Pesticides and You

News from Beyond Pesticides, formerly the National Coalition Against the Misuse of Pesticides

Volume 26, Number 2 Summer 2006

Sublethal Effects of Pesticide Exposure

Humans and Vertebrate Wildlife

Rodents Teach Lesson of Failed Chemical Controls • Pesticides and Playing Fields • Scotts Poisons the Wrong Family • Managing West Nile Virus Safely

Despair and Hope

Solutions to an increasingly well-documented problem taking hold

This issue of *Pesticides and You* balances despair with hope. The articles together show that as the pesticide problem gets more and more defined, safer solutions begin increasingly to take hold. Unfortunately, the poisoning continues, and so we document one family's ordeal and urge others to tell their story. What we are seeing to a greater degree, though, is the institutionalization of pesticide-free solutions by local government, as well as policy and cultural shifts.

The increasingly well-documented pesticide problem

The analysis of the pesticide problem (despair) is increasingly sophisticated, raising more and more health and environmental issues associated with pesticide use. The March, 2006 U.S. Geological Survey (USGS) study, *Pesticides in the Nation's Streams and Ground Water, 1992-2001*, reports widespread findings of pesticide mixtures in the nation's lakes, rivers, and streams that are simply not evaluated by EPA. For nearly half of the pesticides detected, the agency does not have benchmark health or environmental standards. Insecticides that are highly neurotoxic organophosphates, such as diazinon, chlorpyrifos and malathion, are found to exceed aquatic-life benchmarks in urban streams.

Preliminary study results link pesticide exposure to a lowering of IQ. According to research evaluating North Dakota farm children, those exposed to pesticides test an average of five points lower on standard IQ tests. We already knew from the Jacobsons' research in Michigan in the mid-1990s that toxic exposure could reduce children's IQ by six points and damage short-term memory, planning ability, and sustained attention.

Confirming earlier National Cancer Institute research linking elevated cancer rates to farm use of pesticides, a new study finds that agricultural pesticide use leads to a 2.6 to 5-fold increased risk of non-Hodgkin's lymphoma.

Adding to the notion that once dispersed in the environment it is nearly impossible to control where pesticides end up, one study finds numerous pesticides in seven western national parks and preserves. The authors conclude that the contamination in Alaskan parks is a function of long-distance drift, confirming earlier drift studies. In a similar vain, researchers at Johns Hopkins School of Public Health published research findings that household antibacterial hand soap, which is washing down drains, persists during wastewater treatment, accumulates in municipal sludge, and then ends up being used in food production without any government assessment or monitoring.

New research conducted by the Manomet Center for Conservation Sciences (Massachusetts) brings us up-to-date on the science concerning sublethal effects of organophosphate and carbamate pesticides in humans and vertebrate wildlife. This type of analysis escapes the EPA's regulatory review process. Speaking of EPA, and the inadequacies of its pesticide review program, leaders of three federal and state employee unions wrote the EPA Administrator in May, 2006, challenging the agency's failure to fully evaluate the health impacts of pesticides under the *Food Quality Protection Act*, in violation of principles of scientific integrity and objectivity. The scientists say that EPA is ignoring evidence that suggests these pesticides damage developing nervous systems of fetuses, infants and children.

Safe solutions take hold

Sarasota, Florida officials moved to restrict homeowner fertilizer use, reducing pesticide usage through the ban of herbicide/fertilizer "weed and feed" lawn products. This follows on the heels of an ordinance with the same restriction in Madison (and Dane County), Wisconsin, which survived a court challenge from the pro-pesticide industry lobby. And, to make the point that use of synthetic herbicides, and the associated run-off, are unnecessary, we write about the Town of Marblehead, Massachusetts that converted 15 acres of playing fields to organic management. This includes a review of the five myths of organic turf management.

Meanwhile, you will read about the *Rodent and Vector Control Academy*, which took its training session from New York City to Washington, DC, to develop a rodent management strategy in the face of failed chemical-based rodent control programs in major U.S. cities. The program teaches that ineffective chemical-intensive control programs, which do not attack the cause of the problem and breed rodent resistance, must be replaced by local inter-agency coordinated programs that focus on sanitation and exclusion.

The message is similar for West Nile virus, as communities begin to consider seriously alternatives to spraying. An increasing number of jurisdictions are finding that programs focused on managing breeding sites, community education, and use of biological larvicides, when necessary, are the most effective approach.

We review the new book *Organic, Inc.*, which provides context and raises the challenges that lie ahead, as we are successful in generating greater and greater demand for organic products. Here, we face serious questions about preserving the core environmental, workplace, and production values that served as the foundation for organic when it began.

As we succeed, there is more push-back from the pro-pesticide lobby, which expends resources to fight our programs and increasingly attempts to recast itself in an environmental light (greenwashing). That is why we especially appreciate all those supporters who are able to join us in a special fundraising drive in Beyond Pesticides' 25th anniversary year. Please see your mail for more information on contributing to Beyond Pesticides this year, or go to our website www.beyondpesticides.org. Thanks for your support!

–Jay Feldman is executive director of Beyond Pesticides

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Finding a Service Provider That Will Not Poison

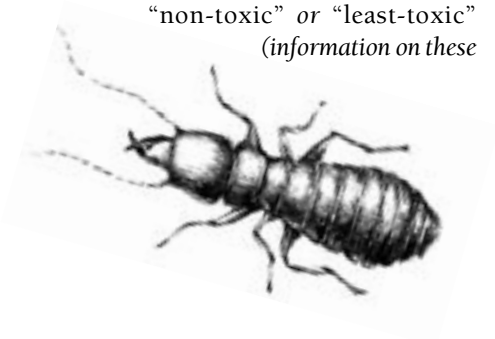
We have a termite problem that will require immediate attention. We have a copy of your "A Guide to Home Termite Management" which gives ample information on the safest types of termite control, but I wonder if you can also advise us how to find companies who use less toxic methods of termite control. Do you maintain such a list? If not, can you suggest ways of finding such companies. Any help you can give us will be greatly appreciated.

James Weinberger, By email

Dear Mr. Weinberger,

We do run a database of service providers offering organic and least-toxic services. Companies are listed in the Safety Source for Pest Management. Safety Source *can be found by going to our website (www.beyondpesticides.org) and selecting "Safety Source for Pest Management" from under the* **Info** *Services tab at the top of the page. Once on the Safety Source page, you can click on the "Find a Service Provider" link at the top of the page. This will take you to a page where you can choose to search for a provider by state or service category. By choosing to search by state, you will be directed to a map of the United States. Simply click on your state and you will find a list of organic and least toxic service providers. We have over 200 companies listed, although unfortunately we do not know of service providers in every state.*

Companies on Safety Source *have completed the Beyond Pesticides survey and indicated that they use one or more practices and/or materials that we categorize as* "non-toxic" *or* "least-toxic" *(information on these categories can be found by choosing the "Non-Toxic Pest Management" link and the "Least Toxic Pesticides" link on the* Safety Source *webpage). We include in this directory the companies' survey responses in their own words so that you can see them for yourself. Many of the companies in the directory operate businesses that we consider "mixed operations" because they may also use products that we classify as* "toxic" *(a definition of toxic pesticides is located under the "Toxic Pesticides" link). Before talking to them, it is suggested that you look over our tips on talking to service providers, which can be found under the "Talking to Service Providers" link.*



If you find a service provider that is not listed in our database and you think should be, please encourage them to contact us. We are always trying to expand our database in order to help as many people as possible. Good luck!

Does Organic Gardening Include Miracle-Gro?

Does Beyond Pesticides have the ingredients of Miracle Gro available? I just joined an organic garden and my plot is next to someone who is using Miracle Gro. I want to show them why it is NOT organic and in fact, dangerously toxic.

Thanks,

Jill, By email

Hi Jill-

There are many different Miracle-Gro products, and each one has different ingredients. For example, Miracle-Gro Weed and Feed contains the toxic herbicide 2,4-D. Other Miracle Gro Products do not include pesticides, but do include some toxic fertilizer ingredients. Here is an excerpt on Miracle-Gro fertilizers from Organic Gardening *magazine that I think will be helpful for you:*

> **From *Organic Gardening* Magazine, July/August 2000 Issue.**
>
> Miracle-Gro is a synthetic fertilizer that contains ammonium phosphate and several other chemicals that can be toxic to your soil and plants. It is prohibited from use in certified -organic farming. Here's what soil expert Robert Parnes, Ph.D., says in his book Fertile Soil: "[Ammonium fertilizer] acidifies the soil, and thus it is probably more harmful to soil organisms than any other nitrogen fertilizer . … The application has to be timed carefully and placed properly to avoid burning the leaves and roots … In addition, ammonium tends to inhibit the release of … potassium … Ammonium fertilizers are deliberately manufactured to be spread at high application rates in order to obtain maximum yields with no regard to adverse effects on the soil. Probably nowhere is the conflict between the mass production of food to feed the world and the preservation of the soil more obvious than in the confrontation over the use of either ammonium fertilizers or liquid ammonia."
>
> And there's more: long-term studies at the University of Wisconsin have shown that acidic chemical fertilizers are causing serious, permanent damage to our soils. Usually these fertilizers are also highly soluble, so they leach away and pollute our water systems, too. Soil fertility authority Garn Wallace, Ph.D., of Wallace Laboratories in El Segundo, California, points out that Miracle-Gro contains muriate of potash, which contains excess chlorine that will burn plants and inhibit the uptake of nitrogen. Dr. Wallace also warns that products such as Miracle-Gro often contain unsafe levels of zinc and copper that will be toxic to soil life.
>
> And if all that's not enough to convince you to avoid this stuff, consider this: you have to mix Miracle-Gro with water and apply it ever "7 to 14 days." If you opt to fertilize organically, on the other hand, all you have to do is mix a ½-inch layer of grass clippings into your beds before each crop.

As the grass decomposes, it will improve your soil's texture and stimulate microbial life and help prevent disease, all while releasing plenty of nutrients to feed your plants. (For full details on organic fertilizers, see "How to Fertilize Your Garden," *Organic Gardening*, July/August 2000.)

For best results, your neighbor should use a slow-release organic fertilizer once a year, usually in the fall, to increase the efficiency of nutrient uptake and reduce nutrient run-off and leaching. Fast-release fertilizers can induce pest outbreaks and are more likely to leach into water. Look for the words "slow release" or "insoluble" on fertilizer labels. The higher the percentage of slow release fertilizer, the less chance of leaching. As a general rule, use an organic slow-release fertilizer with a balanced ratio of numbers close in proximity, such as 5-3-4.

Creosote Treated Wood Used in Construction of Home

I am a homeowner in Sonoma County, California and have had some recent concerns about a couple of the structures on our property.

The original owner of the property built all of the dwellings and structures himself. He was an architect and an engineer who had worked for the County. He had access to and utilized old telephone poles in his construction. For one of the houses in particular, he used telephone poles as the main support beams for the house, and these poles are exposed and visible inside the house; they are just part of the funky decor.

The smell of creosote is fairly strong in the house, so I am concerned with toxicity by inhaling. In addition, we have many poles that were used in many places on the property, so I am also now concerned about its environmental fate.

If you have any advice, information, or resources for me to learn more and to perhaps have some testing done, I would greatly appreciate it.

Thanks so much,

Gina, Sonoma County, CA

Dear Gina,

Thank you for contacting Beyond Pesticides with your question regarding creosote. You can find an abundance of information regarding wood preservatives on our website (www.beyondpesticides.org) by clicking on the link labeled "Wood preservatives" under the "issues" tab on our homepage. When you get to the wood preservatives page you will see a list on the left hand side. If you select publications you will come to a page with a list of publications regarding wood preservatives. The publication Poison Poles: A Report About the Toxic Trail of Wood Preservatives *has information about creosote in it. The sections that you may find the most helpful are Appendix A: Chemicals-At-A-Glance, The Chemical Actors, The Toxic Trail subsection: Treated Poles in Use, and Findings.*

The smell that you have noticed is a warning; creosote can be absorbed through the lungs as a contaminant in the air. It can also be taken into the body through ingestion and skin contact. Some reports have indicated that brief exposures to large amounts of coal-tar creosote can cause harmful effects on the skin, eyes, nervous system, and kidneys; produce abdominal pain and vomiting, heart damage, anemia, and can result in death. Some of the chronic health effects include reproductive toxicity, immunotoxicity, and organ damage. It also contains ingredients that are considered endocrine disruptors. As for the environmental fate, leaching of chemicals is certainly a problem and creosote treated wood has the potential to contaminate groundwater in certain ecosystems.

There are two options for dealing with treated wood. One option is removing and replacing the wood with a safer alternative. Another option is sealing the poles, however a sealant must be reapplied as time passes and it will not prevent wood that is in the ground from leaching chemicals. It will, however, reduce immediate exposure from the pole. The Center for Environmental Health suggests using two coats of semi-transparent oil-based deck stains (with enough color to detect wear) and to reseal at least every year.

Information on alternatives can be found on our Wood Preservatives page by selecting the "Resources" link on the left hand side. If you scroll down the resources page, you will find a link labeled "Manufacturers of alternatives to CCA-treated wood and playground equipment."

Write Us!

Whether you love us, disagree with us or just want to speak your mind, we want to hear from you. All mail must have a day time phone and verifiable address. Space is limited so some mail may not be printed. Mail that is printed will be edited for length and clarity. Please address your mail to:

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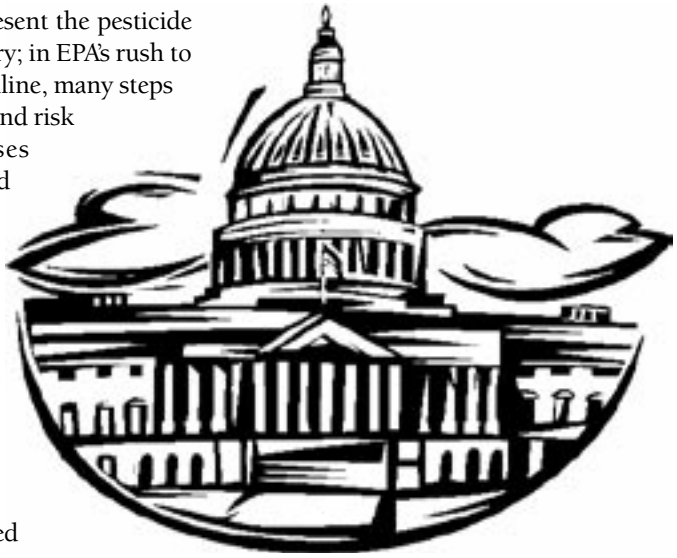
EPA Scientists Revolt Against Bush Administration Pesticide Policy

Fed up with the politicization of government science, EPA scientists recently told the Bush administration 'enough is enough.' In a letter dated May 24, 2006, leaders of three federal and state unions, including the American Federation of Government Employees, the National Treasury Employees Union, and the Engineers and Scientists of California (which together represent over 9,000 scientists, risk managers and other specialists), asked EPA Administrator Stephen Johnson to either adopt the maximum exposure protections or remove from the market the final 20 organophosphate and carbamate pesticides scheduled for final tolerance decisions. The non-profit organization Public Employees for Environmental Responsibility (PEER), an alliance of local, state and federal resource professionals, argues that in a rush to meet an August 3, 2006 deadline for issuing final tolerance approvals, EPA is ignoring evidence that suggests these pesticides damage developing nervous systems of fetuses, infants and children. PEER says scientists with the federal government contend that: their colleagues in EPA's pesticides program feel besieged by political pressure exerted by agency officials perceived to be closely aligned with the pesticide industry and former EPA officials who now represent the pesticide and agricultural industry; in EPA's rush to meet the August 3 deadline, many steps in the risk assessment and risk management processes have been abbreviated or eliminated, in violation of principles of scientific integrity and objectivity; and, there is a prevailing belief among managers in EPA's pesticides and toxics programs that regulatory discussions should only be conducted after reaching full consensus with the regulated pesticide and chemical industries.



Key Vote Won To Save Toxics Release Inventory

On May 18, 2006, the U.S. House of Representatives voted to prevent the Environmental Protection Agency (EPA) from rolling back reporting requirements for the nation's worst polluters under the Toxics Release Inventory (TRI) program. According to the non-profit group OMB Watch, EPA proposed changes to the TRI in September 2005 that would have let thousands of large industrial facilities stop reporting their pollution emissions. OMB Watch says this would cut off public access to vital health and safety data that are used by emergency planners, community groups, researchers, and medical professionals. TRI is a publicly available EPA database that contains information on toxic chemical releases and other waste management activities reported annually by certain covered industry groups as well as federal facilities. The amendment, which was sponsored by Reps. Pallone (D-NJ) and Solis (D-CA), passed by a wide margin of 231 to 187. "Lawmakers have sent a clear message to the EPA that they and their constituents value the public's right to know about toxic pollution," stated Sean Moulton, director of federal information policy for OMB Watch. "The EPA's attempts to rollback reporting on toxic pollution are unacceptable to so many Americans and their representatives have expressed that with their vote."

Lawsuit Challenges Genetically Engineered Alfalfa

Despite low public opinion of genetically engineered (GE) food, negative scientific studies and countless lawsuits, the biotech industry continues to push its products. In the latest battle to protect public health, the environment, and farmer's livelihoods from the consequences of widespread GE agriculture, a coalition of farmers, farm groups, consumers, and environmentalists filed a lawsuit on February 16, 2006 challenging the U.S. Department of Agriculture's (USDA) approval of GE alfalfa. According to the plaintiffs, the suit (*Geertson Farms, et. al. v. Johanns*) contends that USDA improperly allowed the commercial release of GE alfalfa, the first commercial release of a GE perennial crop, and failed to analyze the public health, environmental, and economic consequences of the release. It also asserts that the GE alfalfa will likely contaminate natural alfalfa and ultimately prevent farmers from producing natural,

non-GE alfalfa for markets that demand it. The GE alfalfa is designed to tolerate high doses of glyphosate, the active ingredient in Monsanto's Roundup herbicide. Currently, 83% of U.S. alfalfa is grown without any herbicides, and many experts note that GE alfalfa could lead to massive increases in herbicide use on alfalfa and more chemical pollution in the environment. Plaintiffs include Center for Food Safety (also serving as counsel), Sierra Club, Western Organization of Resource Councils, National Family Farm Coalition, Beyond Pesticides, Cornucopia Institute, Dakota Resource Council, and two individual alfalfa seed producers. *For a copy of the lawsuit, see http://www.worc.org/pdfs/Executive%20Summary-alfalfa-lawsuit.pdf.*

Widespread Pesticide Poisoning of Water Focus of Landmark Government Study

On March 3, 2006, the U.S. Geological Survey (USGS) released *Pesticides in the Nation's Streams and Ground Water, 1992-2001*, a ten-year survey of the contamination caused by pesticide use in agricultural and urbanized areas. More than 80 percent of urban streams and more than 50 percent of agricultural streams have concentrations in water of at least one pesticide, mostly those in use during the study period, that exceed a water-quality benchmark for aquatic life. Water-quality benchmarks, set by EPA, are estimates of pesticide concentrations that the agency says may have adverse effects on human health, aquatic life, or fish-eating wildlife. Insecticides, particularly diazinon, chlorpyrifos, and malathion frequently exceed aquatic-life benchmarks in urban streams. While the standard benchmarks were not exceeded for human health, recent studies and decades of incomplete risk assessments suggest that EPA benchmarks are severely underestimated. In addition, nearly half of the pesticides detected do not currently have benchmarks. The USGS study also reports widespread findings of complex pesticide mixtures. Most stream samples and about half of the well samples contain two or more pesticides, and frequently more. Robert Gilliom, Ph.D., the lead USGS researcher, explains that, "The potential effects of contaminant mixtures on people, aquatic life, and fish-eating wildlife are still poorly understood…Our results indicate, however, that studies of mixtures should be a high priority." A study by Tyrone Hayes, PhD, University of California, Berkeley, "Toxic Effects of Pesticides Amplified When Combined" (*see February 2006 issue of Technical Report (21)2*), finds that pesticide mixtures harm frogs at levels that do not produce the same effects alone, often levels 10 to 100 times below EPA's acceptable threshold levels.

Take Action: *Stop water contamination by pesticides and other lawn chemicals in your community. Help reduce and eliminate the use of unnecessary chemicals on lawns and public property, such as parks and athletic fields. Join the Coalition for Pesticide-Free Lawns and order copies of the new door hanger, which helps to educate neighbors that pesticides are not necessary for a healthy, green lawn. For more information on pesticides in water, see Beyond Pesticides' article, "Threatened Water: Turning the Tide on Pesticide Contamination," in the Winter 2005-2006 edition of* Pesticides and You *(Vol. 25, No. 4).*

Pesticide Industry, including Former EPA Official, Plotted Bush Human Testing Policy

According to meeting notes, representatives of the pesticide industry met with Bush administration officials to map out EPA rules authorizing experiments on humans with pesticides and other chemicals, which were ultimately adopted in January 2006. At the August 9, 2005 meeting, representatives of the pesticide trade association, CropLife America, Bayer Crop Life Science and former top EPA pesticide and toxics official, James Aidala, who now represents chemical companies with the law firm Bergeson and Campbell, met with OMB and EPA officials, just before the Bush administration first unveiled the first proposal for the rule on September 12. During the meeting, CropLife America attendees urged: *Re kids—never say never; Pesticides have benefits. Rule should say so. Testing, too, has benefits;* and, *We want a rule quickly—[therefore] narrow [is] better. Don't like being singled out but, speed is most imp.* "These meeting notes make it clear that the pesticide industry's top objective is access to children for experiments. After reading these ghoulish notes one has the urge to take a shower," said Public Employees for Environmental Responsibility (PEER) executive director Jeff Ruch, whose organization works with EPA scientists who have been prevented from voicing ethical and scientific concerns about human subject testing. "For an administration which trumpets its concern for the 'value and dignity of life,' it is disconcerting that no ethicists, children advocates or scientists were invited to this meeting to counterbalance the pesticide pushers," Mr. Ruch said.

Beyond Pesticides is opposed to testing pesticides on humans. Because EPA does not evaluate pesticides for their societal benefits, or need, in light of available alternative approaches, practices and products, a basic ethical standard threshold for human testing is being violated by the agency. *For a copy of the meeting notes, see www.peer.org/docs/epa/06_26_5_EPA_HumanTesting_meetingnotes.pdf.*

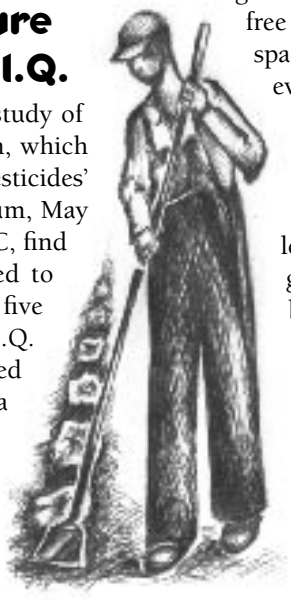
Sarasota County, FL Proposes Regulation of Fertilizers, 'Weed and Feed' Products

In what has the potential to be a growing trend to restrict fertilizer and 'weed and feed' use in communities across the country, Sarasota County, FL proposed new rules to restrict homeowner fertilizer use, and in effect, reduce pesticide usage through the ban of 'weed and feed' lawn products. The City of Madison and Dane County, WI successfully passed a phosphorus fertilizer/'weed and feed' ban and defeated the pesticide industry's challenge to the ordinance in U.S. District Court, *CropLife America et al., v. City of Madison et al.,* in 2005. The Sarasota proposal is spurred by the threat of red tide algae blooms and major fish kills in the Gulf. While red tide develops 40 miles offshore and fertilizer runoff does not likely cause the algae blooms, it contributes to the duration, intensity and potential for damage. The county commissioners voted unanimously to set an example and require the county maintenance department and contractors to use "fertilizers with maximum slow-release characteristics." County staff also was ordered to draft an ordinance to prohibit applying quick-release fertilizer on lawns and landscapes of private property owners during the rainy season. The pesticide industry has vowed to fight such lawn chemical restrictions. In January 2005, Allen James, president of the industry front group Responsible Industry for a Sound Environment (RISE), made the following statement, "We are watching the entire U.S., but particularly the border states of New York, Connecticut, Maine, Wisconsin, Minnesota, and Washington for any activity relative to banning pesticides, especially for outdoor lawn care and parks…" *Contact Beyond Pesticides for more details, or see www.beyondpesticides.org/lawn.*

Pesticide Exposure Linked to Lower I.Q.

Preliminary results from a study of North Dakota farm children, which were presented at Beyond Pesticides' 24th National Pesticide Forum, May 19, 2006 in Washington, DC, find that those children exposed to pesticides test an average of five points lower on standard I.Q. tests. The research, conducted by University of North Dakota (UND) researchers Patricia Mouton, PhD and Thomas Petros, PhD, studied two groups of children in the northern Red River Valley, one group living on or near an active farm or field, another living at least one mile from those locations. Dr. Moulton, an experimental psychologist, said the average intelligence score for the farm children is 98, below the average I.Q. score of 103 for the group with lower chronic exposures to pesticides. Children living on farms also had lower scores in verbal comprehension, visual perceptual reasoning, memory and mental processing speed, the study found. "That's just the raw I.Q.," Dr. Moulton explained at the conference. "We're going to look at a dose-response relationship. We're going to be able to associate the test scores with (pesticide) concentrations in the blood and urine." The study is an offshoot of a large epidemiological study that UND researchers are conducting on chronic pesticide exposure and degenerative brain diseases, including Parkinson's, Alzheimer's and multiple sclerosis. *Dr. Moulton's presentation at the 24th National Pesticide Forum is available on VHS video. See www.beyondpesticides.org/forum for more information.*

Nation's Largest Urban Farm Evicted, Farmers to Fight in Court



The nation's largest urban farm, the South Central Farm, a 14-acre community garden that provided pesticide-free food and community green space to over 350 families, was evicted by police in riot gear on June 13, 2006. More than 40 protesters, including actor Darryl Hannah were arrested. The garden, located in downtown Los Angeles, CA was first acquired by the city in the 1980's by eminent domain. It was given to the community for use as a garden in 1992. The land is farmed by working class families, providing a major source of food for many people in the area, and is an important part of the com-

munity and culture. On the farm, families have the opportunity to grow foods that are healthy and pesticide-free, often the only source of affordable organic food. Many families grow food indigenous to their countries of origin that have important cultural, nutritional, and medicinal value. The urban farm is also one of the largest areas of green space in Los Angeles. Although negotiations began in the mid-nineties, the city finally agreed to sell the land to Ralph Horowitz and his business partners for $5,050,000 in August 2003. When the families were notified of the sale in September of that year, they formed the group South Central Farmers Feeding Families and filed a lawsuit seeking to invalidate the sale of the property. The Los Angeles County Superior Court issued a preliminary injunction, but the Court of Appeals reversed the decision on June 30, 2005. The next court date involved with the case has been set for July 12, 2006. Lawyers for the farmers will attempt to make the case that the sale of the land to Horowitz was conducted through an illegal backroom deal. *Support the South Central Farmers Feeding Families by donating online at www.southcentralfarmers.com.*

EPA, Beyond Pesticides and Others Team Up for Rodent Control in DC

The District of Columbia Department of Health (DOH), in partnership with the National Zoo, Environmental Protection Agency (EPA), Beyond Pesticides and University of the District of Columbia, sponsored the *Rodent and Vector Control Academy*, April 26-28, 2006 in Washington, DC. The first ever in DC, the *Academy* is designed to enhance the District's rodent program by teaching the principles of integrated pest management (IPM) to staff from government agencies, hospitals and universities. The partnership created between the groups demonstrates the importance of local, state, federal, public and private partners working together to manage pests without creating the public health and environmental problems associated with pesticide use. Over the past several years, the Smithsonian Institution's National Zoo experienced several issues related to rodents. In 2004, two red pandas died after eating rat poison that had been buried in their yard. With the poisonings at the zoo, rat poison cases that involve children, and the increase in the rodent population in DC, the groups recognized that current rodent control practices are not working. Robert Corrigan, PhD, an expert in the field of pest management, rodent control and IPM, conducted the training activities. According to Dr. Corrigan, "We have rodent control techniques but we don't have any quantitative-oriented strategies." *Beyond Pesticides applauds the DC DOH and the National Zoo for taking the necessary first steps toward a successful IPM program for rodent control in the nation's capital.* *See full story on page 9.)*

Montana Organic Farmers Create "Homegrown" Label

In response to the growing influence of big business in the organic marketplace, the Western Montana Sustainable Growers Union, a group that is made up of 12 organic farms near Missoula, Montana, will offer the "Homegrown" label, an alternative to the USDA organic certification. The Homegrown label will indicate that the food being sold has been grown using sustainable agricultural and labor practices on farms that are within a 150-mile radius. The Homegrown label looks to go beyond the USDA organic label, regulating not just how the food is grown, but also where, and using what labor practices. Growers Union members feel that corporate organics have lost touch with the roots of the organic movement, which they believe has at its core community and local sustainability. "Our organization feels like organic certification makes a lot of sense for growers who live at a distance from their customers. For those growers, the only way customers can be assured that their food was grown the way it was supposed to be grown is to have an impartial third party do inspections. But when the grower and the customer are close together, there can be a trusting relationship," said Josh Slotnick, one of the organizers of the Growers Union.

Environmentalists are supportive, but cautious, about new eco-labels, such as the Homegrown label. Without a third party inspection system, consumers must be comfortable relying on the word of the person selling the food. In addition, not all eco-labels go beyond organic. The "Protected Harvest" eco-label, for example, restricts some pesticides, but allows others. The concern is that consumers may choose a weaker eco-label in the marketplace, which would still get a premium price over conventional, but could out-compete true organics. Many environmentalists believe that the USDA organic label is a good minimum standard, and other factors such as local production, family farming, fair trade practices and more, add additional value to food. *To find and support local organic producers in your area, visit www.localharvest.org.*

Agricultural Pesticide Use Associated with Increased Risk of NHL

Data by researchers from Northwestern University, University of Nebraska Medical Center, and the National Cancer Institute, pre-published April 18, 2006 on the website of the journal *Blood*, adds another

study to the body of evidence linking pesticide exposure to cancer, specifically, non-Hodgkin's Lymphoma (NHL). According the study, "Agricultural pesticide use and risk of t(14;18)-defined subtypes of non-Hodgkin lymphoma," agricultural exposure to insecticides, herbicides, and fumigants leads to a 2.6 to 5.0-fold increased risk in the incidence of a certain type, t(14;18)-positive, NHL. Non-Hodgkin's lymphoma is a cancer of the immune system. There are several different types of NHL, which are differentiated by the type of immune cell that is cancerous, the characteristics of the cancerous cell, and different genetic mutations of the cancerous cells. The few with known causes include those associated with specific bacteria and viruses such as the Epstein-Barr virus, HIV-related lymphomas, body cavity lymphomas or T-cell lymphoma. However, none of these specific causes explain the increased incidence of lymphomas in recent years. There are epidemiologic studies of farm and household pesticide use that link elevated rates of NHL, a 22% (Cantor, 1982) and 30% (Colt et al., 2006) increase, respectively, to pesticide exposure. The farming study finds a 70% increased risk in subjects less than 65 years of age. The results of this latest study further confirm the link between pesticides and the increased incidence of NHL.

Agricultural Chemicals Show Up in National Park Snow

According to researchers at Oregon State University, even the most pristine areas of our national parks and preserves cannot escape pesticide contamination. The study, "Atmospheric Deposition of Current-Use and Historic-Use Pesticides in Snow at National Parks in the Western United States," published in the journal *Environmental Science & Technology*, analyzes pesticides in seasonal snow pack samples collected in spring 2003 from seven western national parks and preserves: Sequoia (CA), Rocky Mountain (CO), Mount Rainier (WA), Glacier

(MT), Denali (AK), Noatak (AK), and Gates of the Arctic (AK). From a list of 47 pesticides and degradation products, the most frequently detected current-use pesticides are dacthal, chlorpyrifos, endosulfan, and -hexachlorocyclohexane, whereas the most frequently detected historic-use pesticides are dieldrin, α -hexachlorocyclohexane, chlordane, and hexachlorobenzene. Based on an analysis looking at latitude, temperature, elevation, particulate matter, and two indicators of regional pesticide use, the researchers believe that regional current and historic agricultural practices are largely responsible for the distribution of pesticides in the national parks in the study. "Clearly, regional U.S. and Canadian agricultural practices, both past and present, play a significant role in contributing to the accumulation of pesticides in the seasonal snow pack," said lead author Kim Hageman, PhD. Because there is no farmland near Alaskan parks, her team concluded that contamination in snow is the product of long-range drift. *The study may be viewed at www.beyondpesticides.org/documents/snowcontamination.pdf.*

Antibacterial Soap Ingredient Found in Recycled Sewage Sludge Used on Crops

Researchers at the Johns Hopkins Bloomberg School of Public Health measured levels of the antibacterial hand soap ingredient, triclocarban, as it passed through a wastewater treatment facility and determined that approximately 75 percent of the ingredient that washed down the drain persists during wastewater treatment and accumulates in municipal sludge, which later is used as fertilizer for crops. The study is published in the June 2006 issue of the journal *Environmental Science & Technology* (Vol. 40, No. 11). According to senior author Rolf Halden, PhD, assistant professor and co-founder of the Johns Hopkins Center for Water and Health, triclocarban is leading a peculiar double life. "Following its intended use as a topical antiseptic, we are effectively and inadvertently using it as an agricultural pesticide that is neither regulated nor monitored." More studies are underway to determine if triclocarban, which is toxic when ingested, can migrate from sludge into foods, thereby potentially posing a human health risk.

"The irony is twofold," explained Dr. Halden. "First, to protect our health, we mass-produce and use a toxic chemical which the Food and Drug Administration has determined has no scientifically proven benefit. Second, when we try to do the right thing by recycling nutrients contained in biosolids, we end up spreading a known reproductive toxicant on the soil where we grow our food. The study shows just how important it is to consider the full life cycle of the chemicals we manufacture for use in our daily life." Dr. Halden's previous research determined that triclocarban, similar to the structurally related antimicrobial triclosan, also contaminates rivers and streams across the U.S. *For more information on triclosan, see the Triclosan ChemicalWATCH factsheet in the Fall 2004 issue of* Pesticides and You *(Vol. 24, No. 3) and the follow-up article in the Winter 2004-2005 issue (Vol. 24, No. 4).*

Rodents Teach Lesson of Failed Chemical Controls

City officials gather to learn new approaches to rodent management less dependent on chemicals, more focused on habitat reduction

It was big news when the District of Columbia announced that the *Rodent and Vector Control Academy* was coming to town in April. The *Rodent Academy* had already opened in New York City to rave reviews for a limited three-day engagement. While the *Rodent Academy* is not a Broadway, or even an Off-Off-Broadway, Show, it really could be. Former teacher and researcher in the Entomology Department at Purdue University, now international rodent management expert, Robert (Bobby) Corrigan, PhD, had the audience of city and federal officials caught up in the drama and the humor of a topic at the top of every big city Mayor's public health agenda –rodent control. Animated and walking across the stage with rolled up shirt- sleeves and a wireless microphone, Dr. Corrigan, who holds a doctorate in rodent and vertebrate pest management, delivered his opening lines (paraphrasing): *The chemical–intensive approach that the public and private sector use for rodent control is not working. There is a better way that relies on sanitation practices and exclusion techniques*. Dr. Corrigan piqued the interest of the audience.

Dr. Corrigan placed himself in the middle of the stage and said, "I'm going to take you into the world of this animal in a big way." With that began the three-day training session at the National Zoo, which served as a sponsor of the event, along with the District of Columbia (DC) government, Beyond Pesticides, the University of the District of Columbia, and the U.S. Environmental Protection Agency (EPA). A truly effective rodent control program is based on a holistic approach that includes all levels of government and city occupants. Understanding this, the DC government had recently formed a partnership to help kick off a new campaign, "Working Together for a Rat Free DC."

Dr. Corrigan did not need to convince anyone that current rodent control practices are not working. Those responsible for managing the problem already know this from their experience. That is why officials came to the academy from as far away as Baltimore and Philadelphia. The training was also attended by more than 100 District of Columbia (and other local governments), federal employees, pest control companies, and advocacy organizations.

The rodent problem

Because of the complex cultural and sociological components of metropolises, different infrastructures and uncoordinated agencies are often indirectly and in some cases directly responsible for causing rat populations to proliferate.

According to the D.C. Department Health (DOH) director, Gregg A. Pane, M.D., "Reports about rats are the number one source of complaints in the office as well as the number one public health issue." Babies in cribs, the confined elderly, and the indigent homeless are among the most vulnerable to foraging rats and mice. In the U.S. alone, estimates suggest up to 14, 000 people are bitten by rats each year with the majority being children, according to Dr. Corrigan.

Rats and mice contribute to approximately 55 different diseases, including a diverse range of pathogens from viruses to parasitic worms. "Rat-bite fever" —whose symptoms include chills, fever, vomiting, aches, and pains—is often misdiagnosed for a severe case of flu.

Gerard Brown, program manager of the DOH Rodent Program, said the number of rat complaints in DC in 2006 is currently at 3,521, a decrease from 4,415 in 2000. Mostly, city officials attribute the decrease to their public-awareness and enforcement campaigns that make residents more aware of the factors that breed rats. The officials believe that the experience gained from participating in the *Rodent Academy* will substantially reduce the complaints and help to make DC rat free.

The rats that are plaguing the District and other cities are primarily the Norway rats. Weighing on average 12 to 16 ounces, these rats are about 16 inches in length. Because these rats are originally from the area along the border between Russia and Iran, they are ground-dwelling mammals that dig and construct nests within earthen burrows. Reproductive peaks for the Norway rat occur in the spring and fall. In ideal conditions, such as a rat colony living in a poorly maintained restaurant, breeding may occur for as long as an entire year. The gestation period for a rat is 22 days averaging liters of 8-12 pups. A female rat is able to produce 4 to 7 liters and ultimately wean 20 or more pups, provided she lives for a year or more. Their peak time of travel is at dusk and just prior to dawn.

Sanitation is key to successful rodent management.

The rodenticide problem

Typical rodenticides (pesticides) used to treat the problem also create problems. Rodenticides are hazardous and pose a very dangerous threat to children and animals, making them either very sick or causing death if ingested. They also contribute to the toxic load found in our nation's streams and waterways. The average pest professional uses second-generation anticoagulants to control rodents, such as cholecalciferol, bromethalin, aluminum phosphide and zinc phosphide that contain the active ingredients, warfarin, brodifacoum, bromadiolone and difethialone.

Anticoagulants have become problematic because: (i) they are associated with accidental poisonings of children and non-target wildlife; and, (ii) rodents are showing resistance to certain compounds. Rat poisons harm children in all communities, but African-American and Latino children and children living below the poverty level suffer a disproportionately high risk. In 2004 in New York state, for example, it was reported that 57 percent of children hospitalized for rodenticide poisoning are African Americans, although only 16 percent of New York state's population is African American; 26 percent of hospitalized children are Latino, although Latinos comprise only 12 percent of the state's population. Additionally, a disproportionate percentage of children hospitalized are below the poverty level.

Although buried, aluminum phosphide is blamed in the 2003 death of two red pandas at the National Zoo. According to zoo officials, it was the first time the zoo used the pesticide in an animal exhibit, although the zoo had used it in the past in non-exhibit areas.

How to address the problem

Dr. Corrigan's IPM approach places strong emphasis on sanitation, pest exclusion (which includes addressing human behavior and structural pest proofing), education and training, while selecting least toxic chemicals if all else fails. Sanitation is the MOST important step to rodent control, stresses Dr. Corrigan. The goal of the program is not "extermination," but prevention. By preventing the presence of rodents, Dr. Corrigan teaches to reduce the need for pesticides through pest exclusion strategies that address structural and landscape planning.

Dr. Corrigan advocates the establishment of a mayoral task force comprised of the City's agencies and authorities, including Parks and Recreation, Housing, License and Inspection, Sanitation, Public Works, Health, Planning, Administrative Services, Education and the Transportation Authority—such as the one established in New York City in 2003 after a successful pilot program initiated in 2001 in Brooklyn.

New York City's Rodent Control Task Force was created to concentrate the city's efforts on eliminating the conditions in which rodents flourish and emphasize interagency collaboration. The task force meets monthly around the following objectives:

- Making city-managed properties and facilities a model for effective rodent control;
- Enforcing, rat proofing, providing owner/resident education for all properties, and eradicating in the target areas;
- Enlisting community involvement from elected officials, community boards and community-based organizations;
- Creating and advancing a legislative agenda to provide new tools against rodent infestations and reducing barriers to effective enforcement; and,
- Tracking the program's success by measuring neighborhood-level performance related to the implementation of rodent prevention measures, and rodent activity.

Dr. Corrigan's *Rodent Academy* trainings in 2005-2006 was a key part New York's program expansion. DC's Mr. Brown attended one of those trainings, where he recognized the value it could bring to the District's program.

Without a multi-level coordinated approach, Dr. Corrigan believes that big city rodent problems will never be solved. For example, if rats are exterminated from a "street level" area, the population can possibly be replaced by a nearby subsurface rat population, such as rodents living in sewers and subways. A rat infestation originating from an abandoned lot or house may replace the rats recently exterminated within a multi-family housing unit. Without a coordinated effort, city-level rat control programs are reduced to "harvesting," which Dr. Corrigan equates to harvesting crops.

The use of rodent-resistant trash receptacles, such as those now required by an ordinance in New York City, play a large role in the sanitation process, a message repeated many times at the *Academy*. Food waste issues, such as the garbage practices of homeowners, refuse from commercial food facilities, and junk piles, as well as clutter, contribute to the rat issues in cities. As Dr Corrigan stresses, an ordinance is a key element for an effective rodent control program. In New York City, Mayor Michael Bloomberg committed additional resources to purchase over 8,000 new rodent resistant trash receptacles. The trashcans are being used to help communities avoid reoccurring infestations by providing them with a rodent-resistant container for residential refuse storage. Made of thick, tough plastic, a self-closing lid and attached wheels, the receptacle is designed to be compatible with refuse disposal equipment.

Educational materials

Educational material provided at the *Rodent Academy* consists of a folder filled with extensive materials, all justifying the need for municipalities to implement an IPM approach. Because a well-coordinated effort is required among all essential agencies, course materials include information on health, policy and regulation, planning, sanitation, enforcement and safety, followed by case studies —all in an effort to reach the diverse target audience that includes policy makers, rodent control program managers and facilities managers, environment, housing and health advocacy groups and federal and local government representatives. After the materials are distributed, Dr. Corrigan tells the class that, "You're going to know more about rats and mice than the average pest controller on the street."

The class learns that the majority of interior urban rodent problems can be eliminated if business owners, municipalities and building superintendents emphasize rodent proofing of all buildings. This includes simple things that homeowners should also do, such as fixing a hole in a foundation or installing a pest proofing brush on the bottom of a door. Proactive building design and construction materials are key in keeping pests out. Both residential and commercial doors must be kept closed to deny rodents entry into buildings. By incorporating proper rodent proofing techniques at ground floor levels, pest entry can be eliminated, with an added benefit of reduction in energy cost.

Landscape planning measures aimed at avoiding rodent infestation are key to addressing rodent problems in cities. The class learned that landscaping choices and practices, often overlooked by facilities maintenance staff and landscaping companies, play an important role in the potential impact of pest pressures on buildings. An example cited by Dr. Corrigan is that rats love to burrow in ivy.

At the completion of the extensive three-day training, an exam is given and each participant receives a certificate of completion from the DOH.

Next steps for the District of Columbia

After attending the *Rodent Academy*, DC Office of Clean Cities and the Department of Health launched a pilot initiative with the Mid-14th Street Business Association and residents located in a two- block area in the Northwest section of the city. Members of the pilot team were given the educational materials that were used at the *Rodent Academy*. The initiative began with a community clean up event, entitled *Community Clean Up & Rat Abatement Inspection*.

The District also initiated an IPM campaign and will include the following goals:

- Organize community educational presentations;
- Work with business associations and development corporations;
- Educate children to become stewards of sanitation at school and home;
- Conduct baiting of targeted burrows on private property through petition process; and,
- Initiate a strict enforcement campaign with fines ranging from $75.00 for residential violations up to $500.00 for commercial violations.

Future steps

The *Rodent Academy* can visit cities across the U.S. Before arranging a conference, the following steps should be taken to identify groups needed to form a public-private partnership that includes government agencies, a local university, environmental agency and community-based public interest groups. The partnership should then be used to identify the agencies needed to eliminate conditions that lend to the proliferation of rodents. Next, begin to schedule a series of meetings to create a budget, create press material, and budget for the 3-day *Rodent Academy*.

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A pesticide-free football field, managed by Chip Osborne, in Marblehead, MA.

Pesticides and Playing Fields

Are we unintentionally harming our children?

By Eileen Gunn and Chip Osborne

Parents and teachers spend a lot of time ensuring the safety of children. Yet, the common, everyday practices used to maintain our children's playing fields are unintentionally and unnecessarily exposing them to carcinogens, asthmagens, and developmental toxins.

The typical soccer field is deluged with a mixture of poisons designed to kill fungus, weeds, and insects. A conventional maintenance plan includes the use of a fungicide on a regular basis to prevent fungal pathogens, a post-emergent herbicide (such as 2,4-D) to kill crabgrass and dandelion seed, a selective herbicide (such as Trimec or Mecoprop) to kill clover and other broadleaf weeds, and an insecticide (such as Merit or Dylox) to kill insects such as grubs. These are all pesticides, whose health effects are discussed below, and their use on playing fields is particularly troubling because children come into direct contact with the grass, and have repeated, and prolonged exposures. While much is known about the effects of individual pesticides and products, the health effects of the mixtures, described here, on children are not evaluated by the U.S. Environmental Protection Agency (EPA).

Many people think that the pesticides "wear off," and that children are not being exposed. However, the Centers for Disease Control (CDC) found multiple pesticide residues, including the herbicide 2,4-D, in the bodies of children ages 6-11 at significantly higher levels than all other age categories. Herbicides such as 2,4-D and Mecoprop, chemicals tied to respiratory ailments, are found in 15 percent of children tested, ages 3 to 7, whose parents had recently applied the lawn chemicals. Breakdown products of organophosphate pesticides are present in 98.7 percent of children tested. Additionally, scientific studies show that herbicides, such as 2,4-D, are tracked indoors from lawns where residues may remain for up to a year in carpets, dust, air and surfaces.

More reasons to be concerned?

Children are especially vulnerable to pesticides

- The National Academy of Sciences reports that children are more susceptible than adults to pesticides and other environmental toxins. This is because pound for pound children take in more pesticides relative to their body weight, their detoxification system is not fully developed, and their developing organ systems are more vulnerable.
- 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.

Children, cancer and pesticides

- Of all 99 human studies done on lymphoma and pesticides, the Lymphoma Foundation of America found 75 show a connection between exposure to pesticides and lymphomas.
- A study published in the *Journal of the National Cancer Institute* found that household and garden pesticide use can increase the risk of childhood leukemia as much as seven-fold.
- A study published by the American Cancer Society found an increased risk for non-Hodgkins Lymphoma (NHL) for

Yes! Organic Playing Fields Are Possible

Five myths about problems with organic playing field management

Have you ever tried suggesting eliminating pesticide use on children's playing fields in your community and been told it is not possible, it would cause more injuries, or it just costs too much? Chip Osborne, a horticulturists living in Marblehead, Massachusetts, has been told all of these things and more in his quest to transform 15 acres of playing fields to organic management. He recently spoke at the Beyond Pesticides 24th National Forum, shared his experience, and disputed the unfounded statements you often hear.

Myth 1: Organic turf management puts fields "at risk." Opponents, or uninformed turf managers, claim that organic management will put the fields at risk for disease and weed infestation, however, in a Cornell University study of turf, chemically maintained turf is more susceptible to disease. The reason was found to be very low organic matter content and depleted soil microorganisms.

A key component of organic management is topdressing with compost, adding a steadily available source of nutrients, adding thousands of beneficial microorganisms that help fight disease. Research at Cornell University demonstrates that topdressing with compost suppresses some soil-borne fungal diseases just as well as conventional fungicides.

Myth 2: Organic athletic fields are not "safe" and cause more injuries. This myth often preserves dandelions and tufts of plants that children may trip on. But organic practices can ensure control of unwanted plants in the turf. Moreover, these injury claims are not substantiated. The safety of a field is not dependent on whether there is an organic versus chemical-based maintenance program, *any* turf that has an irregular surface can lead to falls or twisted ankles. In fact, chemical turf is generally hard and compacted because there is not much soil biology (life in the soil). Organic management focuses on cultural practices, such as aeration, that alleviate compaction and provides a softer, better playing surface.

Myth 3: Organic fields always have clover problems. Excess clover is an indicator of the soil condition. Clover is found in fields with low nitrogen levels, compaction issues, and drought stress. It is an issue in large patches because it can be slippery when wet. However, clover is a beneficial plant that "fixes," or transforms, free nitrogen from the atmosphere into the turfgrass. Clover roots are extensive and provide significant resources to soil organisms, and it is extremely drought resistant, staying green long after turf goes dormant.

The organic turf manager recognizes the value of clover and other unwanted plants, sets a reasonable tolerance level, and uses sound horticultural practices such as pH management, fertilization, aeration, overseeding with proper grass seed, and proper watering to control them.

Myth 4: Organic turf management is prohibitively expensive. This is another unsubstantiated, anecdotal statement by many naysayers, but when asked for hard and fast budget numbers to prove these claims, they are not available. Most municipalities do not have accurate figures on the costs of their chemical programs. The question really is -What is the cost of NOT going organic? What is the cost of exposing developing children to known cancer causing, endocrine disrupting, and asthma triggering chemicals where they play for long hours?

Over the past five years, Mr. Osborne transformed 15 acres of playing fields to organic care, now at a cost of $2400-$3000 per 2 acre playing field, not including mowing costs. A conventional fully chemically-treated athletic field by TruGreen ChemLawn for the same area is estimated at $3400. While initial costs to transition a chemical-dependent turf to organic care can be higher, in the long-run costs will be lower as inputs, like fertilizer and water, decrease. You are also no longer paying for annual chemical treatments.

Myth 5: Organic fields need to be rested. Once again, this is not a chemical versus organically-managed field issue. All fields ideally should be rested for recuperative growth. Athletic activity naturally tears up turf from the soil, especially football, leaving open areas for opportunistic weeds to grow. Prepping the area and spreading a repair mixture of compost and seed that quickly establishes as soon as possible will fill in the area and negate the need for herbicides down the road.

subjects exposed to common herbicides and fungicides, particularly Mecoprop (MCPP). People exposed to glyphosate (Roundup) are 2.7 times more likely to develop NHL.

Children, asthma and pesticides

- Pesticides, along with other environmental factors, cause and trigger asthma.
- Common herbicides, 2,4-D, Mecoprop, Dicamba, (often found together as Trimec) and RoundUp (glyphosate) are respiratory irritants that can cause irritation to skin and mucous membranes, chest burning, coughing, nausea and vomiting.
- A 2004 peer-reviewed study found that young infants and toddlers exposed to herbicides (weed killers) within their first year of life are four and a half times more likely to develop asthma by the age of five, and almost two and a half times more likely when exposed to insecticides.

Children, learning and developmental disorders and pesticides

- A report by the National Academy of Sciences indicates that as many as 25 percent of all developmental disabilities in children may be caused by environmental factors.
- A 2002 peer-reviewed study found children born to parents exposed to glyphosate (Roundup) show a higher incidence of attention deficit disorder and hyperactivity (ADD and ADHD).

For references on the above facts, see Children and Pesticides DON'T Mix at www.beyondpesticides.org/lawn, or contact Beyond Pesticides.

Alternatives to pesticides

The Cornell University *Athletic Turf Study*, whose funding was pulled before completion, sampled soil at five Orange County, NY, public school playing fields and analyzed the samples for pH, nutrients, and soil compaction. Weed populations were also mapped. Cornell researchers note the common trends as lack of adequate topsoil, soil compaction, overuse and multi-purpose fields, limited funds for maintenance, and limited maintenance staff and equipment. Cornell researchers also state, in addition to building and ground personnel, it became apparent that school administrators, funding sources, athletic directors, coaches, teachers, parents, and students all need to be educated on maintenance issues. We add that they should be educated on the health effects of pesticides as well.

There is not a quick and easy step-by-step formula for maintaining every sports field because there are site-specific conditions and varying sports needs. It is necessary to utilize information gathered in site analysis to develop a site-specific management plan. As Paul Sachs states in his book, *Managing Healthy Sports Fields: a guide to using organic materials for low-maintenance and chemical-free playing fields (2004),*

> "Ecological turf maintenance calls for the manager to consider all of the organisms in the turf ecosystem, because most of them are allies. It also means expectations may have to be adjusted to a more realistic and practical threshold where a natural equilibrium can be maintained."
>
> "There is a fear of failure," says Mr. Osborne, "but actually the organically maintained fields are relatively easy to keep in good shape."

What you can do

You do not have to be an expert on athletic turf management or the health effects of every pesticide used on playing fields. What you do need to know is that children are being unnecessarily exposed to chemicals that can impair their health, and that a safer, proven way exists to manage turf. Your school can have dense, vigorous, and well-groomed organic playing fields that are the pride of your community.

Thirty-three states have laws and over 400 school districts nationwide have policies or programs requiring integrated pest management, pesticide bans, or right-to-know provisions in schools. These laws or policies are not necessarily well-known or satisfactorily implemented.

- Determine whether your state, school or community has a law or policy governing pesticide usage in and around schools, or on public lands. Find out if, and how well it is being implemented.
- If you do not have a law, call for an organic land care policy in your community.
- Petition the school and the town parks department to convert the playing fields to organic care.
- Require that the grounds maintenance director, or contracted professional, be trained in organic land care.

For a referenced copy of this article, see www.beyondpesticides.org/lawn.

Scotts Poisons the Wrong Family

A family that sought to avoid lawn chemicals had its yard mistakenly treated by Scotts Lawn Service

By Robert H. Ryan

Editors Note: *The prevalent and poorly regulated use of pesticides in our society means that everyone is at risk. Beyond Pesticides urges those who are involuntarily exposed and/or poisoned by pesticides to report these incidents to state authorities, EPA, elected officials, and the local media (see below for more information). Beyond Pesticides works with people and organizations at the community level to stop the poisoning and promote safe solutions.*

On May 17, 2005, Scotts Lawn Service mistakenly treated the home of the Ryan Family with 2,4-D, Dicamba, and MCCP. The actual house that Scotts was hired to treat was on a different street with a similar name. The Ryans, who live in Massachusetts, have two small children and, at the time, one more on the way. They made a point of not using chemical treatments on their lawn. The Ryans were particularly concerned given that one of their sons had numerous allergies as well as asthma. Scotts Lawn Service treated the Ryan's lawn with a variety of pesticides by mistake. When the Ryans figured out what had happened and requested mitigation from Scotts, the obstacles and problems they encountered were endless.

Family's children exposed to pesticides

When the Ryans discovered on the evening of May 17, that their lawn had been treated with chemicals, they immediately called the Scotts Miracle-Gro Company to complain and demand that the company remove the chemical contamination. Mrs. Ryan informed Scotts that given that they also failed to properly mark the property and provide sufficient notice that pesticides were applied, she and her two sons were exposed to the pesticides within eight hours of the application. The Ryans were not only worried about exposure to pesticides from the lawn itself, but they also worried that the pesticides would contaminate the private well they used for their drinking water.

The Ryans had high hopes that Scotts would be responsive when they received a call early the next morning from the Scotts' applicator who mistakenly treated their lawn. The applicator apologized for the mistake and said he would stop by their house later to talk about resolving the problem. Later that morning the Ryans received a message from Dan McGuire from Scotts Lawn Service who said that he wanted to follow up on the mistake that was made. When Mrs. Ryan spoke with Mr. McGuire and learned that Scotts had no plan to resolve the situation, she told him that they would like Scotts to remove the contaminated soil, in order to guarantee that the toxic pesticides were removed and no longer a threat. Mr. McGuire said that the issue of soil removal would have to be addressed by corporate headquarters and he would pass on the information.

Shortly after Mrs. Ryan's conversation with Mr. McGuire, the Ryans received a message from Andy Benute, the Regional Director for Scotts Lawn Service on the East Coast whose office is in the Marysville, OH Corporate Office for the Scotts Miracle-Gro Company. Mr. Benute expressed his regrets regarding the situation and said that, although he was traveling, he would try to be in touch with them as soon as possible.

Family puts Scotts on notice

On May 19, Mr. Ryan, an attorney, faxed a letter to Mr. Benute and Mr. David M. Aronowitz, General Counsel for the Scotts Miracle-Gro Company, to establish the record that the Scotts Miracle-Gro Company was on notice regarding the incident and to request that they immediately mitigate the potential harm. In the fax, Mr. Ryan demanded that the soil replacement process being the following day, May 20.

The next day, Mr. Ryan received a call from Matt Tegmeyer of Vericlaim, which is the third party administrator for Scotts Miracle-Gro Company. Mr. Tegmeyer stated that he just received Mr. Ryan's letter of May 19 and stated that he was to investigate the incident and make a recommendation to Scotts Miracle-Gro Company regarding the requested mitigation. Mr. Tegmeyer seemed understanding of the seriousness of the issue, and said that although he could not make any guarantees, he believed that the Scotts Miracle-Gro Company would likely honor the request for mitigation. He even informed Mr. Ryan that the Scotts Miracle-Gro Company had made similar mistakes in the past, including the improper application of pesticides to the yard of an EPA administrator who lived in Maryland and had an organic yard. He stated that in order to do the mitigation, Scotts Miracle-Gro would want to have the Ryans execute a release of all claims. Mr. Ryan informed him that until he was certain no permanent harm was inflicted on him or any member of his family, particularly his unborn child, he would not execute a release. Mr. Ryan then explained to Mr. Tegmeyer that he and his family were not looking for a cash settlement, but given the serious health issues involved with his pregnant wife and extremely allergic two year old, he wanted immediate mitigation. Mr. Tegmeyer requested that Mr. Ryan fax him a copy of the EPA Guide regarding Soil Excavation that he had referenced in their discussion. Mr. Ryan went one step further and also provided Mr. Tegmeyer with the name and contact information of a nursery that could handle the soil replacement in a timely fashion.

Later that same day, Mr. Ryan received a call from Mr. Tegmeyer informing him that he had been in touch with Mr. McGuire who had said he would contact a few landscapers and have them go to the Ryans' house. None of the landscapers ever came to the Ryans' house and in the meantime, on May 22, the Ryans' asthmatic son accidentally got onto the lawn and had a severe allergic reaction which resulted in skin inflammations, a swollen face and impacted breathing, requiring medical intervention. After this incident, Mr. Ryan immediately called Mr. Tegmeyer to report it and stress the urgency of having the soil replaced immediately.

On May 26, after nothing materialized from the alleged landscapers that Scotts was going to send over, Mr. Ryan obtained a quote from the nursery he had suggested to Mr. Tegmeyer and faxed it to him, making it clear that if the nursery were to receive a deposit they could start removing the contaminated soil immediately and the entire process could be completed by June 1.

Soon after this conversation, Mr. Ryan was contacted and told that Mr. McGuire had received an estimate from another landscaping company that was cheaper. This landscaping company, however, could not start work for one to two weeks and there was some question as to how much of the contaminated soil they would actually remove. Debate about the few thousand dollars in question continued between the Ryan family and Scotts which resulted in Mrs. Ryan contacting Mr. David M. Aronowitz to request that he consider the health concerns of the Ryan family and the potential negative impact to Scotts Miracle-Gro.

The family rejects settlement offer

On May 27, the Friday of Memorial Day weekend, it became painfully clear to the Ryans that Scotts Miracle-Gro had engaged in conduct to delay the filing of a formal complaint with the Massachusetts Pesticide Bureau and the EPA Pesticide Enforcement Coordinator in Boston. On that day, Mr. Ryan received a fax from Mr. Tegmeyer that stated Scotts Miracle-Gro Company did "not agree that [the Ryans'] requested course of action is reasonable or necessary and [Scotts] cannot and will not comply with this demand." Scotts also proposed that the Ryans just "apply an activated charcoal product to the entire lawn" and offered to compensate them with $1,000 for the "unnecessary inconvenience this incident has caused." In order to obtain the benefits of the proposal, the Ryans were told they would need to execute a full and final release to the Scotts Miracle-Gro Company. The Ryans rejected the proposal and instead filed a complaint with the Massachusetts Pesticide Bureau and notified the EPA.

Mrs. Ryan suffers miscarriage

A little over two weeks after the wrongful application of the lawn pesticides, the Ryans discovered that Mrs. Ryan had miscarried and it was estimated that the miscarriage occurred within a day of the improper application of the pesticides. Mr. Ryan engaged in extensive research and discovered that a number of studies have linked the pesticides applied by Scotts Miracle-Gro to miscarriage.

Although the Massachusetts Pesticide Bureau initially appeared to take the incident seriously after Mrs. Ryan suffered a miscarriage, informing Mr. Ryan that the numerous violations committed by Scotts Miracle-Gro would result in a thorough investigation and serious sanctions, it appears Scotts Miracle-Gro will not be held accountable. Mr. Ryan questions whether this is in part due to the fact that a former legal counsel for the Pesticide Bureau now works for the law firm defending Scotts Miracle-Gro.

At present, the Ryans are working with Massachusetts legislators to try to get Massachusetts to update pesticide regulations and enforcement. Mr. Ryan is also in the midst of filing an official complaint with the Attorney General. He is currently trying to bring to light the problems Scotts has caused and their refusal to be the "environmental stewards" they claim to be by taking the proper precautionary steps and resolving problems like theirs.

P.S. Just this season, Scotts Miracle-Gro Lawn Service left a note at the Ryans' door that they could not make an application until the leaves were removed from the lawn. Further contamination was averted this time as mistakes appear to continue.

Editors note. *Pesticide poisoning and contamination stories, like the one described above, must be told and documented. We urge poisoning victims to complete a Pesticide Incident Report that can be printed off the Beyond Pesticides' website at www.beyondpesticides.org/emergencies/pir_form.pdf, or mailed to you upon request. The incident should also be reported to the state pesticide law enforcement agency (see our website, www.beyonpesticides.org, to identify the appropriate contact in your state.) If you call to report the incident, request an investigation and follow up with a written request and letter that documents the conversation and any agreements. Copy your letter to the EPA Administrator (Environmental Protection Agency, Ariel Rios Building, 1200 Pennsylvania Avenue, N.W., Washington, DC 20460. Phone: 202-564-4700) and to your elected officials, U.S. Representatives (www.house.gov/writerep) and U.S. Senators (www.senate.gov). Reporting the incident to local media will help to identify others who have been poisoned and inform the community of this public health and environmental threat. Ultimately, documentation and raised awareness will help curtail practices that are causing poisonings and contamination. For more assistance, contact Beyond Pesticides, 701 E Street, SE, Washington, DC 20003, 202-543-5450, info@beyondpesticides.org.*

Managing West Nile Virus Safely

Communities choose safer, more effective prevention approaches

The **City of Fort Worth and Tarrant County Texas** (pop. 1,620,479) have taken a strong stand against "adulticiding," spraying pesticides to kill adult mosquitoes. The policy, enacted in 1991, is described as a "let's do-it-together plan," with several reasons justifying their anti-adulticiding stance.

"First, spraying chemicals in its streets will not rid the city of mosquitoes. The chemical must make contact with the insect to kill it, making it difficult to destroy mosquitoes hiding in grass, bushes, trees or backyards. Moreover, the chemicals have no residual effects and do nothing to kill mosquito larva thriving in stagnant water. Second, spraying for mosquitoes may give residents a false sense of security. The risk of someone being infected with West Nile might then increase if fewer people decide not to use insect repellents before working or playing outdoors. Third, adding harmful chemicals to the environment can have unwanted secondary effects to both air and water. Lastly, thousands of Fort Worth residents living with respiratory problems, such as asthma, would be in danger of an outset of symptoms.

Until such time when the pros of spraying outweigh the cons, Fort Worth and Tarrant County will continue to promote the importance of the residents' role in preventing mosquitoes at their source—stagnant water—and in protecting themselves from mosquitoes by wearing appropriate clothing and insect repellant outdoors." (Policy adopted in 1991 as posted on the city's website.)

Control of mosquitoes is generally most efficiently accomplished by eliminating mosquitoes in the immature stages, larval and pupae, not in the flying adult stage. *"Ground spraying with ultra low volume (ULV) sprays is a waste of money,"* says noted entomologist and Cornell University professor David Pimentel, PhD, *"Most ground spraying is political and has very little to do with effective mosquito control."* Further, scientific studies link the pesticides used to combat adult mosquitoes to effects on the central nervous, cardiovascular and respiratory systems and long-term health effects such as cancer and disruption of the endocrine (hormonal) system, even at very low doses.

Managing mosquito habitat

A more sensible, integrated pest management (IPM) approach starts with source reduction, altering or eliminating the mosquito larval habitat and breeding grounds (stagnant water.) This involves community sanitation and standing water management - tire removal, de-snagging waterways, catch basin cleaning, and container removal. In a sound IPM program, the focus shifts to larviciding only when source reduction is not feasible.

Focus on larval stage

The Fort Worth and Tarrant County health departments conduct surveillance for mosquito-borne illnesses and breeding sites. They focus control measures on public education and larviciding with the biological pesticides *Bacillus thuringiensis israelensis* (Bti) and *Bacillus sphaericus* (B. sphaericus), bacterial spores which are ingested by the larvae, causing rupturing of the larval gut. They also release gambusia fish (mosquito-eating fish native to Texas) for larval control.

Localities minimize community spraying

After reviewing the potential effectiveness of spraying as well as weighing the risks of the virus with the risks of pesticide exposure, the **City of Lyndhurst, Ohio** (pop. 14,600), a suburb of Cleveland, passed an ordinance in July 2003 prohibiting **Cuyahoga County** from spraying adulticide in its city to control the spread of West Nile virus (WNv). Today, Cuyahoga County also focuses its countywide efforts on larviciding.

According to Joe Lynch, vector control agent for Cuyahoga County, they do surveillance and larviciding for the entire county and would resort to adulticiding only under the thresholds for WNv infected mosquito pools, birds or humans established by the State of Ohio and Centers for Disease Control (CDC). The county is also working on better notification plans to alert the public to a spray event. In Shaker Heights, Ohio, also part of Cuyahoga County, the prevention program, based on breeding site elimination and larviciding, successfully decreased the number of mosquitoes from 128 per trap in 2001 to an average of six mosquitoes per trap in 2002.

Cincinnati and the surrounding **County of Hamilton, Ohio** (pop. 806,652) also do not spray adulticides and rely heavily on surveillance. The Hamilton County General Health District traps mosquitoes and sends them to the Ohio Department of Health for testing. Once a positive pool of mosquitoes is identified, Health District staff canvas a half-mile radius near where the mosquitoes were collected, look for areas of standing water, apply mosquito larvicide dunks where needed, make sure swimming pools are operating properly, and advise residents on precautions they can take to avoid bites.

In **Charlotte, Mecklenburg County, North Carolina** (pop. 796,372), where containers in urban areas are identified as the most common cause for mosquito problems, the County restricts spraying of pesticides, citing a number of reasons. *"One reason is that "fogging" does not control emerging mosquito populations as effectively as larviciding. Adulticiding only works against adult mosquitoes and once the next generation hatches, the problem returns, sometimes as soon as a few days after "fogging." A second reason is that in highly urbanized settings, adulticiding is most effective by aerial application (at a cost of $750,000) which the county is not equipped to provide. There are also concerns with killing non-target insects and human pesticide sensitivity."*

According to Bob Lee, Director of Weed and Pest and Vector Control Program for **Cheyenne, Wyoming** (pop. 54,374), 98%

of the program efforts are focused on larviciding with a mix of Bti and *B.sphaericus* through aerial and ground spraying at an effective cost of $6/acre per air, and $2-3.50 by land applications. His department has an aggressive mosquito surveillance program before and after the applications, and they work in cooperation with Cheyenne and State Health Department, which deliver community education materials.

"When we find West Nile present in mosquito pools here in **Washington, D.C.**," says Peggy Keller, Chief of the Bureau of Community Hygiene and Animal Disease Prevention in the District of Columbia Department of Health, "We don't spray. We've learned that the best way to protect the public from both the virus and the pesticides is to intensify our larviciding program and distribute outreach and education information that emphasizes prevention and protection techniques to the public in the surrounding area."

For a chart on common mosquito control pesticides see www.beyondpesticides.org/mosquito or contact Beyond Pesticides.

Mosquito Madness: How to repel mosquitoes safely

With summer here, and the bugs out in full force, along with some very itchy arms and legs, thoughts turn to mosquitoes-and how to avoid them. The first step in avoiding mosquitoes is prevention. Remove any standing water where mosquitoes can breed around the home and the schoolyard, such as plant pots, leaky hoses, empty buckets, toys, and old tires.

The best way to avoid mosquitoes, especially in the evening when they are most active, is to wear long pants and long sleeves. Burning citronella candles outside also helps repel mosquitoes. Since these two options are not always possible, mosquito sprays can sometimes be a good alternative. Many common mosquito sprays can contain toxic ingredients, however, so it is important to consider all of the options and read labels carefully before buying or spraying the repellents.

Some least-toxic mosquito sprays include:

- **Oil of Lemon Eucalyptus:** The Centers for Disease Control (CDC) recommends lemon eucalyptus oil repellents as a good alternative to DEET. The scented oil of lemon eucalyptus masks both carbon dioxide and lactic acid exhalations that alert mosquitoes to our presence, essentially hiding humans from detection. According to CDC, this plant-based mosquito repellent provides protection time similar to low concentration DEET products.(Repel Lemon Eucalyptus Insect Repellent-www.repel.com).
- **Essential oils:** Pesticides made with essential oils are derived from plants that are known to have insecticidal properties. Some essential oils used in repellents include Cedarwood, Soybean Oil (www.biteblocker.com), and **Geraniol** (MosquitoGuard – www.wildroots.com, Bite Stop – www.bitestop.com, Bugband – www.bugband.net). When compared with products like Citronella, Geraniol proved to be 100% more effective. Against products containing 10% Deet, Geraniol proved to be more effective.
- **Citronella sprays:** The same ingredient in candles that repels mosquitoes also is in some mosquito sprays, including the repellent Natrapel (www.tendercorp.com).
- **Picaridin** (KBR 3023), dervived from pepper, is a newly registered repellent that CDC claims provides comparable protection to DEET products with similar concentrations (Cutter Advanced – www.cutterinsectrepellent.com/). The limited data available on this product suggests that it has low potential for toxicity.
- Some repellents include many of these ingredients, including: Quantum Buzz Away Mosquito Repellent (www.quantumhealth.com), All Terrain (http://www.allterrainco.com/), Avon Skin-So-Soft, and Herbal Armour.

With all these repellents, be sure to reapply often (following the directions on the label) to repel the mosquitoes most effectively.

Be sure to avoid:

- **Pesticide-impregnated clothing**, such as Buzz Off clothing, which is impregnated with the synthetic pyrethroid permethrin. Permethrin is a possible carcinogen and a suspected endocrine disruptor. Endocrine disruptors interfere with normal hormone function and can contribute to breast and testicular cancer, birth defects, learning disorders, and other problems. Animal studies also indicate that small amounts of permethrin may cause immunotoxicity, or corruption of the immune system.
- **Products containing DEET**, which is quickly absorbed through the skin and has caused effects including severe skin reactions including large blisters and burning sensations. Laboratory studies have found that DEET can cause neurological damage, including brain damage in children. EPA requires that child safety claims be removed from all end-use product labels, as they are misleading. DEET labels must inform users of precautions that are realistically impossible to follow, including: (i) not applying the product near children's hands or face, over cuts, wounds and irritated skin; and (ii) thoroughly washing all treated skin with soap and water after returning indoors.

Sublethal Effects of Exposure to Cholinesterase-Inhibiting Pesticides

Humans and vertebrate wildlife

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Introduction

Synthetic and toxic chemicals (of anthropogenic origin) are ubiquitous in the environment at generally low but measurable levels. Pesticide use throughout the U.S. has resulted in the presence of pesticides in surface and ground water supplies (Kolpin et al. 1998; Hopkins et al. 2000), and agrochemicals have been identified as a primary cause of water quality loss nationally (USGS 1999).

Current pesticide regulations in the environmental and human health fields are designed to protect human and wildlife communities from large-dose exposures to pesticides and prevent acute disease symptoms and mortality. However, little protection is currently afforded to humans and wildlife to prevent low-level exposures and sublethal effects (RESOLVE 1994). With improved field monitoring techniques, scientists are producing a growing body of literature documenting in wildlife subtle, adverse effects of low-level chemical exposure on some of the most sensitive physiological processes (e.g., reproduction, development, cognition, and behavior) (reviewed in Grue et al. 1997).

Sentinel animals have alerted humans to chemical hazards in the environment for centuries (van der Schalie et al. 1999). Important breakthroughs in public and environmental health have been made in the last several decades as a result of physiological studies of birds and eggshell formation during the DDT era (Albers et al. 2000) and, since then, of developmental abnormalities due to endocrine disruption from exposure to a wide variety of chemicals (Myers et al. 2003). An integrated examination of the parallels between human and wildlife health with respect to exposure to organochlorine chemicals yielded greater insights, greater awareness, and modified public policies, plus increased activity to mitigate adverse effects.

This proven strategy for advancing environmental protection through integrating wildlife and human toxicity studies has not been extended to one of the most important classes of chemicals actively applied to the environment—the cholinesterase (ChE)-inhibiting organophosphate (OP) and carbamate pesticides. Of all pesticides used, 10% or 122 million pounds of active ingredient are insecticides (US EPA 2004). Approximately 95% of the insecticides applied in the U.S. are these "second generation" compounds (Aspelin and Grube 1999) which replaced organochlorine pesticides (such as DDT) which were found to have intolerable adverse effects due to persistence and biomagnification. Although organophosphates and carbamates are relatively less persistent, they are more acutely toxic, so environmental protection efforts have focused on preventing acute effects.

Several comprehensive reviews of the effects literature are available. A review of lawn and garden pesticide effects by Vanderlinden et al. (2002) provides a good overview of effects from herbicides, insecticides, and fungicides primarily used in Canada. Sanborn et al. (2004) provide a rigorous systematic assessment of chronic human health effects from pesticides. Rolland and Patrick (2000) provide a summary of human and wildlife health threats from environmental chemicals, however, as mentioned above, a characterization of human and wildlife effects specific to cholinesterase-inhibiting pesticides is lacking.

We evaluated relevant studies from the wildlife and human health literature and characterized current knowledge

of adverse effects from non-acute exposures specifically to organophosphate and carbamate pesticides. This product provides a current synthesis and interpretation of the relevant scientific information concerning sublethal effects in humans and vertebrate wildlife from exposure to cholinesterase-inhibiting pesticides. What follows are methods and an abstracted summary of key findings from each review.

Methods

The objective of this literature review was to characterize the effects to humans and wildlife resulting from low-level exposure to cholinesterase-inhibiting compounds. Review papers pertaining to the neurological, genotoxic, immunotoxic, carcinogenic, reproductive, metabolic, respiratory, dermatological, ecological, and miscellaneous effects on human and wildlife were obtained and reprints of published peer-reviewed review papers and primary literature were examined. Literature searches were conducted through ISI Web of Science®, the National Library of Medicine's PubMed and TOXLINE, and through Web-based search engines. Gray literature resources from Toronto Public Health were utilized for further insights to the primary literature (Vanderlinden et al. 2002; Sanborn et al. 2004). Studies were limited from 1980s to present, although for some outcomes older studies are reviewed for completeness. An attempt was made to include all studies conducted in the United States and Canada. Most studies from other countries are included although the review may not be complete.

Laboratory studies to support human health effects were included only to provide context and are not comprehensively reviewed.

Ecotoxicological Terminology

A complex nomenclature has developed to describe chemical exposure and effects in humans and wildlife. Although exposure and effects have their own distinct attributes (such as object, timing, and magnitude), they are often defined in the literature in relation to each other (e.g., sublethal exposure; see examples in Brown and Brix 1998). Furthermore, identical descriptors are frequently used to characterize both exposure and effects (e.g., acute exposure; acute effects). Because imprecise use of non-standardized terms can result in a lack of clarity in communicating research findings, we attempted to use consistently specific terms for interpreting and describing the ecotoxicological findings reviewed in this paper. Terms were selected that offer the most precise meaning for describing exposure and effects. In addition, redundant terms were eliminated and terms used to describe both exposure and effects (e.g., acute) were limited to one context.

Mode of Action. Target and non-target exposure is used in the wildlife literature to identify wildlife targeted for pesticide action (i.e. the pests) as opposed to biota exposed collaterally. Occupational/therapeutic/bystander exposure in the human health literature similarly describes the context in which humans are exposed to chemicals. Dermal/oral/inhalation are precise terms that describe the route of exposure in humans and animals. Direct and indirect effects are used throughout the wildlife literature to describe toxic assaults directly on the organism of interest as opposed to toxic impacts to the habitat (including prey base) the organism of interest utilizes. This distinction, and the use of primary versus secondary poisoning to describe the food chain dynamics of toxic exposure, are less helpful than identifying "direct" effects as toxicological and "indirect" effects as ecological.

Timing of Exposure and Effects. Several identical terms are used to describe the timing elements (onset, frequency and duration) of exposure and effects. Exposure and effects may have immediate or delayed onsets, short- or long-term duration, and frequencies of single or multiple events (within a given duration; e.g., acute or chronic exposure or effects). The most problematic of these is "acute" which is simultaneously used to describe the timing and magnitude of effects. Although "acute" is used to describe an exposure that generally results in an immediate and severe effect, providing a quantitative description of the latency and magnitude of effect would be more instructive. Similarly, "subchronic" is another term of limited value because it is non-intuitive and introduced in the literature as a result of regulatory jargon.

Magnitude of Exposure and Effects. More clarity is available from the terms typically used to describe the magnitude of exposure and effects. However use of the term "sublethal" is confusing. Sublethal is used to describe both exposure and effects (i.e. a sublethal exposure is one which results in sublethal effects). A further complication is that "sublethal" implies the magnitude of *immediate* effects since these low level exposures have been shown to result in mortality of exposed animals, although not necessarily within a short time of exposure. More helpful would be the adoption of quantified terms to describe small/large doses, low/high level exposure, and mild/severe effects. The focus of the current paper is on morbidity or "sublethal" effects although, as noted, effects to animals that do not result immediately in death often have profound consequences to animal vigor, including death which may occur at varying times after exposure.

Summary

■ Neurological effects

Humans. Neurological and neurobehaviorial effects have been described in studies investigating chronic exposure to anti-ChEs in sheep farmers, agricultural, greenhouse, and orchard workers, and pesticide applicators. The neurological effects noted in the literature include increased prevalence of self-reported symptoms such as sleep problems, fatigue, dizziness, gastrointestinal upset, and loss of strength in the extremities; decreased sensory nerve function; decreased motor function; symptoms of parkinsonism; and changes in brain and muscle electrical activities. Effects tend to be more pronounced in workers with the highest exposure. However, most of the results are inconsistent and exposure measurements either do not exist or the method of measurement varies and therefore comparisons between studies are difficult.

Neurobehavioral effects resulting from an acute episode or long-term exposure to anti-ChEs include increased depressive

disorders and anxiety. Deficits in cognitive function were observed in workers with varying levels of exposure and in some studies, long-term deficits were detected. Reported symptoms include memory disturbances, poor concentration, anger, fatigue, tension, and confusion.

Vertebrate Wildlife. Vertebrate wildlife exhibit a broad spectrum of neurological signs when exposed to low and high doses of anti-cholinesterase pesticides. Signs include clinical signs of intoxication such as vocalization, salivation, rapid heart beat, rapid breathing, tremors, and incoordination in mammals; decreased singing, hypothermia and gastrointestinal distress in birds; tremors and convulsions in reptiles; paralysis in amphibians; and muscle paralysis, loss of equilibrium, tetany and convulsions in fish. Behavioral dysfunction has been documented in most vertebrates including impacts to learning in mammals, birds, and fish; hyperactivity in mammals and birds sometimes followed by behavioral "slumps" and lethargy in mammals, birds, amphibians and fish; and, impacts on memory in mammals and birds. Studies show that all vertebrate classes experience disruption of feeding when exposed to cholinesterase-inhibiting chemicals either through pesticide-induced anorexia, prey-avoidance, altered aggressive behaviors and feeding hierarchies, and/or impacts to vision, learning and memory. Increased risk of predation as a result of pesticide exposure has also been documented in most vertebrate classes (mammals, birds, fish) either because of disrupted predator-avoidance behaviors or other behavioral dysfunctions. Studies of mammals and reptiles indicate that males, with higher baseline cholinesterase levels, may be less sensitive to pesticides than females.

■ Genotoxic effects

Humans. Effects of exposure to anti-ChE compounds include increased aneuploidy in sperm genetic material and increased chromosomal aberrations and fragile sites in lymphocytes. One study reported no change in micronuclei frequency with low exposure to malathion, however, numerous studies indicate an increased frequency of micronuclei with pesticide mixtures that include anti-ChEs. While effects tend to be increased in workers with higher exposure, cytogenetic effects have been observed in workers with low exposure to organophosphates and pesticide mixtures containing anticholinesterases.

Vertebrate Wildlife. Very little information is available on the genotoxic effects of cholinesterase-inhibiting chemicals in wildlife. Studies on mammals, amphibians and fish show that carbofuran, carbaryl and malathion cause DNA strand breakage in some vertebrates.

■ Immunotoxic effects

Humans. Epidemiological data revealed immune function impairment associated with long-term exposure to anti-ChEs in pesticide applicators, agricultural workers, persons ingesting contaminated groundwater or living adjacent to agricultural lands, and organophosphate production workers. Decreases in immune system markers, changes in T-cell ratios, and neutrophil dysfunction indicate humoral and cellular dysfunction. Evidence of elevated autoantibodies suggests possible autoimmune effects. Elevated biomarkers for oxidative stress are also reported.

Vertebrate Wildlife. Laboratory mice have been shown to undergo disruptions in immunoglobulin concentrations as a result of *in utero* or lactational exposure to anti-cholinesterases. No information is available on the immunotoxic effects of pesticide exposure in wild vertebrates.

■ Carcinogenic effects

Humans. In studies that have discerned pesticide types, odds ratios ranging from 1.5 to 7.1 for risk of non-Hodgkins lymphoma have been associated with exposure to Ops, such as diazinon, malathion, chlorpyrifos and to the carbamate, carbaryl, in lawn pesticide applicators and agricultural workers. Increased risk for leukemia has been reported in both adults and children after exposure to OPs and carbamates. Increases in breast tissue lesions that may act as biomarkers for breast cancer were found in women greenhouse workers exposed primarily to anti-ChE compounds and to a lesser extent, triazines and other herbicides. Risk for breast cancer was also increased in farm women who did not directly handle the compounds. Increased risk for prostate cancer with anti-ChEs and increased risk for small lymphatic lymphoma or lung cancer in farmers handling OPs has also been observed. While little evidence exists for risk of brain cancer in adults, several studies have associated exposure to pet flea collars, maternal pesticide use, and home pesticide

application of anti-ChEs with childhood brain cancer. Studies also suggest that risk increases when exposure occurs during critical developmental periods in early childhood.

Vertebrate Wildlife. No information is available on the potential carcinogenic effects of cholinesterase-inhibiting pesticides on wildlife.

■ Reproductive effects

Humans. Occupational studies have shown significant associations for maternal as well as paternal exposure to pesticides and adverse reproductive outcomes. Specifically, anti-ChE compounds have been implicated in the following adverse outcomes: changes in hormone levels, such as adrenocorticotropic and follicle-stimulating hormones; impaired semen quality and concentration; increased risk of spontaneous abortion and congenital defects resulting in fetal death; and altered birth parameters such as low birth weight and birth length with home and agricultural exposure to OPs.

Vertebrate Wildlife. Reproduction integrates a number of physiological systems in vertebrates and impacts to reproductive performance as a result of pesticide exposure may result from biochemical, histological, physiological and/or behavioral alterations. Reproductive hormones, including luteinizing hormone, follicle-stimulating hormone, and testosterone in mammals and luteinizing hormone in birds, are adversely affected by exposure to pesticides. Other effects include alterations to testes and sperm, altered sperm capacitation, infertility, maternal weight loss, decreased birth weight, increased stillbirths and decreased litter size documented in mammals; reduced egg-laying, decreased nest attentiveness, decreased hatching success, decreased fledge weight, and increased time to fledging in birds; and decreased egg production, inhibited ovarian development, decreased egg hatchability, and reduced fry production in fish. Exposure to an organophosphate (malathion) has been shown to adversely affect morphogenesis and cause skeletal deformities in amphibians. An organophosphate (parathion) has been found to bioconcentrate in the eggs of lizards.

■ Metabolic effects

Humans. Contrary to wildlife, hyperthermia is a common effect in humans exposed to poisoning doses of anticholinesterases. With lower dose exposures, the interaction of anticholinesterases with thermoregulatory system functions may affect the ability to dissipate heat while working or exercising.

Vertebrate Wildlife. Impact to thermoregulation has been identified as one of the most important outcomes of pesticide exposure in homoiothermic mammals and birds. A hypothermic response is typical in mammals other than humans, and in birds. Hypothermia may reduce metabolic rate and therefore reduce the activation of toxic compounds and metabolites, however, hypothermic birds and amphibians show greater vulnerability to cold stress.

■ Respiratory effects

Humans. Decreased pulmonary function and increased incidence of asthma was reported in three studies on OP manufacturers and farmers exposed to OPs and carbamates.

Vertebrate Wildlife. Very little information is available on respiratory effects of pesticide exposure in wildlife. Clinical signs in fish include gill muscle paralysis, increased amplitude of respiration, and asphyxiation.

■ Dermalogical effects

Humans. Cases of allergic dermatitis or erythema are common in workers with high and frequent exposure to organophosphates, however, the incidence of these effects was found to be rare in adult populations exposed to low doses of mosquito control pesticides. Increased incidence of dermatological effects in children suggests that more research regarding subpopulations sensitive to OP exposure is needed.

Vertebrate Wildlife. No information from studies on mammals, birds, or fish, however, both reptiles and amphibians have shown dermatological sensitivity to cholinesterase-inhibiting chemicals. Phosphamidon has been shown to cause shedding of body scales and color change in agamas, and a number of organophosphate and carbamate pesticides produce damage to melanophores, blisters, negative effects on palate and gill epithelium, and pigmentation effects in amphibians.

■ Miscellaneous Effects

Humans. Paraoxonase polymorphisms resulting in decreased paraoxonase activity were associated with increased symptom reporting, decreased sperm quality, and decreased fetal growth parameters. Increased chronic fatigue symptoms were found with farmers at the highest level of exposure associated with sheep-dipping tasks. Changes in bone formation and decreased bone density were also found in farmers exposed to sheep dips.

Vertebrate Wildlife. Documented effects in mammals include muscle necrosis. Studies show amphibians may exhibit a reduction in red blood cell numbers, edema and liver cell abnormalities as a result of exposure to cholinesterase-inhibiting pesticides.

■ Ecological effects

Vertebrate Wildlife. Impacts to wild mammal communities include inhibited reproduction, population size reduction, and increased population turnover rates. Causal mechanisms include not only physiological effects to mammals, but also impacts to populations of plants and animals comprising prey and other habitat components. In addition, dominance relationships can be impacted by differential effects of pesticides on mammalian members of communities. Documented impacts to birds include reduced population size as a result of reproductive effects.

The Avian Incident Monitoring System

The Avian Incident Monitoring System (AIMS), a cooperative program between American Bird Conservancy (ABC) and EPA, is a centralized source for field data on lethal and sub-lethal effects of pesticides on birds. Although capuring a fraction of incidents, AIMS provides valuable pesticide effects information. For more information, contact American Bird Conservancy, P.O. Box 249, The Plains, VA 20198, 540-253-5780, www.abcbirds.org/aims.

Top Ten Pesticides in the AIMS Database

Pesticide	Class	# of Incidents	Use	Regulatory Status
Carbofuran	Carbamate	990	Insecticide	In use
Diazinon	Organophosphate	602	Insecticide	In use
Famphur	Organophosphate	221	Insecticide	No registered uses
Chlordane	Organochlorine	204	Insecticide	No registered uses
Fenthion	Organophosphate	170	Insecticide, bird poison	No registered uses
Brodifacoum	Coumarin	168	Rodenticide	In use
4-aminopyridine	Pyridine compound	155	Bird poison	In use
Strychnine	Botanical	143	Rodenticide	In use
Dieldrin	Organochlorine	126	Insecticide	No registered uses
Parathion	Organophosphate	119	Insecticide	In use

Conclusions

A compilation and interpretation of the scientific literature investigating sublethal effects of exposure to cholinesterase-inhibiting pesticides in humans and wildlife revealed a body of knowledge relatively advanced in some areas, and undeveloped in others. An extensive literature has developed on the neurotoxicity, carcinogenicity and reproductive effects of pesticides on human health. Other physiological endpoints have been much less studied. Neurophysiological, behavioral and metabolic pathways, especially as they impact foraging, reproduction, and survival, have received the greatest attention from wildlife scientists. The wildlife literature is dominated by studies of birds, but increasing attention is being focused on amphibians and reptiles. Information on wild mammals is surprisingly sparse. The areas of greatest overlap in the human health and wildlife effects literature are neurotoxicity and effects to reproduction.

Several reported neurotoxicological symptoms are similar between humans and wildlife such as fatigue and lethargy, gastrointestinal distress, dizziness and loss of equilibrium, and possibly anxiety and hyperactivity. Behavioral effects on mood and memory tend to be present in both humans and wildlife exposed to anti-cholinesterase compounds, while potential similarities in effects on learning are not as evident.

Exposure to cholinesterase-inhibiting pesticides is associated with adverse effects to reproductive performance in both humans and wildlife. Alterations to reproductive hormones, sperm quality, reproductive organs, and reduced production of offspring and offspring viability have been widely reported in the human and wildlife literature. In addition, genotoxicological studies show evidence of chromosomal aberrations in both humans and wildlife.

Finally, our synthesis and analysis reveal two significant areas of impact that are somewhat distinctive in the human and wildlife literature. A research focus on the carcinogenicity of pesticides in long-lived humans has provided evidence that exposure to cholinesterase-inhibiting compounds may be linked to certain lymphatic and blood cancers. Studies of wild mammal and bird populations have shown significant effects to the highest levels of biological organization (i.e. population, community, ecosystem) as a result of the toxicological effects of pesticides on animals and their habitat components.

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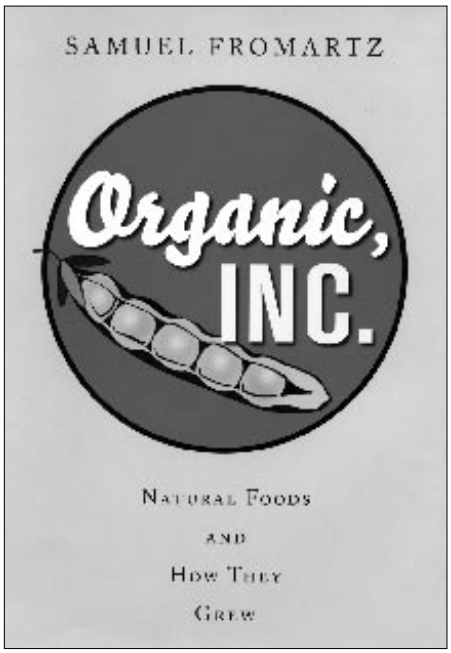
Editor's note: *This research article is an excerpt of the summary section of a lengthier literature review. The complete article can be obtained from the Manomet Center for Conservation Sciences, P.O. Box 1770, Manomet, MA 02345, 508-224-6521, parsonsk@manomet.org. The Center conducts original research on natural systems and wildlife. See www.beyondpesticides.org/documents/wildlife.pdf for bibliography.*

Organic, Inc.

Natural Foods and How They Grew



Samuel Fromartz, Harcourt, Inc., 2006. 294pp. Hardcover. $25.00.

The new book *Organic, Inc.* is a feast of information, delving into the history, perspective, tension, promise, diversity and fragility of the organic food movement in the U.S. The author, Samuel Fromartz, a business reporter, makes the book interesting by weaving into the text his personal experiences and perspectives ("I am pursuing an agenda of virtuous consumption. . ."). While not taking sides in what increasingly is becoming a raging debate on the pluses and minuses of organic's exponential growth, Mr. Fromartz gives voice and history to the positions on both sides—those with a vision of an organic *movement* tied to ideals of small scale local food production systems ("foodsheds"), contrasted with those promoting an organic *industry* focused on sales and driving down price in conventional markets. (See "Mass Natural: With Wal-Mart going organic, where will organic go?" *New York Times Magazine*, June 4, 2006.)

The founding generation of organic practitioners could generally be described as small farmers committed to local food production and alternative distribution networks that today includes direct marketing (farmers' markets), cooperatives, and consumer supported agriculture (CSA) subscriptions. Certified organic farms have grown in number, from 3,000 in 1993 to 9,000 in 2004, but many put the number as high as 20,000 when including organic operations that do not bother with certification. While this is barely a fraction of the two million farms in the U.S., it is a sector that is growing while other independent farmers are disappearing. As the author points out, small farm advocate and essayist Wendell Berry, 30 years ago in *The Unsettling of America: Culture and Agriculture*, warned of the dangers of industrial farms that pushed small farmers from the scene and advanced a culture of environmental exploitation.

The advocates for "Big Organic" believe that only through large growth can we truly impact agriculture with practices that are more sustainable and bring in large numbers of consumers. Earthbound Farm, the processors of organic bagged salad, sells 22 million servings every week. The company markets produce grown on 26,000 acres, mostly in California and Arizona, but also in Mexico, Canada, Chile, and New Zealand, according to the author. Earthbound told Mr. Fromartz that it has eliminated seven million pounds of synthetic fertilizer and 225,759 pounds of chemical pesticides from use annually. Here's the rub. The well-known West Coast organic farm consultant, "Amigo" Bob Cantisano says of Earthbound, "They're good stewards of the land and the environment. . .But they've also put a lot of organic farmers I know out of business with their marketing practices." By the way, Mr. Fromartz points out how mainstream marketing attracted him: "I slipped into the movement . . . through the attractive entry point of Whole Foods."

The author cites all the reasons people are drawn to organic: "health and nutritional concerns, a family or personal history of illness, fear of pesticides [better said: knowledge of pesticide hazards], environmental ideals, adherence to principles of agrarianism or biodynamics, spiritual or religious beliefs, a desire for high-quality fresh food, left- or right-wing politics, a commitment to sustainable farming, economic necessity or economic opportunism."

The organic law was intended to hold this growth accountable to standards, to keep the mainstreaming of organic in touch with the values that nurtured its birth. This is the challenge, whether talking about agroecological farming versus "input substitution" systems, or the allowance of approved synthetic ingredients in processed food labeled organic, which is supported by the Organic Trade Association. As the author notes, those environmental, consumer, and farm organizations that supported the all-natural, or no synthetic, ingredient requirement of the original national organic law, did so to "protect the industry by reinforcing its unique identity, creating a more solid foundation for future growth."

Clearly, people approach organic on different levels. For some, it is simply a product choice in the supermarket aisle. For others, it is an opportunity to transform a way of life. As consumers express their desires, organic will evolve to incorporate more values that consumers want to support, such as small farms, cooperatives, labor practices, and humane treatment of animals –even no synthetic substances.

The author sees organic moving ahead without addressing "a wholesale solution to all the ills of conventional agriculture." The rich mix of history, experience, diversity and vision, described in *Organic, Inc.*, brought organic to where it is today, despite the conventional wisdom that it could never be done. With this foundation, the opportunity exists now to create a collective vision and future that brings value-laden food into our homes, restaurants and schools, where mass culture is transformed by the food purchasing decisions that demand attention to growing, processing, marketing, and labor practices.

– Jay Feldman

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