Children and Pesticides Don't Mix

Children are especially vulnerable to pesticides

- The National Academy of Sciences reports that children are more susceptible to chemicals than adults and estimates that 50% of lifetime pesticide exposure occurs during the first five years of life.[1]
- According to EPA and the American Association of Poison Control Centers, every year more than 10,000 kids are poisoned by rodenticides. Rat poisons are by far the leading cause of [pesticide-related] visits to health care facilities in children under the age of six years and the second leading cause of hospitalization.[2]
- EPA concurs that children take in more pesticides relative to body weight than adults and have developing organ systems that are more vulnerable and less able to detoxify toxic chemicals.[3]
- A 2010 study conducted by the National Institutes of Environmental Health Sciences found certain foods eaten by children contained either an organophosphate or pyrethroid pesticide, leading researchers to believe that government agencies may be underestimating children's dietary exposure to pesticides and, therefore, the inherent risks to children's health.[4]
- One 2011 French cohort study finds that pre-natal exposures to atrazine are associated with fetal growth restriction and small head circumference. [5]
- Infants crawling behavior and proximity to the floor account for a greater potential than adults for dermal and inhalation exposure to contaminants on carpets, floors, lawns, and soil.[6]
- Children with developmental delays and those younger than six years are at increased risk of ingesting pesticides through nonfood items, such as soil.[7]
- Studies find that pesticides such as the weedkiller 2,4-D pass from mother to child through umbilical cord blood and breast milk.[8]
- One 2010 analysis observed that women who use pesticides in their homes or yards were two times more likely to have offspring with neural tube defects than women. [9]
- Consistent observations have led investigators to conclude that chronic low-dose exposure to certain pesticides might pose a hazard to the health and development of children.[10]
- The World Health Organization (WHO) cites that over 30% of the global burden of disease in children can be attributed to environmental factors, including pesticides.[11]

Children, cancer and pesticides

- The probability of an effect such as cancer, which requires a period of time to develop after exposure, is enhanced if exposure occurs early in life.[12]
- A 2010 population-based, case-control study of California and Washington state born children ten years of age or younger finds a strong interaction between insecticide exposure during childhood and chromosome abnormalities, suggesting that exposure in childhood to insecticides in combination with a reduced ability to detoxify them increases risk of developing brain tumors.[13]
- A study published in the *Journal of the National Cancer Institute* finds that household and garden pesticide use can increase the risk of childhood leukemia as much as seven-fold.[14]
- A 2010 meta-analysis on residential pesticide use and childhood leukemia finds an association with exposure during pregnancy, as well as to insecticides and herbicides. An association is also found for exposure to insecticides during childhood.[15]

Commonly Used Chemicals

Chemical	Common Use	Health Effects
2,4-D	Lawns	c, ed, r, n, kl, si, bd
Dicamba	Lawns	r, n, kl, si, bd
Fipronil	Indoor/outdoor baits, pet care	c, ed, n, kl, si
Glyphosate	Lawns	c, r, n, kl, si
Permethrin	Mosquitoes, head lice, garden	c, ed, r, n, kl, si

Key: Birth/developmental defects=bd; Kidney/liver damage=kl; Sensitizer/irritant=si; Cancer=c; Neurotoxicity=n; Endocrine Disruption=ed; Reproductive effects=r

Alternatives

Eliminate exposure to toxic chemicals by implementing organic management practices that use cultural, mechanical and biological methods of control. An organic diet keeps chemicals out of children.

Studies show children's developing organs create "early windows of great vulnerability" during which exposure to pesticides can cause great damage.

- Studies show that children living in households where pesticides are used suffer elevated rates of leukemia, brain cancer and soft tissue sarcoma.[16]

- Pesticides can increase susceptibility to certain cancers by breaking down the immune system's surveillance against cancer cells. Infants and children, the aged and the chronically ill are at greatest risk from chemically-induced immune suppression.[17]

- A study published by the American Cancer Society finds an increased risk for non-Hodgkin's lymphoma (NHL) in people exposed to common herbicides and fungicides, particularly the weedkiller mecoprop (MCPP). People exposed to glyphosate (Roundup®) are 2.7 times more likely to develop NHL.[18]

- 75 out of all 99 human studies done on lymphoma and pesticides find a link between the two.[19]

- Four peer-reviewed studies demonstrate the ability of glyphosate-containing herbicides to cause genetic damage to DNA (mutagenicity), even at very low concentration levels.[20]

- A 2007 study published in *Environmental Health Perspectives* finds that children born to mothers living in households with pesticide use during pregnancy had over twice as much risk of getting cancer, specifically acute leukemia (AL) or non-Hodgkin lymphoma (NHL).[21]

- A 2007 Canadian report shows that a greater environmental risk exists for boys, specifically when it comes to cancer, asthma, learning and behavioral disorders, birth defects and testicular dysgenesis syndrome.[22]

Children, asthma and pesticides

- Researchers find that pesticides may increase the risk of developing asthma, exacerbate a previous asthmatic condition or even trigger asthma attacks by increasing bronchial hyperresponsiveness.[23]

- A 2004 study finds that young infants and toddlers exposed to herbicides (weedkillers) within their first year of life are 4.5 times more likely to develop asthma by the age of five, and almost 2.5 times more likely when exposed to insecticides.[24]

- EPA material safety data sheets for the common herbicides 2,4-D, mecoprop, dicamba, (often combined as Trimec®) and glyphosate (Roundup®) list them as respiratory irritants that can cause irritation to skin and mucous membranes, chest burning, coughing, nausea and vomiting.

Children, learning and developmental disorders and pesticides

- Roughly one in six children in the U.S. has one or more developmental disability, ranging from a learning disability to a serious behavioral or emotional disorder.[25]

- Scientists believe that the amount of toxic chemicals in the environment that cause developmental and neurological damage are contributing to the rise of physical and mental effects being found in children.[26]

- Studies show children's developing organs create "early windows of great vulnerability" during which exposure to pesticides can cause great damage.[27]

- According to researchers at the University of California-Berkeley School of Public Health, exposure to pesticides while in the womb may increase the odds that a child will have attention deficit hyperactivity disorder (ADHD).[28]

- A 2012 study was the first to find that, at age 7, boys had greater difficulty with working memory, a key component of IQ, than girls with similar prenatal exposure to chlorpyrifos exposures, establishing a difference between how boys and girls respond to prenatal exposure. Similarly, another 2012 study reports that babies exposed in the womb to chlorpyrifos have brain abnormalities after birth.[29]

- In utero exposure to organophosphate pesticides may cause long-term hormonal and behavior alterations. Studies show that exposure to even low levels of chlorpyrifos during pregnancy can impair learning and change brain function.[30]

- One study found that there has been a seven- to eight-fold

increase in the number children born in California with autism since 1990 where incidence to 5 years of age per 10,000 births rose consistently from 6.2 for 1990 births to 42.5 for 2001 births, suggesting that environmental factors including pesticides and household chemicals are also contributing to the phenomenon.[31]

- Lawn pesticide products containing herbicides and fertilizers(such as "weed and feed" products) tested on mice show increased risk of infertility, miscarriage and birth defects at very low dosages.[32]
- Additional studies on lawn pesticide product formulations show effects on learning ability, aggressiveness, memory, motor skills and immune system function.[33]
- A 2002 study finds children born to parents exposed to glyphosate (Roundup®) show a higher incidence of attention deficit disorder and hyperactivity.[34]
- A study of 210,723 live births in Minnesota farming communities finds children of pesticide applicators have significantly higher rates of birth defects than the average population.[35]
- In a 2004-2005 review of 2,4-D, EPA finds that, "there is a concern for endocrine disruption."[36]

Pesticide accumulation and drift

- Children ages 6-11 nationwide have significantly higher levels of pesticide residues in their bodies than all other age categories.[37]
- Biomonitoring testing in Canada finds residues of lawn pesticides, such as 2,4-D and mecoprop, in 15 percent of children tested, ages three to seven, whose parents had recently applied the lawn chemicals. Breakdown products of organophosphate insecticides are present in 98.7 percent of children tested.[38]
- A 2011 study by the Centers for Disease Control and Prevention's (CDC) National Institute for Occupational Safety and Health (NIOSH) and state agency partners finds that pesticide drift from conventional, chemical-intensive farming has poisoned thousands of farmworkers, rural residents and their children in recent years.[39]
- Scientific studies show that 2,4-D applied to lawns drifts and is tracked indoors where it settles in dust, air and surfaces and may remain for up to a year in carpets.[40]
- Samples from 120 Cape Cod homes, where elevated incidence of breast, colorectal, lung, and prostate cancers are reported, find high indoor air and dust concentrations of carbaryl, permethrin, and 2,4-D.[41]
- A study published in *Environmental Health Perspetives* found that children who eat a conventional diet of food produced with chemical-intensive practices carry residues of organophosate pesticides that are reduced or eliminated when they switch to an organic diet.[42]
- Scientists at the California Department of Public Health found that 28% of the mothers studied who lived near fields in the Central Valley, which were sprayed with organochlorines, such as endosulfan and dicofol, have children with autism.[43]
- A 2005 study published in the *Journal of the American Medical Association* found that students and school employees are being poisoned by pesticide use at schools and from drift off of neighboring farmlands.[44]

Children who eat a diet of food produced with chemical-intensive practices carry pesticide residues that are reduced or eliminated when they switch to an organic diet.

Resources

1 National Research Council, National Academy of Sciences. 1993. Pesticides in the Diets of Infants and Children, National Academy Press, Washington, DC: 184-185.

2 USEPA. 2011. Rodenticide Products for Consumers. Available at http://www.epa.gov/pesticides/mice-and-rats/consumer-prod.html#risk, and USEPA. 2011. EPA News Release: EPA Takes Major Actions to Reduce Americans' Risks from Mouse and Rat Poisons / Move will better protect children, pets and wildlife. Release Date: 06/07/2011)

3 USEPA, Office of the Administrator, Environmental Health Threats to Children, EPA 175-F-96-001, September 1996. See also: http://www.epa.gov/pesticides/food/pest.htm.

4 Lu C, Schenck FJ, Pearson MA, Wong JW 2010. Assessing Children's Dietary Pesticide Exposure: Direct Measurement of Pesticide Residues in 24-Hr Duplicate Food Samples. Environ Health Perspect 118:1625-1630

5 Chevrier C, Limon G, Monfort C, Rouget F, Garlantézec R, Petit C, et al. 2011. Urinary Biomarkers of Prenatal Atrazine Exposure and Adverse Birth Outcomes in the PELAGIE Birth Cohort. Environ Health Perspect. 119:1034-1041

6 Bearer, CF. 2000. "The special and unique vulnerability of children to environmental hazards." Neurotoxicology 21: 925-934; Fenske, R., et al. 1990. "Potential Exposure and Health Risks of Infants following Indoor Residential Pesticide Applications." Am J. Public Health. 80:689-693.

7 Faustman EM, Silbernagel SM, Fenske RA, Burbacher TM, Ponce RA. 2000. Mechanisms underlying children's susceptibility to environmental toxicants. Environ Health Perspect. 108(suppl 1):13 –21.

8 Pohl, HR., et al. 2000. "Breast-feeding exposure of infants to selected pesticides," Toxicol Ind Health. 16 :65 –77; Sturtz, N., et al. 2000. Detection of 2,4-dichlorophenoxyacetic acid (2,4-D) residues in neonates breast-fed by 2,4-D exposed dams. Neurotoxicology 21(1-2): 147-54; Houlihan, J., et al. 2005. Body Burden, The Pollution in Newborns. Environmental Workgin Group, Washington, D.C. http://www.ewg.org/reports/body_burden2/ (accessed8/5/05).

9 Brender, JD., et al. 2010. Maternal Pesticide Exposure and Neural Tube Defects in Mexican Americans. Ann Epidemiol. 20(1):16-22

10 Weiss, B., et al. 2004 April. "Pesticides," Pediatrics 113(4): 1030-1036.

11 World Heath Org. (WHO). 2006. Principles for Evaluating Health Risks in Children Associated with Exposure to Chemicals. Geneva, Switzerland.

12 Vasselinovitch, S., et al., "Neoplastic Response of Mouse Tissues During Perinatal Age Periods and Its Significance in Chemical Carcinogensis," Perinatal Carcinogenesis, National Cancer Institute Monograph 51, 1979.

13 Nielsen, S.S., et al. 2010. Childhood brain tumors, residential insecticide exposure, and pesticide metabolism genes. Environmental Health Perspectives 118(1):144-149

14 Lowengart, R. et al. 1987. "Childhood Leukemia and Parent's Occupational and Home Exposures," Journal of the National Cancer Institute 79:39.

15 Turner, M.C., et al. 2010. Residential pesticides and childhood leukemia: a systematic review and meta-analysis. Environ Health Perspect 118(1):33-41

16 Leiss, J., et al. 1995. "Home Pesticide Use and Childhood Cancer: A Case-Control Study," American Journal of Public Health 85:249-252; Gold, E. et al. 1979. "Risk Factors for Brain Tumors in Children," Am J of Epidemiology 109(3): 309-319; Lowengart, P., et al. 1995. "Childhood Leukemia and Parents' Occupational and Home Exposures," J National Cancer Institute 79(1): 39-45; Reeves, J. 1982. "Household Insecticide-Associated Blood Dyscrasias in Children," (letter) Am J of Pediatric Hematology/Oncology 4:438-439; Davis, J., et al. 1993. "Family Pesticide Use and Childhood Brain Cancer," Archives of Environmental Contamination and Toxicology 24:87-92; Buckley, J., et al. 1994. "Epidemiological characteristics of Childhood Acute Lymphocytic Leukemia," Leukemia 8(5):856-864.

17 Repetto, R., et al. 1996 March. Pesticides and Immune System: The Public Health Risk, World Resources Institute, Washington, DC.

18 Hardell, L., et al. 1999 Mar. "A Case-Control Study of Non-Hodgkin Lymphoma and Exposure to Pesticides," J of the Am Cancer Soc, (85):6. p.1353.

19 Osburn, S. 2001. Do Pesticides Cause Lymphoma? Lymphoma Foundation of America, Chevy Chase, MD.

20 Cox C. 2004 Winter. "Glyphosate." Journal Of Pesticide Reform. Vol. 24 (4).

21 Rudant, J. et al. 2007. Household Exposure to Pesticides and Risk of Childhood Hematopoietic Malignancies: The ESCALE Study (SFCE). Environ Health Perspect. 115:1787–1793.

22 Canadian Partnership For Children's Health And Environment. 2007. A Father's Day Report - Men, Boys And Environmental Health Threats. www.healthyenvironmentforkids.ca.

23 Hernández, AF., Parrón, T. and Alarcón, R. 2011. Pesticides and asthma. Curr Opin Allergy Clin Immunol.11(2):90-6

24 Salam, MT, et al. 2003. "Early Life Environmental Risk Factors for Asthma: Findings from the Children's Health Study." Environmental Health Perspectives. 112(6): 760.

25 Boyle, C. A., et al. 1994. "Prevalence and health impact of developmental disabilities in US children." Pediatrics 93: 399-403.

26 National Research Council. 2000. Scientific frontiers in developmental toxicology and risk assessment. Washington, DC: National Academy Press.Physicians for Social Responsibility, The National Environmental Trust, and The Learning Disabilities Association of America. 2000. Polluting our future: Chemical pollution in the U.S. that affects child development and learning. http://www.net.org/health/tri_report.pdf (accessed 6/2/05).

27 Landrigan, P.J., L Claudio, SB Markowitz, et al. 1999. "Pesticides and in¬ner-city children: exposures, risks, and prevention." Environmental Health Perspectives 107 (Suppl 3): 431-437.

28 Marks AR, Harley K, Bradman A, Kogut K, Barr DB, Johnson C, et al. 2010. Organophosphate Pesticide Exposure and Attention in Young Mexican-American Children: The CHAMACOS Study. Environ Health Perspect 118:1768-1774.

29 Horton, M, Kahn, L, et al. 2012. Does the home environment and the sex of the child modify the adverse effects of prenatal exposure to chlorpyrifos on child working memory? Neurotox and Teratology 34(5):534–541); Rauh, V, Perera, F et al. 2012. Brain anomalies in children exposed prenatally to a common organophosphate pesticide. PNAS doi:10.1073/pnas.1203396109

30 Haviland, Butz, Porter. 2009. Long-term sex selective hormonal and behavior alterations in mice exposed to low doses of chlorpyrifos in utero. Reprod Toxicol;29(1):74-9

31 Hertz-Picciotto, I. and Delwiche, L. 2009. The Rise in Autism and the Role of Age at Diagnosis. Epidemiology:20(1):pp 84-90

32 Greenlee, A. et al. 2004. "Low-Dose Agrochemicals and Lawn-Care Pesticides Induce Developmental Toxicity in Murine Preimplantation Em-

bryos," Environ Health Perspect 112(6): 703-709; Cavieres, M., et al. 2002. "Developmental toxicity of a commercial herbicide mixture in mice: Effects on embryo implantation and litter size." Environ Health Perspect 110:1081-1085.

33 Porter, W. 2004 Spring. "Do Pesticides Affect Learning and Behavior? The neuro-endocrine-immune connection," Pesticides and You, Beyond Pesticides. 21(4): 11-15; Shettler, T., et al. 2000. "Known and suspected developmental neurotoxicants," In Harms Way: Toxic Threats to Child Development, Greater Boston Physicians for Social Responsibility: Cambridge, MA; Mitchell, J. et al. 1989. "The Behavioral Effects of Pesticides in Male Mice," Neurotoxicology and Teratology, 11: 45-50.

34 Cox C. 2004. Journal Of Pesticide Reform. Vol. 24 (4) citing: Garry, V.F. et al. 2002. "Birth defects, season of conception, and sex of children born to pesticide applicators living in the Red River Valley of Minnesota." Environ. Health Persp. 110 (Suppl. 3):441-449.

35 Garry, V., et al. 1996. "Pesticide appliers, biocides, and birth defects in rural Minnesota." Environmental Health Perspectives 104(4):394-399.

36 EPA. 2004 June. 2,4-D. HED's Human Health Risk Assessment for the Reregistration Eligibility Decision (RED). P. 7.

37 Centers for Disease Control and Prevention. 2003 Jan. Second National Report on Human Exposure to Environmental Chemicals.

38 Valcke, Mathieu, et al. 2004. "Characterization of exposure to pesticides used in average residential homes with children ages 3 to 7 in Quebec." National Institute of Public Health, Québec. www.inspq.qc.ca/pdf/publica-tions/319-CaracterisationPesticidesEnfants.pdf (accessed 6/2/05).

39 Lee, SJ. et al. 2011. Acute Pesticide Illnesses Associated with Off-Target Pesticide Drift from Agricultural Applications — 11 States, 1998–2006. Environ Health Perspect. 119:1162–1169

40 Nishioka, M., et al. 1996. Environmental Science Technology, 30:3313-3320; Nishioka, M., et al. 2001. Environmental Health Perspectives, 109(11).

41 Rudel, Ruthann, et al. 2003. "Phthalates, Alkylphenols, Pesticides, Poly¬brominated Diphenyl Ethe rs, and Other Endocrine-Disrupting Compounds in Indoor Air and Dust." Environmental Science and Technology 37(20): 4543-4553.

42 Lu, C. et al. 2008. Dietary Intake and Its Contribution to Longitudinal Organophosphorus Pesticide Exposure in Urban/Suburban Children. Environ Health Perspect doi:10.1289/ehp.10912 available via http://dx.doi.org/.

43 Roberts, C. et al. 2007. Maternal Residence Near Agricultural Pesticide Applications and Autism Spectrum Disorders among Children in the California Central Valley. Environ Health Perspect.115(10)

44 Alarcon, WA. et al. 2005. Acute illnesses associated with pesticide exposure at school. JAMA. 294(4); 455-465.

BEYOND PESTICIDES
701 E Street, S.E., Suite 200, Washington DC 20003
202-543-5450 (v) • 202-543-4791 (f)
info@beyondpesticides.org • www.beyondpesticides.org