

13. C. Wilkinson and S. Baker, *The Effects of Pesticides on Human Health* (Princeton, NJ: Princeton Scientific Publishing Co., 1990), citing R. Lewis and R. Lee, Air pollution from pesticides: Sources: Occurrence and dispersion, *Indoor Air Pollution from Pesticides and Agricultural Processes* (Boca Raton, FL: CRC Press, 1976), 51–94.

14. Wilkinson and Baker, *Effects of Pesticides*, 83.

15. Leidy et al., Concentration and movement of diazinon in air, *J. Env. Sci. Health* B17 (1982): 311–19.

16. M. Nishioka et al., Measuring transport of lawn-applied herbicide acids from turf to home: Correlation of dislodgeable 2,4-D turf residues with carpet residues and carpet surface residues, *Env. Sci. Technol.* 30 ([1996]11).

17. Gurunathan et al., Accumulation of chlorpyrifos on residential surfaces and toys accessible to children, *Env. Health Persp.* 106(1998): 9–16.

For more information on school pest control that protects children's health,
contact the Healthy Schools Campaign at 888-CPR-4880 or http://www.calhealthyschools.org.