EACP Committee

From:	Autumn Ness <ANess@beyondpesticides.org>
Sent:	Monday, September 07, 2020 8:42 PM
To:	EACP Committee
Cc:	Shane M. Sinenci; Gina M. Young; Tamara Paltin; Keani N. Rawlins; Alice L. Lee; Riki Hokama; Yukilei Sugimura; Tasha A. Kama; Mike J. Molina; Kelly King
Subject:	Testimony in support of EACP-1
Attachments:	Beyond Pesticides Statement EACP pesticide bill.docx; DOE Memo on Herbicides in School.pdf; american academy of pediatrics statement on pesticides.pdf

Aloha,
Please find my testimony in support of EACP-1, along with supporting documents, attached.
I will be present for the committee hearing to answer any questions.
Mahalo,
Autumn Ness
Hawai'i Program Director
Beyond Pesticides
808 250 4200

BEYOND PESTICIDES
701 E Street, SE ▪ Washington DC 20003
202-543-5450 phone ▪ 202-543-4791 fax
info@beyondpesticides.org ▪ www.beyondpesticides.org

Maui County Council
Environmental, Agricultural, and Cultural Preservation Committee

In STRONG SUPPORT of EACP-1:
Integrated Pest and Environmental Management on County Property
September 8, 2020

Committee Chair Sinenci, and Members of the EACP Committee:

Thank you for the opportunity to express my strong support for EACP 1. Many dedicated individuals have worked for years toward the goal of making our public spaces pesticide free. Great progress has been made with the cooperation of Maui County Parks and Public Works Departments and I really hope we can finally celebrate a bill codifying that our County owned public spaces will be managed with the health of our environment and most vulnerable residents in mind.

I've worked on this issue in many capacities over the years, including as the assistant to Council Member Elle Cochran. I am currently the Hawai'i Director for Beyond Pesticides, a national nonprofit organization that aims to educate the public on the hazards of pesticides and promote alternatives to their use. On behalf of our members in Hawai'i and across the United States, we strongly support the passage of EACP-1, and offer technical support and services to continue to assist Maui County personnel in the transition away from herbicide use in public spaces, however needed.

Over the years, we have faced industry backed rhetoric and fearmongering about radical cost increases associated with more sustainable land management practices, which have shown to be completely false. **The chemical industry business model depends on the false assumption that we can not manage our public spaces without their toxic products, and we are showing that too to be false. Collectively, we have the knowledge and resources to do better, so it is our kuleana to do so.**

EACP-1 is a huge step toward protection of children, elderly, and vulnerable population groups that suffer from compromised immune and neurological systems, cancer, reproductive problems, respiratory illness and asthma, Parkinson's, Alzheimer's, diabetes, and learning disabilities. **Of the 30 most commonly used lawn care pesticides, 16 are linked to cancer, 17 are endocrine (hormone) disruptors, 21 are reproductive toxicants, 12 are linked to birth defects, 14 are neurotoxic, 25 cause kidney liver effects, and 26 are skin or eye irritants.[1]**

[1] Health Effects of 30 Commonly Used Pesticides. 2015. Beyond Pesticides. http://www.beyondpesticides.org/lawn/factsheets/30health.pdf
(See Appendix C for a fully cited copy of the fact sheet)

In addition to concerns over human health, we are at a time of cascading environmental crises. Managed honeybee populations across the country have been declining at an unsustainable rate, approximately 30% each year.[2] Wild pollinators are also in trouble; eastern monarch butterflies lost 80% of their population since 1990.[3] New research published late last month finds that 30%, over 3 billion birds have been lost since 1970,[4] risking the Silent Spring first warned by Rachel Carson. Studies finds that pesticides are contributing each of these concerning statistics.

Now is the right time for Maui County to act on toxic pesticides. The science on the dangers of pesticides is clear. The Hawai'i State Board of Education, and local communities across the state and the U.S. are choosing to stop using these toxic chemicals on our public spaces.

Chemical intensive Land Management and Climate Change

Healthy, living soil sequesters carbon. It literally pulls it out of the air, and stores it in the ground. And in this day and age, where atmospheric carbon levels are wreaking havoc on our planet, anything that puts carbon in the ground and keeps it there buys us time to implement bigger solutions.

Turning our parks and roadways into an emergency carbon sink system is incredibly easy. All it requires is that we stop using pesticides and synthetic fertilizers that disrupt the carbon-capturing systems that naturally exist in healthy, organic soil. Influential climate scientist James Hansen argues that land-management practices are one of the few affordable options available today for drawing down carbon.

On a recent trip to Washington DC I spoke to a House Committee on Agriculture senior staffer: "In the last six months there has been a watershed shift in the conversation related to soil health and climate change." The current trending conversation on Capitol Hill is about how pesticide- and fertilizer-heavy practices contribute to climate change, how organic practices sequester carbon, and how we can facilitate transitions to organic practices.

Unfortunately, Capitol Hill is in gridlock. The stark reality is that bold legislation that addresses energy and industrial carbon emissions won't go anywhere until at least after the 2020 elections.

The good news is that we can start working on soil health and carbon sequestration zones now, locally, all over Maui County. In fact, climate solution leaders in Washington DC expressed real, desperate hope that states and counties will have these conversations locally and enact system overhauls so that in 2021 they have more data and success stories to propel even faster action on the federal level.

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[2] Bee Informed Partnership. National Management Survey. Total Annual Losses. https://bip2.beeinformed.org/survey/

[3] Center for Biological Diversity. 2017. Iconic Butterfly Has Declined by More Than 80 Percent in Recent Decades. https://www.biologicaldiversity.org/news/press_releases/2017/monarch-butterfly-02-09-2017.php

[4] Greenfieldboyce, Nell. 2019. North America has lost 3 billion birds, scientists say. NPR. https://www.npr.org/2019/09/19/762090471/north-america-has-lost-3-billion-birds-scientists-say

As an added bonus, **healthy soil and the organic matter inside retain water better, making the land resistant to drought, and more stable in the kind of big storm events that are increasing with climate change, sending less sediment runoff into our streams and ocean.**

In this day and age, where atmospheric carbon levels are wreaking havoc on our planet, we should absolutely turn Maui County parks and open spaces into areas that put carbon in the ground and keep it there.

Adverse Effects of Chemical Pesticides

The passage of EACP -1 is critical as our country's appetite for pesticides raises grave concerns about the effects of chemical-intensive practices, our relationship to nature, chemical effects at the cellular level, and weed resistance to chemical controls. The U.S. Geological Survey has linked pesticide use in urban areas to runoff and pesticide contamination of local waterways.[5] ***Of the 30 most commonly used lawn pesticides, 20 have a high potential to leach into waterways, 19 have been detected seeping into groundwater, 22 are toxic to birds, 14 are toxic to mammals, 29 are toxic to bees, and all 30 of these chemicals present toxicity concerns for fish or other aquatic organisms.*** [6] [See Appendix C and D for a chart and references for this information.]

Rachel Carson wrote in *Silent Spring*, "By their very nature, chemical controls are self-defeating, for they have been devised and applied without taking into account the complex biological systems against which they have been blindly hurled. The chemicals may have been pretested against a few individual species, but not against living communities." She warned us to protect the diverse organisms that make up a healthy ecosystem, including bees, birds, butterflies and other pollinators.

Pesticide-Induced Diseases

Scientific literature documents elevated rates of chronic diseases among people exposed to pesticides, with increasing numbers of studies associated with both specific illnesses and a range of illnesses. ***Beyond Pesticides' Pesticide-Induced Diseases Database[7] documents over 750 studies linked to human health effects. Of which, there are 359 studies on cancer; 107 studies on sexual and reproductive dysfunction; 102 studies on Parkinson's disease; 87 studies on learning and developmental disorders; 33 studies on birth defects; 32 studies on asthma; 18 studies on diabetes; and 12 studies on Alzheimer's disease.***

The studies in the database show that our current approach to restricting pesticide use through risk assessment-based mitigation measures is not working. EPA's risk assessment fails to look at chemical mixtures, synergistic effects, certain health endpoints (such as endocrine disruption), disproportionate effects to vulnerable population groups, and regular noncompliance with product label directions. These deficiencies contribute to its severe limitations in defining real

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[5] United States Geological Survey. 2007. Pesticides in US Streams and Groundwater. *Environmental Science and Technology.* http://water.usgs.gov/nawqa/pnsp/pubs/files/051507.ESTfeature_gilliom.pdf

[6] Environmental Effects of 30 Commonly Used Lawn Pesticides. 2015. Beyond Pesticides. http://www.beyondpesticides.org/lawn/factsheets/30enviro.pdf

[7] Beyond Pesticides. 2019. Pesticide Induced Diseases Database. http://www.beyondpesticides.org/resources/pesticide-induced-diseases-database/overview

world poisoning, as captured by epidemiologic studies in the database. [See Appendix A for additional health effect information, and Appendix B for failures of the EPA regulatory system.]

An Organic Systems Approach that Eliminates the Need for Toxic Pesticides

By limiting the use of pesticides, EACP - 1 encourages County Personnel to implement organic practices that have been shown to maintain turf expectations with minimal financial implications. While conventional, chemical-intensive turf and landscape management programs are generally centered on a synthetic product approach that continually treats the symptoms of turf problems with toxic chemicals, ***organic approaches focus on the root causes of pest problems, which lie in the soil***. These land management techniques reveal that toxic pesticides are not needed for successful turf management. Rather, this approach incorporates preventive steps based on supporting soil biology to improve soil fertility and turf grass health, natural or organic products based on a soil analysis that determines need, and specific cultural practices, including mowing height, aeration, dethatching, and over-seeding.

For example, in the case of mowing high, the natural system supported by this practice is an increase in the root depth of grass. Deeper roots provide greater capacity for the grass to draw water and nutrients from the soil, and stronger grass plants are better able to crowd out weeds or slough off pest pressure. Thus, the practices incorporated as part of a systems approach build resiliency, a term used to describe the ability for an environment to bounce back to its previous state after a disturbance. By fostering healthy soil biology, this approach leads to less need for outside inputs, such as synthetic pesticides and fertilizers. And when properly maintained, lawns and playing fields cared for in this way meet the same expectations of conventional, chemically managed turf.

These practices and the ever-expanding product line of natural alternatives has enabled a cost parity between the conventional and natural approach. A report produced by nationally renowned turf grass expert Chip Osborne in coordination with Grassroots Environmental Education, which looks specifically at the cost of conventional and organic turf management on school athletic fields, concludes that ***once established, a natural turf management program can result in savings of greater than 25% compared to a conventional turf management program.***[8] There is also research from Harvard University which determined that, ultimately, total operating costs of its organic maintenance program are expected to be the same as the conventionally based program. In a 2009 *New York Times* article,[9] the school determined that ***irrigation was reduced by 30%, saving 2 million gallons of water a year as a result of reduced irrigation needs.*** The school was also spending $35,000/year trucking yard waste off site. The university can now use those materials for composting and has saved an additional $10k/year due to the decreased cost and need to purchase fertilizer from off-campus sources.[10] And while a decade ago the natural systems approach required slightly increased up-front costs and saw savings in the long run, technology and practices have now progressed to the point where parity can be achieved from the outset.

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[8] Osborne, Charles and Doug Wood. 2010. A cost Comparison of Conventional (Chemical) Turf Management and Natural (Organic) Turf Management on School Athletic Fields. Grassroots Environmental Education. http://www.grassrootsinfo.org/pdf/turfcomparisonreport.pdf
[9] Raver, Anne. 2009. The Grass is Greener at Harvard. http://www.nytimes.com/2009/09/24/garden/24garden.html?_r=2
[10] Harvard University. 2009. Harvard Yard Soils Restoration Project Summary Report. http://www.slideshare.net/harvard_uos/harvard-yard-soils-restoration-project-summary-report-22509-4936446

Herbicide-Free Management of Rights of Way and Open Spaces

Herbicide-free management of county rights of way and other open spaces is also based on a holistic systems approach. We are working with public works departments across the State of Hawai'i to identify areas of roadway that can be maintained with barrier solutions like weed mats or cover seeding. We will be working with road crews over the next few years to identify stretches of road/highway that can be replanted with native trees such as a'ali'i and crown flower bushes to create pollinator corridors that also choke out invasive weeds.

Departments across the state have found success in specialized machinery that can mow hard-to-reach stretches of highway, eliminating the use of herbicides, and allowing them to improve sight distance instead of leaving stretches of dead brown weeds at tight corners and along scenic stretches of highway. During their work to eliminate herbicide use on the highways, they have identified areas where the presence of weeds and their living biology and root systems are actually beneficial, as they prevent runoff and dangerous rock falls during rain storms.

In many areas, a targeted inquiry at where and why herbicides are being used reveal that their use is actually unwarranted, and other methods of weed control are actually much more effective.

Autumn Ness
Hawai'i Organic Land Management Program Director
Beyond Pesticides
808 250 4200
aness@BeyondPesticides.org

Appendix A. Key Areas of Concern

Children's Vulnerability

Children face unique dangers from pesticide exposure. The National Academy of Sciences reports that children are more susceptible to chemicals than adults and estimates that 50% of lifetime pesticide exposures occur during the first five years of life.[11] In fact, studies show ***children's developing organs create "early windows of great vulnerability" during which exposure to pesticides can cause great damage.***[12] Additionally, 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).[13]

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

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

[13] 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.

As EPA points out in its document, *Pesticides and Their Impact on Children: Key Facts and Talking Points*:[14]

- "Due to key differences in physiology and behavior, children are more susceptible to environmental hazards than adults."
- "Children spend more time outdoors on grass, playing fields, and play equipment where pesticides may be present."
- "Children's hand-to-mouth contact is more frequent, exposing them to toxins through ingestion."

In 2012, the American Academy of Pediatrics (AAP) released a landmark policy statement, *Pesticide Exposure in Children*, on the effects of pesticide exposure in children, acknowledging the risks to children from both acute and chronic effects.[15] AAP's statement notes that, "Children encounter pesticides daily and have unique susceptibilities to their potential toxicity." The report discusses how kids are exposed to pesticides every day in air, food, dust, and soil. Children also frequently come into contact with pesticide residue on pets and treated lawns, gardens, and indoor spaces.

Pesticides, such as glyphosate and its formulated products (Roundup) and 2,4-D, both widely used on turf and lawns, can be tracked indoors resulting in long-term exposures. Scientific studies show that pesticides, like 2,4-D, that are applied to lawns drift and are tracked indoors where they settle in dust, air and on surfaces and may remain in carpets.[16,17] Pesticides in these environments may increase the risk of developing asthma, exacerbate a previous asthmatic condition, or even trigger asthma attacks by increasing bronchial hyper-responsiveness.[18] This is especially important as 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.[19]

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.[20] Similarly, 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.[21]

Prenatal exposures to pesticides can also have long-lasting impacts on infants and children. Herbicides, like glyphosate, can adversely affect embryonic, placental and umbilical cord cells, and can impact fetal development. Preconception exposures to glyphosate were found to moderately increase the risk for spontaneous abortions in mothers exposed to glyphosate

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[14] See: https://www.epa.gov/sites/production/files/2015-12/documents/pest-impact-hsstaff.pdf

[15] Roberts JR, Karr CJ; Council On Environmental Health. 2012. Pesticide exposure in children. Pediatrics. 2012 Dec; 130(6):e1765-88.

[16] Nishioka, M., et al. 1996. Measuring lawn transport of lawn-applied herbicide acids from turf. Env Science Technology, 30:3313-3320.

[17] Nishioka, M., et al. 2001. "Distribution of 2,4-D in Air and on Surfaces Inside Residences. Environmental Health Perspectives 109(11).

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

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

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

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

products.[22] 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 who did not use pesticides.[23] Studies also find that pesticides, like 2,4-D, can also pass from mother to child through umbilical cord blood and breast milk.[24,25]

Biomonitoring testing has also documented pesticide residues in children. Residues of lawn pesticides, like 2,4-D and mecoprop, were found in 15 percent of children tested, ages three to seven, whose parents had recently applied the lawn chemicals. Breakdown products of organophosphate insecticides were present in 98.7 percent of children tested.[26] In one study, children in areas where glyphosate is routinely applied were found to have detectable concentrations in their urine.[27] While glyphosate is excreted quickly from the body, it was concluded, "a part may be retained or conjugated with other compounds that can stimulate biochemical and physiological responses." A 2002 study finds children born to parents exposed to glyphosate show a higher incidence of attention deficit disorder and hyperactivity.[28]

Pesticides and Pets

Studies find that dogs exposed to herbicide-treated lawns and gardens can double their chance of developing canine lymphoma (1) and may increase the risk of bladder cancer in certain breeds by four to seven times (2).

(1) Scottish Terriers exposed to pesticide-treated lawns and gardens are more likely to develop transitional cell carcinoma of the bladder, a type of cancer.[29]
(2) "Statistically significant" increase in the risk of canine malignant lymphoma in dogs when exposed to herbicides, particularly 2,4-D, commonly used on lawns and in "weed and feed" products.[30]

Adverse Effects to Wildlife

While the data is pouring in on intersex species in waterways that surround urban and suburban areas and there are certainly a mix a factors, the contribution of runoff from suburban landscapes are seen as an important contributor. In *Suburbanization, estrogen contamination, and sex ratio in wild amphibian populations,* the authors from Yale University's School of Forestry and Environmental Studies and the U.S. Geological Survey (USGS) find the following: "While there is evidence that such endocrine disruption can result from the application of agricultural pesticides and through exposure to wastewater effluent, we have identified a diversity of endocrine disrupting chemicals within suburban neighborhoods.

[22] Arbuckle, T. E., Lin, Z., & Mery, L. S. (2001). An Exploratory Analysis of the Effect of Pesticide Exposure on the Risk of Spontaneous Abortion in an Ontario Farm Population. Environ Health Perspect, 109, 851–857.
[23] Brender, JD., et al. 2010. Maternal Pesticide Exposure and Neural Tube Defects in Mexican Americans. Ann Epidemiol. 20(1):16-22.
[24] Pohl, HR., et al. 2000. Breast-feeding exposure of infants to selected pesticides. Toxicol Ind Health. 16:65-77.
[25] 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.
[26] 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.
[27] Acquavella, J. F., et al. (2004). Glyphosate Biomonitoring for Farmers and Their Families: Results from the Farm Family Exposure Study. Environ Health Perspect. 112(3), 321-326.
[28] 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.
[29] Hayes, H. et al., 1991. "Case-control study of canine malignant lymphoma: positive association with dog owner's use of 2,4-D acid herbicides," Journal of the National Cancer Institute, 83(17):1226.
[30] Glickman, Lawrence, et al. 2004. "Herbicide exposure and the risk of transitional cell carcinoma of the urinary bladder in Scottish Terriers," Journal of the American Veterinary Medical Association 224(8):1290-1297.

Sampling populations of a local frog species, we found a strong association between the degree of landscape development and frog offspring sex ratio. Our study points to rarely studied contamination sources, like vegetation landscaping and impervious surface runoff, that may be associated with endocrine disruption environments around suburban homes."[31]

Pesticides and the Decline of Pollinators

Since 2006, honey bees and other pollinators in the U.S. and throughout the world have experienced ongoing and rapid population declines. The continuation of this crisis threatens the stability of ecosystems, the economy, and our food supply, as one in three bites of food are dependent on pollinator services. Pollination services are valued at over $125 billion globally. According to a 2014 Presidential Memorandum, pollinators provide $24 billion annually to the US economy.[32]

Appendix B. The Failure of EPA Regulatory System

Pesticides are, by their very nature, poisons. The Federal Insecticide Fungicide and Rodenticide Act (FIFRA), the law governing pesticide registration and use in the U.S., relies on a risk-benefit assessment, which allows the use of pesticides with known hazards based on the judgment that certain levels of risk are acceptable. However, EPA, which performs risk assessments, assumes that a pesticide would not be marketed if there were no benefits to using it and therefore no risk/benefit analysis is conducted or evaluated by the agency "up front." Registration of a pesticide by EPA does not guarantee that the chemical is "safe," particularly for vulnerable populations such as pregnant mothers, children, pets, and those with chemical sensitivities. Below are examples of concern within the pesticide registration process. These factors should give pause to lawmakers tasked with protecting public and environmental health, and supports action, such as Bill 52-14, to prohibit toxic pesticides and, in so doing, encourage alternatives.

Conditional Registration. EPA will often approve the use of a pesticide without all of the necessary data required to fully register the chemical, and will assign it a "conditional" registration. The agency assumes that while it waits for additional data the product would not cause adverse impacts that would prevent an eventual full registration. A recent report (2013) from the Government Accountability Office, entitled *EPA Should Take Steps to improve Its Oversight of Conditional Registrations,*[33] strongly criticizes this process, citing poor internal management of data requirements, constituting an "internal control weakness." The report states, "The extent to which EPA ensures that companies submit additional required data and EPA reviews these data is unknown. Specifically, EPA does not have a reliable system, such as an automated data system, to track key information related to conditional registrations, including whether companies have submitted additional data within required time frames." However, these recommendations do not go far enough. Pesticides without all the data required for a full understanding of human and environmental toxicity should not be allowed

[31] Lambert, M.R., Giller, G.S.J., Barber, L.B., Fitzgerald, K.C., Skelly, D.K., 2015. Suburbanization, estrogen contamination, and sex ratio in wild amphibian populations. Proc. Natl. Acad. Sci. 112, 11881e11886.

[32] White House Blog: New Steps to Protect Pollinators, Critical Contributors to Our Nation's Economy http://www.whitehouse.gov/blog/2014/06/20/new-steps-protect-pollinators-critical-contributors-our-nation-s-economy.

[33] Government Accountability Office. August 2013. EPA Should Take Steps to Improve Its Oversight of Conditional Registrations. GAO-13-145. http://www.gao.gov/products/GAO-13-145.

on the market. Several historic examples exist of pesticides that have been restricted or canceled due to health or environmental risks decades after first registration. Chlorpyrifos, an organophosphate insecticide, which is associated with numerous adverse health effects, including reproductive and neurotoxic effects, had its residential uses canceled in 2001. Others, like propoxur, diazinon, carbaryl, aldicarb, carbofuran, and most recently endosulfan, have seen their uses restricted or canceled after years on the market due to unreasonable human and environmental effects. Recently, a product manufactured by DuPont, Imprelis, with the active ingredient aminocyclopyrachlor, was removed from the market only two years after EPA approval under conditional registration.[34] Marketed as a broadleaf weed killer, Imprelis was found to damage and kill trees. However, in EPA's registration of the chemical, the agency noted, "In accordance with FIFRA Section 3(c)(7)(C), the Agency believes that the conditional registration of aminocyclopyrachlor will not cause any unreasonable adverse effects to human health or to the environment and that the use of the pesticide is in the public's interest; and is therefore granting the conditional registration."[35]

Failure to test or disclose inert ingredients. Despite their innocuous name, inert ingredients in pesticide formulations are neither chemically, biologically, or toxicologically inert; in fact they can be just as toxic as the active ingredient. Quite often, inert ingredients constitute over 95% of the pesticide product. In general, inert ingredients are minimally evaluated, even though many are known to state, federal, and international agencies to be hazardous to human health. For example, until October 23, 2014,[36] creosols, chemicals listed as hazardous waste under Superfund regulations and considered possible human carcinogens by EPA,[37] were allowed in pesticide formulations without any disclosure requirement. EPA recently took action to remove cresols and 71 other inert ingredients from inclusion in pesticide formulations as a result of petitions from health and consumer groups. However, numerous hazardous inerts remain. For example, a 2009 study, entitled *Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells*,[38] found that an inert ingredient in formulations of the weed killer Roundup (glyphosate), polyethoxlated tallowamine (POEA), is more toxic to human cells than the active ingredient glyphosate, and, in fact, amplifies the toxicity of the product – an effect not tested or accounted for by the pesticide registration process. A 2014 study, *Major pesticides are more toxic to human cells than their declared active principle*, found inert ingredients had the potential to magnify the effects of active ingredients by 1,000 fold.

Pesticide manufacturers argue against the disclosure of inert ingredients on pesticide product labels, maintaining that this information is proprietary. Limited review of inert ingredients in pesticide products highlights a significant flaw with the regulatory process. Rather than adopt a precautionary approach when it comes to chemicals with unknown toxicity, EPA allows uncertainties and relies on flawed risk assessments that do not adequately address exposure and hazard. Then, when data becomes available on hazards, these pesticides, both active

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[34] Environmental Protection Agency. June 2012. Imprelis and Investigation of Damage to Trees. http://www.epa.gov/pesticides/regulating/imprelis.html.

[35] Environmental Protection Agency. August 2010. Registration of the New Active Ingredient Aminocyclopyrachlor for Use on Non-Crop Areas, Sod Farms, Turf, and Residential Lawns. http://www.regulations.gov/contentStreamer?objectId=0900006480b405d8&disposition=attachment&contentType=pdf.

[36] Environmental Protection Agency. October 2014. EPA Proposes to Remove 72 Chemicals from Approved Pesticide Inert Ingredient List. http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/3397554fa65588d685257d7a0061a300!OpenDocument.

[37] Environmental Protectin Agency. October 2013. Cresol/Cresylic Acid. http://www.epa.gov/ttnatw01/hlthef/cresols.html.

[38] Benachour and Seralini. 2009. Glyposate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells. *Chemical Research and Toxicology. http://pubs.acs.org/doi/abs/10.1021/tx800218n.*

ingredients and inerts, have already left a toxic trail on the environment and people's well-being.

Label Restrictions Inadequate. From a public health perspective, an inadequate regulatory system results in a pesticide product label that is also inadequate, failing to restrict use or convey hazard information. While a resident may be able to glean some acute toxicity data, chronic or long-term effects will not be found on products' labels. Despite certain pesticides being linked to health endpoints, such as exacerbation of asthma,[39] learning disabilities,[40] or behavioral disorders,[41] this information is not disclosed on the label. Furthermore, data gaps for certain health endpoints are also not disclosed.

Mixtures and Synergism. In addition to gaps in testing inert ingredients and their mixture with active ingredients in pesticide products, there is an absence of review of the health and environmental impacts of pesticides used in combination. A study by Warren Porter, PhD., professor of zoology and environmental toxicology at the University of Wisconsin, Madison, examined the effect of fetal exposures to a mixture of 2,4-D, mecoprop, and dicamba exposure —frequently used together in lawn products like Weed B Gone Max and Trillion— on the mother's ability to successfully bring young to birth and weaning.[42] A 2011 study, entitled *Additivity of pyrethroid actions on sodium influx in cerebrocotorial neurons in primary culture,*[43] finds that the combined mixture's effect is equal to the sum of the effects of individual pyrethoids. This equates to a cumulative toxic loading for exposed individuals. Similarly, researchers looked at the cumulative impact the numerous pesticides that may be found in honey bee hives in the 2014 paper *Four Common Pesticides, Their Mixtures and a Formulation Solvent in the Hive Environment Have High Oral Toxicity to Honey Bee Larvae.*[44] The findings of the study send no mixed messages —pesticides, whether looked at individually, in different combinations, or even broken down into their allegedly inert component parts have serious consequences on the bee larvae survival rates. The synergistic effects in most combinations of the pesticides amplify these mortality rates around the four-day mark.

Research by Tyrone Hayes, PhD, professor of integrative biology at UC Berkeley has compared the impact of exposure to realistic combinations of small concentrations of pesticides on frogs, finding that frog tadpoles exposed to mixtures of pesticides took longer to metamorphose to adults and were smaller at metamorphosis than those exposed to single pesticides, with consequences for frog survival. The study revealed that "estimating ecological risk and the impact of pesticides on amphibians using studies that examine only single pesticides at high concentrations may lead to gross underestimations of the role of pesticides in amphibian declines."[45]

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[39] Hernandez et al. 2011. Pesticides and Asthma. *Current opinion in allergy and clinical immunology.* http://www.ncbi.nlm.nih.gov/pubmed/21368619.
[40] Horton et al. 2011. Impact of Prenatal Exposure to Piperonyl Butoxide and Permethrin on 36-Month Neurodevelopment. *Pediatrics.* http://www.ncbi.nlm.nih.gov/pubmed/21300677
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Appendix C. Health Effects of Commonly Used Pesticides

A Beyond Pesticides Factsheet – A Beyond Pesticides Factsheet – A Beyond Pesticides Factsheet – A Beyond Pesticides Factsheet

Health Effects of 30 Commonly Used Pesticides

Pesticides	Health Effects						
	Cancer	Endocrine Disruption	Reproductive Effects	Neurotoxicity	Kidney/Liver Damage	Sensitizer/ Irritant	Birth Defects
Herbicides							
2,4-D*	X[4]	X[10]	X[7]	X[8]	X[8]	X[1]	X[11]
Benfluralin					X[1]	X[1]	
Bensulide				X[2]	X[1]	X[2]	
Clopyralid			X[7]			X[2]	X[7]
Dicamba*			X[1]	X[2]	X[2]	X[1]	X[1]
Diquat Dibromide			X[12]		X[11]	X[1]	
Dithiopyr					X[1]	X[1]	
Fluazipop-p-butyl			X[1]		X[1]		X[1]
Glyphosate*	X[12]	X[8]	X[1]		X[8]	X[1]	
Imazapyr					X[7]	X[2]	
Isoxaben	X[3]				X[2]		
MCPA		X[6]	X[2]	X[2]	X[11]	X[1]	
Mecroporp (MCPP)*	Possible[3]	X[6]	X[2]	X[1]	X[9]	X[1]	X[1]
Pelargonic Acid*						X[1]	
Pendimethalin*	Possible[3]	X[6]	X[1]			X[2]	
Triclopyr			X[7]		X[9]	X[1]	X[7]
Trifluralin*	Possible[3]	X[6]	X[1]		X[2]	X[1]	
Insecticides							
Acephate	Possible[3]	X[6]	X[11]	X[9]		X[2]	
Bifenthrin*†	Possible[3]	Suspected[6,10]		X[8]		X[1]	X[9]
Carbaryl	X[3]	X[10]	X[8]	X[1]	X[11]	X[11]	X[7]
Fipronil	Possible[3]	X[6]	X[8]	X[8]	X[8]	X[8]	
Imidacloprid ‡			X[7]		X[2]		X[7]
Malathion*	Possible[3]	X[10]	X[11]	X[9]	X[2]	X[2]	X[2]
Permethrin*†	X[3]	Suspected[6,10]	X[1,7]	X[9,7]	X[9]	X[1]	
Trichlorfon	X[3]	X[6]	X[11]	X[2]	X[2]		X[2]
Fungicides							
Azoxystrobin					X[2]	X[2]	
Myclobutanil		Probable[6]	X[2]		X[2]		
Propiconazole	Possible[3]	X[6]	X[2]		X[1]	X[1]	
Sulfur						X[1]	
Thiophanate methyl	X[3]	X[1]	X[1]	Suspected[1]	X[1]	X[2]	X[1]
Ziram	Suggestive[3]	Suspected[6]		X[2]	X[2]	X[2]	
Totals:	16	17	21	14	25	26	12

*These pesticides are among the top 10 most heavily used pesticides in the home and garden sector from 2006-2007, according to the latest sales and usage data available from EPA (2011), available at http://www.epa.gov/opp00001/pestsales/07pestsales/market_estimates2007.pdf.

† EPA lists all synthetic pyrethroids under the same category. While all synthetic pyrethroids have similar toxicological profiles, some may be more or less toxic in certain categories than others. See Beyond Pesticides' synthetic pyrethroid fact sheet at bit.ly/TLBuP8 for additional information.

‡ Imidacloprid is a systemic insecticide in the neonicotinoid chemical class, which is linked to bee decline.

Description

Most toxicity determinations based on interpretations and conclusions of studies by university, government, or organization databases. Empty cells may refer to either insufficient data or if the chemical is considered relatively non-toxic based on currently available data.

The list of 30 commonly used lawn chemicals is based on information provided by the General Accounting Office 1990 Report, "Lawn Care Pesticides: Risks Remain Uncertain While Prohibited Safety Claims Continue," U.S. Environmental Protection Agency (EPA) National Pesticide Survey (1990), Farm Chemicals Handbook (1989), The National Home and Garden Pesticide Use Survey by Research Triangle Institute, NC (1992), multiple state reports, current EPA Environmental Impact Statements, and Risk Assessments, EPA national sales and usage data, best-selling products at Lowe's and Home Depot, and Beyond Pesticides' information requests.

For more information on hazards associated with pesticides, please see Beyond Pesticides' *Gateway on Pesticide Hazards and Safe Pest Management* at www.beyondpesticides.org/gateway. For questions and other inquiries, please contact our office at 202-543-5450, email info@beyondpesticides.org or visit us on the web at www.beyondpesticides.org.

Citations

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Appendix D. Environmental Effects of 30 Commonly Used Lawn Pesticides

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Environmental Effects of 30 Commonly Used Lawn Pesticides

Pesticides	Health Effects					
	Detected in Groundwater	Potential Leacher	Toxic to Birds	Toxic to Fish/ Aquatic Organisms	Toxic to Bees	Toxic to Mammals
Herbicides						
2,4-D*	X[1,2,3,4,7]	X[3,4]	X[1,2,3,11]	X[1,2,3,11]	X[1,11]	X[3,4,12]
Benfluralin	X[7]		X[3,11]	X[3,11]	X[5,11]	
Clopyralid	X[2,7]	X[2,11]	X[11]	X[11]	X[11]	
Dicamba	X[2,7]	X[1,2,3]	X[10,11]	X[1,2,3,11]	X[5,10,11]	
Diquat Dibromide		X[5]	X[1,3,11]	X[1,3,11]	X[5,11]	X[1]
Dithiopyr				X[5,6,11]	X[5,11]	
Fluazipop-p-butyl				X[1,4,6,11]	X[1,4]	
Glyphosate*	X[8]	X[5]	X[1,3,11]	X[1,2,11]	X[11]	X[4]
Imazapyr	X[2]	X[2,3]		X[2,5,11]	X[5,11]	
Isoxaben		X[11]	X[11]	X[3,11]	X[11]	
MCPA	X[4,7]	X[1,4,11]	X[1,3,11]	X[1,3,11]	X[5]	X[3]
Mecoprop (MCPP)*	X[4]	X[1,2,3,11]	X[3,11]	X[2]	X[11]	X[3]
Pelargonic Acid*			X[3§]	X[3§]	X[5]	
Pendimethalin*	X[3,7]		X[1,3,11]	X[1,3,11]	X[5,11]	X[3]
Triclopyr	X[2,7]	X[1,2,3,11]	X[2,3,11]	X[2,3,11]	X[5,11]	
Trifluralin*	X[4,7]			X[3,11]	X[5,11,12]	
Insecticides						
Acephate		X[1]	X[1,3,10,11]	X[3,11]	X[1,3,10,11]	X[3]
Bifenthrin*†			X[1,10,11]	X[1,10,11]	X[1,10,11]	X[1,4]
Carbaryl	X[1,3,7]	X[11]	X[2,11]	X[1,2,3,11]	X[1,2,3,11]	X[3,11]
Fipronil	X[7]	X[5,11]	X[2,4,10,11]	X[2,4,10,11]	X[2,4,10,11]	X[4]
Imidacloprid ‡	X[7]	X[1,2,10,11]	X[1,2,11]	X[1,2,11]	X[1,2,10,11]	
Malathion*	X[1,2,3,7]	X[1,3,5]	X[1,2,3,10,11]	X[1,2,3,10,11]	X[1,3,10,11]	X[3]
Permethrin*†	X[2,7]			X[1,2,3,11]	X[1,2,3,11]	
Trichlorfon		X[1,3,11]	X[1,3,11]	X[1,3,11]	X[1,11]	X[4‖]
Fungicides						
Azoxystrobin	X[9]	X[3,4,11]	X[11]	X[3,11]	X[11]	
Myclobutanil	X[7]			X[5]		
Propiconazole	X[7]	X[3]		X[3,11]	X[5,11]	X[11]
Sulfur		X[1]	X[11]	X[11]	X[11]	
Thiophanate methyl		X[3]		X[3,11]	X[11]	
Ziram		X[3,4]	X[1,3,11]	X[1,3,11]	X[11]	X[3]
Totals:	19	20	22	30	29	14

*These pesticides are among the top 10 most heavily used pesticides in the home and garden sector from 2006-2007, according to the latest sales and usage data available from EPA (2011), available at http://www.epa.gov/opp00001/pestsales/07pestsales/market_estimates2007.pdf.
† EPA lists all synthetic pyrethroids under the same category. While all synthetic pyrethroids have similar toxicological profiles, some may be more or less toxic in certain categories than others. See Beyond Pesticides' synthetic pyrethroid fact sheet at bit.ly/TLBuP8 for additional information.
‡ Imidacloprid is a systemic insecticide in the neonicotinoid chemical class, which is linked to bee decline.
§ Based on soap salts.
‖ Based on in-vitro mammalian cell study.

Description

Most toxicity determinations based on interpretations and conclusions of studies by university, government, or organization databases. Empty cells may refer to either insufficient data or if the chemical is considered relatively non-toxic based on currently available data. The column labeled "Potential to Leach" refers to a chemical's potential to move into deeper soil layers and eventually into groundwater. The column labeled "Toxic to Mammals" refers to conclusions based on evidence from studies done on non-human mammals.

The list of 30 commonly used lawn chemicals is based on information provided by the General Accounting Office 1990 Report, "Lawn Care Pesticides: Risks Remain Uncertain While Prohibited Safety Claims Continue," U.S. Environmental Protection Agency (EPA) National Pesticide Survey (1990), Farm Chemicals Handbook (1989), The National Home and Garden Pesticide Use Survey by Research Triangle Institute, NC (1992), multiple state reports, current EPA Environmental Impact Statements, and Risk Assessments, EPA national sales and usage data, best-selling products at Lowe's and Home Depot, and Beyond Pesticides' information requests.

For more information on hazards associated with pesticides, please see Beyond Pesticides' *Gateway on Pesticide Hazards and Safe Pest Management* at www.beyondpesticides.org/gateway. For questions and other inquiries, please contact our office at 202-543-5450, email info@beyondpesticides.org or visit us on the web at www.beyondpesticides.org.

Citations

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701 E Street, SE • Washington DC 20003
202-543-5450 phone • 202-543-4791 fax
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Appendix E. Cost Analysis

I have compiled cost analysis quotes, comments and summaries from various cities, school districts and universities who have successfully converted to organic or pesticide-free landscape policies, all of whom confirm that they were able to do so with relatively little increase in budget. **It is important to note that every successful program was not a one for one substitute of an organic herbicide for a prohibited herbicide. Any cost analysis calculation that merely substitutes an organic product for a synthetic product, or that substitutes hand weeding for synthetic herbicide application will produce an artificially high cost, and will be completely ineffective.**

- In 2009, Harvard published a summary report of their Harvard Soils Restoration Project, which was a project to bring their landscape maintenance into a fully organic system. Below is their cost summary. You can find their full report here, including the slide below that states that "**total operating costs of our organic maintenance programs are expected to be the same as our conventionally-based programs**":
  http://www.treewiseorganics.com/HarvardYardProject2-25-09.pdf

Program Costs and Investments

- Costs for the Pilot totaled ~ $40K and included consulting and staff training, contracted labor for initial applications of compost, and lab analysis.
- An initial investment of ~$45K for equipment to support the FMO organic programs going forward, includes: compost tea brewers, and creation of soil composting facility at the Arnold Arboretum.
- At maturity however, total operating costs of our organic maintenance programs are expected to be the same as our conventionally-based programs.

Eric T. Fleisher and Wayne Carbone (Manager FMO Landscape Services) show off the new Compost Tea Brewer in Harvard Yard.

In a 2009 New York Times Article, "The Grass is Greener at Harvard" the school determined that irrigation was reduced by 30%, saving 2 million gallons of water a year as a result of reduced irrigation needs. The school was also spending $35,000/year trucking yard waste off site. The university used those materials for composting and saved an additional $10k/year due to the decreased cost and need to purchase fertilizer from off-campus sources, per the report.

- 2011, the state of New York enacted the Child Safe Playing Field Act, prohibiting the use of toxic pesticides on school grounds and playing fields. To assess the effectiveness of the act after its initial implementation, New York State conducted a school district survey in 2013, comparing results to a prior, 2000 questionnaire on the topic. **The state found that, adjusted for inflation, median total expenditure by school district was negligible ($1,350 [$1,804 adjusted for inflation in 2013 dollars] in 2000 vs $1,890 in 2013).** The survey also revealed increased use of non-pesticidal pest management tactics in outdoor areas (more overseeding, aeration, organic fertilizer use).

  You can see the full report, by the State of New York, here:
  https://ecommons.cornell.edu/bitstream/handle/1813/43853/pest-mgmt-schools-NYSIPM.pdf?sequence=1

- October 1, 2019, South Miami City Manager Steven Alexander, issued a memorandum to the Mayor and Members of the City Commission in support of legislation codifying requirements that the city use only certified organic or EPA minimum risk products in maintenance of city spaces:

  "Florida ranks as one of the biggest consumers of chemical pesticides in the country. (...)

  In 2017, the City of South Miami's Procurement Division drafted a Request for Proposals for a landscaping contract which included a provision that respondents may only utilize' certified organic or EPA minimum risk' products in their maintenance of park and public right of way, in addition to several other measures intended to reduce the use of pesticides. ***Thus-far this initiative has been a qualified success, allowing the City to cut down on its waste-footprint significantly at relatively little expense, and providing a model for other local government to use as guidance."***

  Please see the memorandum, which included the language of the city ordinance, at this link:
  https://beyondpesticides.org/assets/media/documents/SouthMiami_FL_Organic ordinance.pdf

- In February of 2016, the Irvine City Council implemented an **organic program, to take effect immediately with no phase out time**. In their 2018 Annual Report, the city cost analysis states: "**Staff estimates the budget impact for 2018 at approximately 10% of the division's $27 million annual allocation. A large part of the impact is from the minimum wage increase of $11.00 to $15.00 by 2022 and the higher cost of organic materials.**"

The following municipalities have passed laws that completely restrict the use of glyphosate and/or all synthetic pesticides, and none of them have reported radical increases in costs related to labor, organic product substitutes, equipment or other costs. In fact, most municipalities who convert to pesticide or herbicide free practices report budget long term cost savings related to reduced irrigation, fertilizer and pesticide inputs.

California

Benicia – City decided to go glyphosate-free following the verdict in Johnson v. Monsanto Co.

Burbank – City Council members voted to discontinue the use of Roundup in city parks for one year, and Burbank Unified School District will no longer use it due to cancer concerns.

Cambria – North Coast school board trustees formally proposed a ban on glyphosate for all school properties.

Encinitas – Banned the use of Roundup and other glyphosate-based weed killers in city parks.

Fairfax – Passed municipal ordinance restricting use of toxic pesticides on public property.

Greenfield – Adopted a resolution to "halt all use of the carcinogenic weed killer Roundup and replace it with 'greener' alternatives."

Irvine – City Council passed resolution to cease spraying Roundup and other chemicals on public parks, streets and playgrounds.

Long Beach – Citing the landmark $289 million verdict in Johnson v. Monsanto Co., Long Beach Parks & Recreation Director Gerardo Mouet announced an immediate halt on the spraying of Roundup in Long Beach Parks.

Los Angeles County – The Los Angeles County Board of Supervisors issued a moratorium on glyphosate-based herbicides, including Roundup weed killer.

Marin County – The county stopped using glyphosate, the active ingredient in Monsanto's Roundup weed killer, on all county-maintained parks, landscaping, playgrounds, walkways and parking areas.

Napa – A policy announced in March of 2019 banned glyphosate use on city property, completing a phase-out campaign that started three years ago.

Novato – Following the $289 million Monsanto verdict, Novato Mayor Josh Fryday said the city will no longer use Roundup weed killer.

Oakland – Passed ordinance initiating Integrated Pest Management program that restricts toxic pesticide use and promotes pesticide use as last resort. On Sept. 1, 2018, the city formally halted the use of Roundup. Alameda County is reviewing its chemical spraying practices.

Richmond – Issued an ordinance to ban the use of glyphosate for all weed abatement activities conducted by the city.

San Francisco – Restricts the use of toxic pesticides on public property in favor of alternative, organic methods.

San Lorenzo Valley – The San Lorenzo Valley Water District voted 4-1 for a permanent ban of glyphosate pesticide use by the district.

Santa Rosa – Banned the use of Roundup at city parks.

Sonoma – Banned glyphosate use on all city-owned property.

Thousand Oaks – City instituted a ban on glyphosate use on public golf courses.

Watsonville – City council voted unanimously to ban Roundup use on city property.
Woodland – Woodland Joint Unified School District suspended the use of Roundup on school campuses.

Colorado

Boulder – Banned Roundup for use on city parks.

Connecticut

Middletown – Passed ordinance banning toxic pesticides and herbicides on municipally-owned fields, parks and other property.
****A growing number of Connecticut towns, including Branford, Cheshire, Granby, Essex, Greenwich, Manchester, Oxford, Plainville, Roxbury, Watertown, and Woodbridge have adopted bans or restrictions on glyphosate use. The state also has Public Act 09-56 to eliminate the use pesticides in K-8 schools.

Florida

Miami – Announced a city-wide ban on glyphosate-based herbicides in February of 2019.
Miami Beach – Passed a resolution banning the use of glyphosate weed killers for landscaping and maintenance work on city-owned property.

Hawai'i

State Department of Education - Banned use of all herbicides on all public school grounds, effective immediately, June 2019

Illinois

Chicago – The city stopped spraying glyphosate in public spaces.
Evanston – Evanston decided to go pesticide-free in 2010. Glyphosate is banned from use on city property, parks and schools.
Urbana– Adopted the Midwest Grows Green natural lawn care initiative to eliminate synthetic lawn pesticides on city parks.

Iowa

Dubuque – City instituted a ban on glyphosate use in public parks.

Maine

Portland – Banned synthetic pesticides in March of 2019. Private property owners may only use organic treatments on lawns and gardens. No pesticides may be used within 75 feet of a water body or wetland.

Maryland

Montgomery County – County Council voted to ban the use of cosmetic pesticides on private lawns. In December 2018, Montgomery County Parks announced that it would discontinue the use of glyphosate in parks.
Takoma Park– Placed restriction on cosmetic pesticides for lawn care on public and private property.

Massachusetts

Chatham – Passed an order banning glyphosate use in parks, athletic fields, mulch beds and walkways.

Warwick – A measure to ban Monsanto's Roundup passed at a Special Town Meeting. The ban does not allow people to spray glyphosate on any land within the town.

Wellesley– Wellesley banned all pesticides in 2011. Glyphosate is restricted from being sprayed on athletic fields and any city-owned property. The chemical can be used in limited emergency weed control situations.

Minnesota

Minneapolis– Commissioners of the Minneapolis Parks and Recreation Board decided to eliminate all glyphosate-based products from being used in neighborhood parks. In October of 2018, the Park Board's Operations & Environment Committee voted to extend the glyphosate ban to the entire Minneapolis park system.

New York

New Paltz– The use of toxic pesticides and herbicides by city employees or by private contractors is forbidden on all city-owned lands.

Westchester County – Enacted a law for pesticide-free parks.

North Carolina

Carrboro – The city of Carrboro has restricted glyphosate use since 1999. Under the terms of the ban, glyphosate cannot be sprayed in public parks, schools and town buildings or properties. The city will only allow glyphosate to be sprayed under limited circumstances.

Ohio

Cuyahoga County – Local ordinance prohibits the use of pesticides on county-owned land, and established the adoption of an Integrated Pest Management program for county-owned properties.

Texas

Austin – City Council voted to prohibit the spraying of glyphosate on city lands.

Virginia

Charlottesville, Virginia – Restricts the use of glyphosate on any city-owned parks, schools, or buildings. Glyphosate can only be sprayed under limited circumstances.

DAVID Y. IGE
GOVERNOR

DR. CHRISTINA M. KISHIMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

For Immediate Action

June 25, 2019

TO: Deputy Superintendent
Assistant Superintendents
Complex Area Superintendents
Principals (All)
Agricultural Teachers (All – via Principals)
Custodians (All – via Principals)

FROM: Dr. Christina M. Kishimoto
Superintendent

SUBJECT: **Use of Herbicides on Hawaii State Department of Education Campuses**

This memorandum serves as a reminder that under the Hawaii State Department of Education's (HIDOE) Integrated Pest Management Program, the use of all herbicides is **banned** on HIDOE campuses. The Integrated Pest Management Program has been providing training for school custodial staff consistent with this policy for the last five years.

This directive aligns with Board of Education policies around ensuring student and staff safety:

- Policy E-301: The Department must provide safe and secure educational facilities.
- Policy E-305: The Department is required to institute procedures for ensuring the safety and security of students, personnel and school buildings.
- Policy 305-01: The Department must provide a caring environment conducive to the physical, mental, social, and emotional well-being of students while they participating in school activities. Such attention shall include instruction in safety practices and attitudes and proper maintenance of buildings, grounds, and equipment.

HIDOE recognizes that custodial staff and agricultural teachers on campuses with large planted areas such as hillsides and gulches may find it labor intensive to manually remove overgrown vegetation and weeds. While we are exploring the possible use of organic products that may be safely and effectively used as an alternative, all employees must continue to comply with HIDOE's policy banning herbicide use.

Any herbicides currently stored on campuses should immediately be removed under the HIDOE's procedures for disposal of hazardous waste. (See attachment). Schools requiring additional training or guidance are highly encouraged to reach out to the Auxiliary Services Branch, at (808) 586-3452.

Thank you for your cooperation in upholding our commitment to student and staff safety and care for our aina.

CMK:rh
Attachment

c: Office of School Facilities and Support Services
Procurement Office
Auxiliary Services Branch

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

FROM THE AMERICAN ACADEMY OF PEDIATRICS

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

POLICY STATEMENT

Pesticide Exposure in Children

COUNCIL ON ENVIRONMENTAL HEALTH

KEY WORDS
pesticides, toxicity, children, pest control, integrated pest management

ABBREVIATIONS
EPA—Environmental Protection Agency
IPM—integrated pest management

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abstract

FREE

This statement presents the position of the American Academy of Pediatrics on pesticides. Pesticides are a collective term for chemicals intended to kill unwanted insects, plants, molds, and rodents. Children encounter pesticides daily and have unique susceptibilities to their potential toxicity. Acute poisoning risks are clear, and understanding of chronic health implications from both acute and chronic exposure are emerging. Epidemiologic evidence demonstrates associations between early life exposure to pesticides and pediatric cancers, decreased cognitive function, and behavioral problems. Related animal toxicology studies provide supportive biological plausibility for these findings. Recognizing and reducing problematic exposures will require attention to current inadequacies in medical training, public health tracking, and regulatory action on pesticides. Ongoing research describing toxicologic vulnerabilities and exposure factors across the life span are needed to inform regulatory needs and appropriate interventions. Policies that promote integrated pest management, comprehensive pesticide labeling, and marketing practices that incorporate child health considerations will enhance safe use. *Pediatrics* 2012;130:e1757–e1763

INTRODUCTION

Pesticides represent a large group of products designed to kill or harm living organisms from insects to rodents to unwanted plants or animals (eg, rodents), making them inherently toxic (Table 1). Beyond acute poisoning, the influences of low-level exposures on child health are of increasing concern. This policy statement presents the position of the American Academy of Pediatrics on exposure to these products. It was developed in conjunction with a technical report that provides a thorough review of topics presented here: steps that pediatricians should take to identify pesticide poisoning, evaluate patients for pesticide-related illness, provide appropriate treatment, and prevent unnecessary exposure and poisoning.[1] Recommendations for a regulatory agenda are provided as well, recognizing the role of federal agencies in ensuring the safety of children while balancing the positive attributes of pesticides. Repellents reviewed previously (eg, N,N-diethyl-meta-toluamide, commonly known as DEET; picaridin) are not discussed.[2]

SOURCES AND MECHANISMS OF EXPOSURE

Children encounter pesticides daily in air, food, dust, and soil and on surfaces through home and public lawn or garden application, household insecticide use, application to pets, and agricultural product

TABLE 1 Categories of Pesticides and Major Classes

Pesticide category	Major Classes	Examples
Insecticides	Organophosphates	Malathion, methyl parathion, acephate
	Carbamates	Aldicarb, carbaryl, methomyl, propoxur
	Pyrethroids/pyrethrins	Cypermethrin, fenvalerate, permethrin
	Organochlorines	Lindane
	Neonicotinoids	Imidacloprid
	N-phenylpyrazoles	Fipronil
Herbicides	Phosphonates	Glyphosate
	Chlorophenoxy herbicides	2,4-D, mecoprop
	Dipyridyl herbicides	Diquat, paraquat
	Nonselective	Sodium chlorate
Rodenticides	Anticoagulants	Warfarin, brodifacoum
	Convulsants	Strychnine
	Metabolic poison	Sodium fluoroacetate
	Inorganic compounds	Aluminum phosphide
Fungicides	Thiocarbamates	Metam-sodium
	Triazoles	Fluconazole, myclobutanil, triadimefon
	Strobilurins	Pyraclostrobin, picoxystrobin
Fumigants	Halogenated organic	Methyl bromide, Chloropicrin
	Organic	Carbon disulfide, Hydrogen cyanide, Naphthalene
	Inorganic	Phosphine
Miscellaneous	Arsenicals	Lead arsenate, chromated copper arsenate, arsenic trioxide
	Pyridine	4-aminopyridine

residues.[3–9] For many children, diet may be the most influential source, as illustrated by an intervention study that placed children on an organic diet (produced without pesticide) and observed drastic and immediate decrease in urinary excretion of pesticide metabolites.[10] In agricultural settings, pesticide spray drift is important for residences near treated crops or by take-home exposure on clothing and footwear of agricultural workers.[9,11,12] Teen workers may have occupational exposures on the farm or in lawn care.[13–15] Heavy use of pesticides may also occur in urban pest control.[16]

Most serious acute poisoning occurs after unintentional ingestion, although poisoning may also follow inhalational exposure (particularly from fumigants) or significant dermal exposure.[17]

ACUTE PESTICIDE TOXICITY

Clinical Signs and Symptoms

High-dose pesticide exposure may result in immediate, devastating, even lethal consequences. Table 2 summarizes features of clinical toxicity for the major pesticides classes. It highlights the similarities of common classes of pesticides (eg, organophosphates, carbamates, and pyrethroids) and underscores the importance of discriminating among them because treatment modalities differ. Having an index of suspicion based on familiarity with toxic mechanisms and taking an environmental history provides the opportunity for discerning a pesticide's role in clinical decision-making.[18] Pediatric care providers have a poor track record for recognition of acute pesticide poisoning.[19–21] This reflects their self-reported lack of medical education and self-efficacy on the topic.[22–26] More in-depth review of acute toxicity and management can be found in the accompanying technical report or recommended resources in Table 3.

The local or regional poison control center plays an important role as a resource for any suspected pesticide poisoning.

There is no current reliable way to determine the incidence of pesticide exposure and illness in US children. Existing data systems, such as the American Association of Poison Control Centers' National Poison Data System or the National Institute for Occupational Safety and Health's Sentinel Event Notification System for Occupational Risks,[27,28] capture limited information about acute poisoning and trends over time.

There is also no national systematic reporting on the use of pesticides by consumers or licensed professionals. The last national survey of consumer pesticide use in homes and gardens was in 1993 (Research Triangle Institute study).[29]

Improved physician education, accessible and reliable biomarkers, and better diagnostic testing methods to readily identify suspected pesticide illness would significantly improve reporting and surveillance. Such tools would be equally important in improving clinical decision-making and reassuring families if pesticides can be eliminated from the differential diagnosis.

The Pesticide Label

The pesticide label contains information for understanding and preventing acute health consequences: the active ingredient; signal words identifying acute toxicity potential; US Environmental Protection Agency (EPA) registration number; directions for use, including protective equipment recommendations, storage, and disposal; and manufacturer's contact information.[30] Basic first aid advice is provided, and some labels contain a "note for physicians" with specific relevant medical information. The label does not specify the pesticide class or "other"/"inert" ingredients that may have significant toxicity and can account for up to 99% of the product.

Chronic toxicity information is not included, and labels are predominantly available in English. There is significant use of illegal pesticides (especially in immigrant communities), off-label use, and overuse, underscoring the importance of education, monitoring, and enforcement.[31]

TABLE 2 Common Pesticides: Signs, Symptoms, and Management Considerations[a]

Class	Acute Signs and Symptoms	Clinical Considerations
Organophosphate and N-methyl carbamate insecticides	• Headache, nausea, vomiting, abdominal pain, and dizziness • Hypersecretion: sweating, salivation, lacrimation, rhinorrhea, diarrhea, and bronchorrhea • Muscle fasciculation and weakness, and respiratory symptoms (bronchospasm, cough, wheezing, and respiratory depression) • Bradycardia, although early on, tachycardia may be present • Miosis • Central nervous system: respiratory depression, lethargy, coma, and seizures	• Obtain red blood cell and plasma cholinesterase levels • Atropine is primary antidote • Pralidoxime is also an antidote for organophosphate and acts as a cholinesterase reactivator • Because carbamates generally produce a reversible cholinesterase inhibition, pralidoxime is not indicated in these poisonings
Pyrethroid insecticides	• Similar findings found in organophosphates including the hypersecretion, muscle fasciculation, respiratory symptoms, and seizures • Headache, fatigue, vomiting, diarrhea, and irritability • Dermal: skin irritation and paresthesia	• At times have been mistaken for acute organophosphate or carbamate poisoning • Symptomatic treatment • Treatment with high doses of atropine may yield significant adverse results • Vitamin E oil for dermal symptoms
Neonicotinoid insecticides	• Disorientation, severe agitation, drowsiness, dizziness, weakness, and in some situations, loss of consciousness • Vomiting, sore throat, abdominal pain • Ulcerations in upper gastrointestinal tract	• Supportive care • Consider sedation for severe agitation • No available antidote • No available diagnostic test
Fipronil (N-phenylpyrazole insecticides)	• Nausea and vomiting • Aphthous ulcers • Altered mental status and coma • Seizures	• Supportive care • No available antidote • No available diagnostic test
Lindane (organochlorine insecticide)	• Central nervous system: mental status changes and seizures • Paresthesia, tremor, ataxia and hyperreflexia	• Control acute seizures with lorazepam • Lindane blood level available as send out
Glyphosate (phosphonate herbicides)	• Nausea and vomiting • Aspiration pneumonia type syndrome • Hypotension, altered mental status, and oliguria in severe cases • Pulmonary effects may in fact be secondary to organic solvent	• Supportive care • Pulmonary effects may be secondary to organic solvent
Chlorophenoxy herbicides	• Skin and mucous membrane irritation • Vomiting, diarrhea, headache, confusion • Metabolic acidosis is the hallmark • Renal failure, hyperkalemia, and hypocalcemia • Probable carcinogen	• Consider urine alkalinization with sodium bicarbonate in IV fluids
Rodenticides (long-acting anticoagulants)	• Bleeding: gums, nose, and other mucous membrane sites • Bruising	• Consider PT (international normalized ratio) • Observation may be appropriate for some clinical scenarios in which it is not clear a child even ingested the agent • Vitamin K indicated for active bleeding (IV vitamin K) or for elevated PT (oral vitamin K)

IV, intravenous; PT, prothrombin time.

[a] Expanded version of this table is available in the accompanying technical report.[1]

CHRONIC EFFECTS

Dosing experiments in animals clearly demonstrate the acute and chronic toxicity potential of multiple pesticides. Many pesticide chemicals are classified by the US EPA as carcinogens. The past decade has seen an expansion of the epidemiologic evidence base supporting adverse effects after acute and chronic pesticide exposure in children. This includes increasingly sophisticated studies addressing combined exposures and genetic susceptibility.[1]

Chronic toxicity end points identified in epidemiologic studies include adverse birth outcomes including preterm birth, low birth weight, and congenital

TABLE 3 Pesticide and Child Health Resources for the Pediatrician

Topic/Resource	Additional Information	Contact Information
Management of acute pesticide poisoning		
Recognition and Management of Pesticide Poisonings	Print: fifth (1999) is available in Spanish, English; 6th edition available 2013	http://www.epa.gov/pesticides/safety/healthcare/handbook/handbook.htm
Regional Poison Control Centers		1 (800) 222-1222
Chronic exposure information and specialty consultation		
The National Pesticide Medical Monitoring Program (NPMMP)	Cooperative agreement between Oregon State University and the US EPA. NPMMP provides informational assistance by E-mail in the assessment of human exposure to pesticides	npmmp@oregonstate.edu or by fax at (541) 737-9047
Pediatric Environmental Health Specialty Units (PEHSUs)	Coordinated by the Association of Occupational and Environmental Clinics to provide regional academically based free consultation for health care providers	www.aoec.org/PEHSU.htm; toll-free telephone number (888) 347-AOEC (extension 2632)
Resources for safer approaches to pest control		
US EPA		
Citizens Guide to Pest Control and Pesticide Safety	Consumer information documents • Household pest control • Alternatives to chemical pesticides • How to choose pesticides • How to use, store, and dispose of them safely • How to prevent pesticide poisoning • How to choose a pest-control company	www.epa.gov/oppfead1/Publications/Cit_Guide/citguide.pdf
Controlling pests	Recommended safest approaches and examples of programs	www.epa.gov/pesticides/controlling/index.htm
The University of California Integrative Pest Management Program	Information on IPM approaches for common home and garden pests	www.ipm.ucdavis.edu
Other resources		
National research programs addressing children's health and pesticides	• NIEHS/EPA Centers for Children's Environmental Health & Disease Prevention Research • The National Children's Study	www.niehs.nih.gov/research/supported/centers/prevention www.nationalchildrensstudy.gov/Pages/default.aspx
US EPA	Pesticide product labels	www.epa.gov/pesticides/regulating/labels/product-labels.htm#projects
The National Library of Medicine "Tox Town"	Section on pesticides that includes a comprehensive and well-organized list of web link resources on pesticides	http://toxtown.nlm.nih.gov/text_version/chemicals.php?id=23

anomalies, pediatric cancers, neurobehavioral and cognitive deficits, and asthma. These are reviewed in the accompanying technical report. The evidence base is most robust for associations to pediatric cancer and adverse neurodevelopment. Multiple case-control studies and evidence reviews support a role for insecticides in risk of brain tumors and acute lymphocytic leukemia. Prospective contemporary birth cohort studies in the United States link early-life exposure to organophosphate insecticides with reductions in IQ and abnormal behaviors associated with attention-deficit/hyperactivity disorder and autism. The need to better understand the health implications of ongoing pesticide use practices on child health has benefited from these observational epidemiologic data.[32]

EXPOSURE PREVENTION APPROACHES

The concerning and expanding evidence base of chronic health consequences of pesticide exposure underscores the importance of efforts aimed at decreasing exposure.

Integrated pest management (IPM) is an established but undersupported approach to pest control designed to minimize and, in some cases, replace the use of pesticide chemicals while achieving acceptable control of pest populations.[33] IPM programs and knowledge have been implemented in agriculture and to address weeds and pest control in residential settings and schools, commercial structures, lawn and turf, and community gardens. Reliable resources are available from the US EPA and University of California—Davis (Table 3). Other local policy approaches in use are posting warning signs of pesticide use, restricting spray zone buffers at schools, or restricting specific types of pesticide products in schools. Pediatricians can play a role in promotion of development of model programs and practices in the communities and schools of their patients.

RECOMMENDATIONS

Three overarching principles can be identified: (1) pesticide exposures are common and cause both acute and chronic effects; (2) pediatricians need to be knowledgeable in pesticide identification, counseling, and management; and (3) governmental actions to improve pesticide safety are needed. Whenever new public policy is developed or existing policy is revised, the wide range of consequences of pesticide use on children and their families should be considered. The American Academy of Pediatrics, through its chapters, committees, councils, sections, and staff, can provide information and support for public policy advocacy efforts. See http://www.aap.org/advocacy.html for additional information or contact chapter leadership.

Recommendations to Pediatricians

1. Acute exposures: become familiar with the clinical signs and symptoms of acute intoxication from the major types of pesticides. Be able to translate clinical knowledge about pesticide hazards into an appropriate exposure history for pesticide poisoning.
2. Chronic exposures: become familiar with the subclinical effects of chronic exposures and routes of exposures from the major types of pesticides.
3. Resource identification: know locally available resources for acute toxicity management and chronic low-dose exposure (see Table 3).
4. Pesticide labeling knowledge: Understand the usefulness and limitations of pesticide chemical information on pesticide product labels.
5. Counseling: Ask parents about pesticide use in or around the home to help determine the need for providing targeted anticipatory guidance. Recommend use of minimal-risk products, safe storage practices, and application of IPM (least toxic methods), whenever possible.
6. Advocacy: work with schools and governmental agencies to advocate for application of least toxic pesticides by using IPM principles. Promote community right-to-know procedures when pesticide spraying occurs in public areas.

Recommendations to Government

1. Marketing: ensure that pesticide products as marketed are not attractive to children.
2. Labeling: include chemical ingredient identity on the label and/or the manufacturer's Web site for all product constituents, including inert ingredients, carriers, and solvents. Include a label section specific to "Risks to children," which informs users whether there is evidence that the active or inert ingredients have any known chronic or developmental health concerns for children. Enforce labeling practices that ensure users have adequate information on product contents, acute and chronic toxicity potential, and emergency information. Consider printing or making available labels in Spanish in addition to English.
3. Exposure reduction: set goal to reduce exposure overall. Promote application methods and practices that minimize children's exposure, such as using bait stations and gels, advising against overuse of pediculicides. Promote education regarding proper storage of product.
4. Reporting: make pesticide-related suspected poisoning universally reportable and support a systematic central repository of such incidents to optimize national surveillance.
5. Exportation: aid in identification of least toxic alternatives to pesticide use internationally, and unless safer alternatives are not available or are impossible to implement, ban export of products that are banned or restricted for toxicity concerns in the United States.
6. Safety: continue to evaluate pesticide safety. Enforce community right-to-know procedures when pesticide spraying occurs in public areas. Develop, strengthen, and enforce standards of removal of concerning products for home or child product use. Require development of a human biomarker, such as a urinary or blood measure, that can be used to identify exposure and/or early health implications with new pesticide chemical registration or reregistration of existing products. Developmental toxicity, including endocrine disruption, should be a priority when evaluating new chemicals for licensing or reregistration of existing products.
7. Advance less toxic pesticide alternatives: increase economic incentives for growers who adopt IPM, including less toxic pesticides. Support research to expand and improve IPM in agriculture and nonagricultural pest control.
8. Research: support toxicologic and epidemiologic research to better identify and understand health risks associated with children's exposure to pesticides. Consider supporting another national study of pesticide use in the home and garden setting of US households as a targeted initiative or through cooperation with existing research opportunities (eg, National Children's Study, NHANES).
9. Health provider education and support: support educational efforts to increase the capacity of pediatric health care providers to diagnose and manage acute pesticide

poisoning and reduce pesticide exposure and potential chronic pesticide effects in children. Provide support to systems such as Poison Control Centers to provide timely, expert advice on exposures. Require the development of diagnostic tests to assist providers with diagnosing (and ruling out) pesticide poisoning.

LEAD AUTHORS

James R. Roberts, MD, MPH
Catherine J. Karr, MD, PhD

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Pesticide Exposure in Children

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