

# Pesticides and You

News from Beyond Pesticides / National Coalition Against the Misuse of Pesticides (NCAMP)



## Wreaking Havoc With Life

Atrazine in rain and river water makes frogs hermaphroditic, causes cancer

- 
- Getting the Drift on Chemical Trespass: Pesticide drift hits homes, schools and other sensitive sites throughout communities • State Lawn Pesticide Notification Laws •
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# Shame on Our Government Leadership

## Human rights abuses abound

Respect for human life must be the foundation on which toxics policy is based. It is a tenet that should pervade government and corporate policy. This issue seems particularly poignant right now as public attention is focused on the war in Iraq, the loss of life on both sides, and questions of human rights abuses.

### Shameful acts, fundamental flaws in government policy

It is hard to pick up a newspaper or turn on the TV and not feel a sense of overwhelming shame regarding U.S. policies and operations that are so callously abusive of human rights and disrespectful of human life. Starting with the overall effect of our government policy in the Iraq war, the public is not given full information on the impact of the war on human life. General Tommy Franks, U.S. Central Command, has said, "We don't do body counts." PBS aired a piece on April 26 on civilian casualties, interviewing a researcher from [iraqbodycount.org](http://iraqbodycount.org) which puts the number at over 10,000 at this writing. **Full honest information is a basic tenet.**

We've all seen the pictures and read about U.S. treatment of prisoners at Abu Ghurayb prison in Iraq, actions that the United Nations is considering classifying as war crimes. Now, we learn about the treatment of Portland, Oregon-area attorney Brandon Mayfield, who was jailed for two weeks, with false evidence, sloppy lab work, and overzealous FBI agents who, contrary to the analysis of their Spanish counterparts, linked his fingerprints on a plastic bag to the March 11 Madrid bombing. *The New York Times* reported on June 5 that FBI officials told a congressional briefing that they were working off the equivalent of a "second generation" digital print, never asking to see the original prints or a higher quality image until well after the arrest. After abuse and disruption to his life and work, Mr. Mayfield received a formal apology from the FBI, according to the Times. **Good science is a basic tenet necessary to prevent abuse.**

Then, the recently released Enron tapes again remind us of how the insensitivity to human life invaded the corporate culture of that company. Employees bragged about stealing \$2 million a day from California during the 2000–01 energy crisis by manipulating California's energy market. **Respect for others' lives is a basic tenet.**

### Frogs and the future

Professor Tyrone Hayes at the 22nd National Pesticide Forum at the University of California at Berkeley in April (*see page 10 in this issue*) talked about his research methodology and findings in which the herbicide atrazine, found in rain and river water, makes frogs hermaphroditic and causes cancer. At levels as low as 0.1 parts per billion, exposed frogs became demasculinized (lose of androgen) and feminized (creating of the female hor-

mone estrogen, or estrodial. The manufacturer responded by characterizing the findings as normal background levels, then stopped funding Dr. Hayes' research. While these new findings confirm earlier ones, atrazine's 75–100 million pounds of usage annually continues to make it the number one pesticide used in the U.S. by volume... as EPA deliberates. As Dr. Hayes says, "We are finding much of the same types of effects in amphibians that you would find in humans – retarded growth, retarded development and gonadal and immune system problems." **Where is the interest in full information?**

A recent study, reported in this issue of PAY, finds that synthetic pyrethroids, used increasingly nationwide, have accumulated in many creek sediments to levels that are toxic to freshwater bottom dwellers. **Why do we not have full information before chemicals are so widely dispersed in the environment?**

### Stopping involuntary exposure

In this context of limited information and poor science supporting widespread use of toxic chemicals, the issue of involuntary exposure to these toxic materials is taking on renewed and increased public attention. *Do we have a right to protect ourselves from pesticides invading our lives, our property, our bodies?* This issue of PAY includes an article, *Getting the Drift on Chemical Trespass*, which discusses the issue, identifies methods for detecting pesticide drift, or trespass, and strategies for seeking redress. This exposure increasingly is being defined as secondhand exposure because of the similarity to secondhand cigarette smoke. And, as pointed out in the article, it is both an issue of exposure in the outdoor and indoor environment.

If toxics policy is to respect human life, then it needs to start adopting meaningful restrictions that stop drift, or stop the use of the chemicals that drift. And, if the federal government does not want to address this basic need, then states and localities must exert authority to protect public health. If states do not want to act, then localities must re-exert their right to protect the health and welfare of their residents.

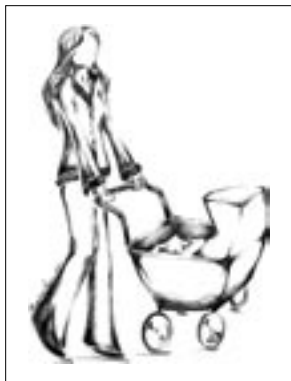
Dr. Hayes reached a conclusion in his work that we all need to embrace. He told us at the Forum, "I used to think that there was a connection between environmental health and public health. I no longer think that. They are one and the same."

My sense of shame in our government's failure to protect human rights in war and toxics policy renews my spirit to work for fundamental change.

—Jay Feldman is executive director of Beyond Pesticides.



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## Chemical Fertilizers: A Foe of Healthy Soil

Dear Beyond Pesticides,  
I am trying to find information regarding the hazards of chemical fertilizer. I realize you primarily deal with pesticides but was hoping you could help me with this issue.  
Gordon Wadle  
Thomson, IL

Dear Mr. Wadle,  
Issues surrounding fertilizer are actually very much linked to pesticides. Some fertilizers on the market actually contain both fertilizer and pesticides, such as All Season Triamine Weed and Feed™ manufactured by Howard Johnson's Enterprises, Inc, which contains the hazardous herbicide 2,4-D in addition to fertilizer. Even chemical fertilizers that don't contain pesticides can damage soil and lawn health, thereby creating an attractive environment for pests. Heavy use of artificial fertilizer damages or kills the naturally occurring, living organisms that inhabit soil. In addition, the ability of artificial fertilizer to deteriorate soil quality helps lead to compaction, reduced water retention and poor soil aeration. Furthermore, chemical fertilizer contributes substantially to environmental pollution, contaminating surface and groundwater.

So what exactly is it about chemical fertilizers that cause such problems to the lawn and the environment? Most artificial fertilizers contain nitrates, which have been found to contaminate ground and surface water. Consumption of nitrates has been linked with birth defects, including childhood brain tumors, learning disabilities, heart disease, immune system damage and several different types of cancer. Phosphate, another major fertilizer ingredient, is a major source of lake and stream pollution across the country. According to the Maine Department of Environmental Protection, "Increased phosphorus in lakes often results in algal blooms turning lakes green, leaving unsightly scum, foul odors and

bad tasting water. In some lakes, repeated algal blooms can result in fish kills or loss of the cold water fishery."

The danger of chemical fertilizer is further increased when the product contains sewage sludge, which is considered the "cleansed" product of sewage treatment. Sewage sludge contains a toxic blend of heavy metals, synthetic organic compounds, pathogens, and radioactive contaminants that come from industrial plants, hospital waste, agricultural run-off, and other known and unknown sources. Farmers and homeowners who purchase and use fertilizers containing this toxic soup are unknowingly turning their lawns and fields into toxic dumping sites. A 2001 report from U.S. Public Interest Research Group (US PIRG) examined 29 fertilizer products purchased in 12 states, and found a total of 22 toxic metals including arsenic and lead.

In the more than ten years since sewage sludge has been recycled as fertilizer, 350 health complaints related to the practice have been collected by The Cornell Waste Management Institute. Health effects include respiratory complications, abscesses, reproductive complications, cysts, asthma, weight loss, fatigue, eye irritations, gastrointestinal illnesses, headaches, lesions, nausea, nosebleeds, rashes and immunodeficiency problems.

The good news is that plenty of alternatives are out there, for use both on residential lawns and in agriculture. Organic fertilizer options include compost, dehydrated cow manure, dried poultry manure, cottonseed meal, blood meal, bone meal and fish emulsion. Additionally, you can leave grass clippings on your lawn to decompose, which will contribute to soil nitrogen content without causing thatch. As an added bonus, the clippings reduce water evaporation from the lawn and keep the soil temperature cooler. Corn gluten, a non-toxic pre-emergent herbicide, also acts as a natural fertilizer. In an agricultural setting, green manures are a healthy alternative to chemical fertilizer. A green manure is a crop that is planted because it improves the quality of soil as it grows. Most green manures are legumes such as alfalfa,

clover, peas and beans, which support nitrogen-fixing bacteria, thus actually adding to the nitrogen content of the soil. Crop rotations rely on a similar principle, as each type of plant has different requirements, and thus alters the soil in which it is planted.

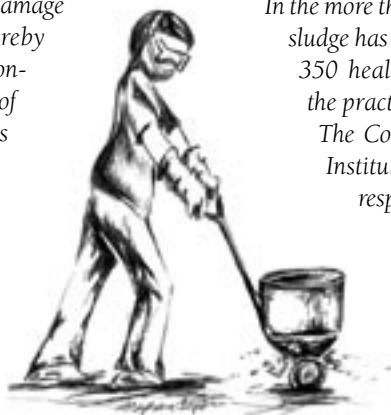
## Wood-Eating Ants

Dear Beyond Pesticides,  
We have a problem with carpenter ants, and I would like to know how to treat this problem safely. Several years ago we were poisoned when Terminix used exterior grade Dursban (containing the active ingredient chlorpyrifos) in our home. Now we are extremely chemically sensitive and have reactive airway disease and endocrine system disturbances. How can we manage the carpenter ants without harming our health?

Linda Hammond  
Ellicott City, MD

Dear Ms. Hammond,  
Seeking alternatives to hazardous chemicals is extremely important for people who deal with chemical sensitivities. It is equally important for those who are not sensitive to seek out the same alternatives. As you have experienced firsthand, commonly used chemicals utilized by companies and sold in stores for do-it-yourself treatment to control common pests can have drastic health effects.

There are non-toxic and least-toxic techniques to manage these wood-consuming ants. If you spy ants in your home, figure out if they are carpenter ants, which can range from ¼ – ½ inch long and can be red, red and black, or all brown. They have two distinguishing characteristics: they have only one node between their thorax and abdomen, and their thorax is evenly rounded in profile, with no spines. The damaged wood in carpenter ant nests has smooth, clean galleries that feel as if they have been polished with fine grit sandpaper. There will be no frass, sawdust, mud, mastic or any other debris in the nest itself. The galleries normally follow the grain of the wood and are excavated in the softer portions, with connecting passages through the harder wood. Carpenter ants often have multiple nest sites, usually located in water-damaged or softened, decaying wood where



there have been plumbing leaks, where wood has been repeatedly soaked by rain or condensation or where wood meets soil. They often begin their nests in decayed wood and then move to dry, sound wood. They can also nest in insulation, small voids or hollow doors. To manage the ants, first watch them to find the location of their nest. Use jelly or honey as bait to find entrances in walls. Ascertain the extent of the infestation by using a flashlight to inspect the entire structure. Look for signs of wood boring activity such as sawdust, cracks, holes and mildew, and determine how fresh the sawdust and frass is. If you see live ants, you most likely have an active infestation. You can hire a pest control company to inspect, but make sure you are not obligated to enter a treatment contract along with the inspection. Check out *Beyond Pesticides' Safety Source for Pest Management* to find a company that offers inspection along with non-toxic and least-toxic alternatives in your area!

If it is determined that you have an active nest, you do not have to use toxic chemicals to get rid of it. Since carpenter ants can only survive in a narrow temperature range, manipulation of the temperature provides a non-toxic control. Various pest control companies may offer to tent and heat the house, or provide an alternative freezing method. Boric acid provides a least-toxic alternative for control. Both Timbor and BoraCare offer control, but must be handled with care, as boric acid is a poison. BoraCare can only be used by a pest control applicator. Insecticidal dusts such as silica aerogel and diatomaceous earth are another least-toxic option. Beware that some varieties of the products that contain these dusts also include pyrethrins. When applying insecticidal dusts, wear goggles, gloves and breathing protection. Do not apply insecticidal dusts where they may accumulate in water runoff, as these chemicals are toxic to fish. Both silica aerogel and diatomaceous earth are inorganic and will remain effective for a long time. Keep any areas treated with these chemicals marked for future reference.

If you are lucky enough to not have an active infestation, take steps to prevent one from occurring. Reduce moisture within your

home by repairing all roof and window leaks. Adequately ventilate damp areas such as basements and crawl spaces. Properly grade soil around the home to drain water away from the structure. Prune tree and bush branches so they are not against the house walls. If you are doing repairs or creating new structures, use a naturally resistant wood such as cedar, cyprus or jarrah.

## Weeds in Public Places

Dear Beyond Pesticides, I'm currently working with my city to draft an Integrated Pest Management (IPM) strategy. Would you provide me with some options for least-toxic products that could replace RoundUp (active ingredient glyphosate)? This is specifically for application at fence lines and along alleyways and in gravel areas.

Lya Badgley  
Snohomish, WA

Dear Ms. Badgley,  
Thank you for your work to reduce toxic pesticide use and develop an IPM program for your community. Toxic herbi-

cides, including glyphosate, that are applied to public areas and the rights-of-way (ROW) areas that you mentioned impinge on the quality of our health and environment. Of course, the best solutions are non-toxic strategies, which include mechanical, biological and cultural methods.

Your city's strategy should incorporate pest identification, population monitoring, determination of injury and action levels, and selection of the most appropriate control tactics. The long-term goal for these areas is to create an ecologically stable plant community that persists in a state that does not reach injury levels. Intervention should be as non-intrusive as possible, as pest management can worsen if competitors and natural enemies of pest vegetation are inadvertently killed by herbicide applications. To that end, planting native vegetation is extremely important for a low-maintenance program. The native plants will additionally provide increased erosion control, aesthetics, wildlife habitat and biodiversity.



Corn gluten provides an excellent, non-toxic pre-emergent weed management. However, once the weeds emerge, cutting, girdling, mowing and grazing animals are all successful mechanical means of eradicating unwanted vegetation. Introduction of natural insect enemies, and steam treatments such as the Waipuna system have also been effective non-toxic techniques.

Least-toxic herbicide products, which serve as alternatives to RoundUp, should be used only as a last resort. Borax has been effective in killing vegetation on ROWs. Other options include products containing vinegar, or herbicidal fatty acid soaps. Carefully read the label of the fatty-acid soap pesticide product to identify the active ingredient and make sure that it does not also contain toxic pesticides or synergists. One available resource for least-toxic herbicides is Victor Safer Brand ([www.victorpest.com](http://www.victorpest.com)).

For more information on how to take action in your community to decrease herbicide use, see [www.beyondpesticides.org](http://www.beyondpesticides.org), click on "Issues" and follow the link for "Lawns and Landscapes," or call Beyond Pesticides at 202-543-5450.

## Chemical Injury Help

Dear Beyond Pesticides, I am always interested in the information in your excellent publication *Pesticides and You*. What happened to the family of Brenda Jones [see *Pesticides and You*, volume 24, number 1] is a common chronic illness in my patients: pesticides cause more chronic illness than any other category of chemicals in the chronically ill, chemically injured patients.

However, there actually is treatment for patients who have developed reactive airway disease. The first most important treatment is environmental controls. The book *Less Toxic Alternatives*, written by a highly experienced health educator, can help the patient substitute less toxic products for use in the home. In addition, the Americans with Disabilities Act and related legislation can be used to request reasonable non-toxic controls in the workplace and apartments and condominiums (the latter through building management/owners). For more information on this, I recommend *The Chemical*

Injury Information Network: PO Box 301, White Sulphur Springs, MT 59645, phone (406) 547-2255, fax (410) 547-2455.

In addition, there is now significant medical advancement in the treatment of reactive airway disease. Glutathione is the most important antioxidant and detoxifying agent of the body: we are all born with it. It does not absorb well when taken by mouth, because stomach acid digests it. However, when used by nebulizer, it provides gradual but very significant reduction in airway inflammation. Furthermore, the biochemistry of this heightened sensitivity is now much better understood. Please see my article on neural sensitization ([www.beyondpesticides.org/how-to/neuralsensitization.pdf](http://www.beyondpesticides.org/how-to/neuralsensitization.pdf)), which is the biochemical vicious cycle that perpetuates heightened sensitivity. [Contact Beyond Pesticides for a copy of the article Dr. Ziem attached, "Neural Sensitization"]. Based upon this biochemistry, I have been working intensely with an excellent biochemist to develop a natural protocol that will help to dramatically reduce the sensitization level. This is referred to as the neural sensitization protocol. It includes hydroxycobalamine, the particular form of B12 that acts as a scavenger for nitric oxide: nitric oxide initiates this vicious cycle. The protocol also contains bioflavinoids, other natural substances that scavenge peroxynitrite. Peroxynitrite is the severely damaging free radical from nitric oxide. The protocol also contains substances to help prevent the conversion of peroxynitrite into even more nitric acid, as well as a well-balanced mix of general antioxidants.

My patients who have used this approach have experienced great improvement over time in the reduction of sensitivity/reactive airway disease. This can also be used for individuals who develop migraines and other chemical symptoms that are exacerbated by chemical exposure. At present, there are three pharmacies that are familiar with this protocol and how to compound it. Key Pharmacy (800-878-1322) probably has the most up-to-date information, but the protocol can also be obtained through Abrams

Royal Pharmacy (800-458-0804) or the Apothecary (301-530-0800).

It is not known at this time whether ongoing use of the protocol will result in a "cure," but dramatic reduction in intensity and severity of chemical exposure definitely occurs in my patients who use this approach. The protocol is never a substitute for exposure controls. The protocol must be prescribed by a physician. I would be very happy to discuss the protocol with the physician of any of your readers, because I feel that it is a major breakthrough. I would like more physicians to be aware that this is a treatable condition, that significant healing can be achieved rather than mere symptom masking by drugs.

In no way should this reduce our endeavors to stop chemical injury from exposure to pesticides and other chemicals. This reduced exposure is not only an essential part of treatment for affected individuals, but also prevents damage to other organs that may not necessarily be related to the mechanism of neural sensitization.

I have a formerly brilliant, athletically vigorous patient poisoned by indirect office exposure to pyrethrins, causing severe brain damage and reactive airway disease. Pyrethroids, organophosphates and many other pesticides are even worse. Reducing pesticides is essential to protect the healthy population.

Reduced pesticide exposure reduced the risk of Parkinson's and other neurodegenerative disease, leukemia, lymphoma, brain cancer, autoimmune disease, sinus inflammation, earaches in children, migraines, asthma, breast cancer (because pesticide cause estrogen dominance) and other inflammatory disease. It is now known that all degenerative disease is a result of chronic inflammation, including but not limited to cardiovascular disease, Alzheimer's, osteoporosis, etc. Even adult onset diabetes is now known to be an autoimmune disease. Common autoimmune diseases in my pesticide injured patients include autoimmune thyroid disease, Lupus, scleroderma, Raynauds, Sjogerns, etc. Pesticides are POISONS and they are poisoning all people.

Thank you again for your long-standing excellent work to protect people from poisons.

Sincerely,  
Grace Ziem, M.D., Dr. P.H.  
Occupational and  
Environmental Health  
Emmitsburg, MD

## Neural Sensitization

Neural sensitization occurs by activation of brain and nerve cell N-methyl-D-aspartate (NMDA), which then increases brain nitric oxide. Several vicious biochemical cycles are then set into motion. Nitric oxide forms a tissue damaging free radical known as peroxynitrite. Peroxynitrite depletes energy ATP, which then further increases the sensitization of NMDA...

Intervention to help reduce this vicious biochemical cycle includes: methyl or hydroxycobalamine sublingually or I.M. (not oral due to poor absorption), general antioxidants (C, E, selenium), glutathione by nebulizer due to poor oral absorption, and ample alpha lipoic acid to reactivate the glutathione in the many damaged lipid tissues (cell membranes, mitochondria, lymph, brain, etc.)...

Humans are social beings and these measures above gradually increase the person's ability to enjoy the company of others and use public places. When society is adequately informed and takes public health reasonable accommodation measures to reduce irritants and toxins in personal products and public places, this further promotes health and reduces sensitization.

—"Neural Sensitization," Grace Ziem, M.D., Dr. P.H. [www.beyondpesticides.org/how-to/neuralsensitization.pdf](http://www.beyondpesticides.org/how-to/neuralsensitization.pdf)



## EPA Allows Increased Infant Exposure to Controversial Toxic Chemical

In a reversal of policy that has shocked and angered environmentalists and public health advocates, the Environmental Protection Agency (EPA) has for the first time since the passage of the 1996 *Food Quality Protection Act* (FQPA) allowed children's risk from pesticide exposure to exceed that of adults. While approving Dow AgroScience's sulfuryl fluoride use for its first food use, EPA identified fluoride as its major toxicological endpoint of concern for exposure. In its risk assessment, which served as the basis for approval, EPA made an unprecedented decision to allow an acceptable dosage for infants that is five times higher than acceptable dosage for adults. On March 22, 2004, the Fluoride Action Network (FAN) and Beyond Pesticides formally challenged EPA's approval of the fumigant based on its elevated risks to children. Sulfuryl fluoride is Dow's alternative to methyl bromide, the ozone-destroying food fumigant that has a phase-out deadline of January 1, 2005, for developed countries under Section 604e of the *Clean Air Act* and the Montreal Pro-



ocol. Environmentalists support the elimination of methyl bromide, given the availability of effective less toxic alternatives. According to Paul Connett, PhD, executive director of FAN and professor of chemistry at St. Lawrence University in Canton NY, "EPA's data showed that some children were already receiving more fluoride than EPA's existing safety standard allowed. Such a situation should have been grounds for rejecting Dow's request to add an additional source of exposure to the diet." However, instead of denying Dow's request, EPA has opted to increase the tolerable dose for children. Environmentalists believe that by loosening the safety standard for children, EPA is in violation of FQPA.

## Bush Ignores Environmental Hazards to Minority and Low-income Communities

It's not just the environmentalists giving the Bush Administration a failing grade for its protection of human health. The EPA's Inspector General (IG) recently reported that EPA has failed to provide adequate protection to minorities and low-income families who are disproportionately affected by pollution. According to environmental watchdog group Bush Greenwatch, the report, EPA Needs to Consistently Implement the Intent of the Executive Order on Environmental Justice (Report No. 2004-P-000070), concludes that the Executive Order signed by President Clinton in 1994 (Executive Order 12898) has not been fully implemented nor has EPA "consistently integrated environmental justice into its day-to-day

operations." The report states, "EPA has not identified minority and low-income, nor identified populations addressed in the Executive Order, and has neither defined nor developed criteria for determining disproportionately impacted." The administration defended its action by stating that it would provide environmental justice to everyone. EPA's response states, "The Agency does not accept the Inspector General's central and baseline assumption that environmental justice only applies to minority and/or low-income individuals. The EPA firmly believes that environmental justice belongs to all people..." The IG dismissed EPA's defense as misleading. The report points out that providing justice to everyone was already the EPA's mission prior to the 1994 order. Minority and low-income families often suffer greater exposure to environmental hazards than other populations because industrial plants tend to be situated in or near low-income neighborhoods, and people of color, including farmworkers, are disproportionately in high risk jobs with exposure to toxic chemicals.

## U.S. Implementation of POPs Treaty Jeopardized

As reported in the Spring 2004 issue of *Pesticides and You*, 50 countries have signed the Stockholm Convention on Persistent Organic Pollutants (POPs), a global treaty that bans or severely restricts twelve POPs, including highly toxic dioxins, PCBs, and certain pesticides, into international law. Now environmental and public health organizations are calling on the U.S. government to ratify and fully implement the treaty. Although President Bush promised in 2001 to support the treaty, his administration has sought to undermine it by proposing legislation that will make it harder, rather than easier, for EPA to control chemicals with POPs characteristics after they are added to the treaty. In order to ratify and fully implement the treaty, Congress must first amend U.S. chemicals and pesticides laws, including the *Toxic Substances Control*

Act (TSCA) and the *Federal Insecticide, Fungicide, and Rodenticide Act* (FIFRA), to give EPA the authority to ban or restrict domestic production, use and export of POPs. Beyond Pesticides and other public interest organizations agree that Congress must reject legislation proposed by the Bush administration and the chemical industry, which would change TSCA and FIFRA by creating new procedural and substantive hurdles for EPA before it can regulate POPs that are banned under the Stockholm Convention. Instead, the groups say Congress should adopt a proactive, protective approach under which chemicals that may have POPs characteristics are monitored and regulated before they become widespread threats to human health, the environment, and marine and terrestrial wildlife. To that end, environment and public health groups sent a letter to EPA on March 8, 2004, recommending that POPs implementing legislation adhere to the following principles: Stockholm Convention decisions supported by the United States should provide the default option for domestic regulation of POPs; the U.S. regulatory process should parallel the international decision-making process; and, EPA should be given broad authority to regulate all persistent, bioaccumulative toxics (PBTs).

## Bush Wins Exemptions To Methyl Bromide Phase-Out

In yet another move to undermine the international environmental law, the Bush administration won exemptions to the treaty protecting the Earth's ozone layer. On March 26, at a special United Nations meeting in Montreal, 114 countries agreed to grant the U.S. and ten other developed countries permission to continue damaging the ozone layer by using the pesticide methyl bromide for "critical uses" despite the availability of less harmful alternatives. Even though the Montreal Protocol allows exemptions of no more than 30 percent, the Bush Administration won exemptions totaling 35% of its 1991 baseline level, or

8,942 metric tons, allowing the country to be in violation of the international treaty. Exemptions of 2,133 metric tons were also made for Italy; Spain, 1,059; and France, 407. Australia, Belgium, Canada, Greece, Japan, Portugal, and the U.K. were each granted exemptions of less than 300 metric tons, according to *Chemical & Engineering News*. Klaus Töpfer, executive director of the UN Environment Program (UNEP), was quoted by *Chemical & Engineering News* as saying, "The high demand for exemptions to the methyl bromide phase-out shows that governments and the private sector will have to work much harder to speed up the development of ozone-friendly replacements." Neither *Chemical & Engineering News* nor the UNEP director made mention of the fact that alternative practices and products have been found effective for nine out of ten methyl bromide uses worldwide. Nor did they mention that many European nations have already successfully banned the pesticide. Methyl Bromide damages and depletes the planet's stratospheric ozone layer and is 50 times more potent than the now-banned chlorofluorocarbons (CFCs). The toxic pesticide is used on grapes, strawberries, tomatoes, grain storage, and in structural pest control, primarily in California and Florida. It has been found to cause birth defects and brain damage in laboratory animals.

## Bush Administration Fails at Protecting Children from Environmental Threats

The Bush Administration received an "F" from environmental health experts for its failure to protect children from environmental threats, according to the Children's Environmental Health Network's Report Card, released on April 5, 2004. "This

report illustrates how this administration's track record is toxic to our children. In choice after choice, they have lessened protections for children and missed opportunities to keep toxicants out of our children's environment," said Dr. Lynn R. Goldman, Chair of the Children's Environmental Health Network (CEHN) and professor at Johns Hopkins University Bloomberg School of Public Health. "Children are losing out to other priorities of this Administration." The Report Card ratings reflect a careful review of approximately 80 "decision points," such as the administration's proposals and decisions to: not support legislation to protect children from the use of hazardous pesticides in school (*School Environment Protection Act*); allow the continued use of a toxic pesticide found at high levels in water systems; take mercury, a potent neurotoxicant, off of the list of hazardous air pollutants; leave the Office of Children's Health Protection leaderless for over two years; cut funding for the National Children's Study; weaken the New Source



Review air quality decisions; and, lessen protections under the *Clean Water Act*. The Report Card on children's environmental health was not able to give a grade higher than a C in any of the 16 different areas it investigated, such as pesticides, air quality, and mercury. CEHN executive director Daniel Swartz noted that the administration is to be commended for some positive steps, such as the EPA proposal to limit pollution from off-road diesel engines, proposed improvements to the cancer risk assessment process. "However, most of the "positives" we identified were either counter-balanced by a negative step of greater magnitude, or were a result of the Administration reversing itself on a bad decision after a public outcry," Mr. Swartz said, citing as examples the standards for arsenic in drinking water and the effort to abandon federal oversight in screening low-income children for lead poisoning.





## Family Physicians Issue Warning to Avoid Pesticides

The Ontario College of Family Physicians (OCFP) in Mississauga, Ontario, Canada is urging families to avoid exposure to pesticides whenever possible. The report, "Systematic Review of Pesticides Human Health Effects," is a comprehensive review of research on the effects of pesticides on human health, which shows consistent links between pesticides and serious illnesses. Because many of the health problems linked to pesticide use are serious and difficult to treat, the authors of the report are advocating a reduction in exposure to pesticides and prevention of harm as the best approach. "Many of the health problems linked with pesticide use are serious and difficult to treat," said Dr. Margaret Sanborn of McMaster University, one of the review's authors. "So we are advocating reducing exposure to pesticides and prevention of harm as the best approach." The authors' findings include positive associations between solid tumors and pesticide exposure, including brain, prostate, kidney and pancreatic cancer, and non-Hodgkin's lymphoma. The study also shows that children are particularly vulnerable to pesticides and at increased risk to certain cancers. The study concludes with steps that the public and family doctors can take to help reduce

health problems linked to pesticide exposure. The researchers recommend first and foremost that people avoid exposure to all pesticides whenever and wherever possible, including reducing both occupational exposures, as well as lower level exposures that occur from the use of pesticides in homes, gardens and public green space. *Download a copy of the Canadian report from [www.ocfp.on.ca/English/OCFP/Communications/CurrentIssues/Pesticides/](http://www.ocfp.on.ca/English/OCFP/Communications/CurrentIssues/Pesticides/) and share it with your doctor and with the local and state medical society in your state. To determine the state medical societies in your state, visit the website directory of the American Medical Association [www.ama-assn.org/ama/pub/category/7630.html](http://www.ama-assn.org/ama/pub/category/7630.html).*

## Dog Owners: Beware of Lawn Pesticides

Be careful where you walk your dog. Scientists at Purdue University's School of Veterinary Medicine warn of a link between a specific canine cancer and 2,4-D, a common lawn care herbicide, produced by the Dow Chemical Company. As a re-

sult of the study, "Herbicide exposure and the risk of transitional cell carcinoma of the urinary bladder in Scottish Terriers," published in the April 15, 2004 issue of the *Journal of the American Veterinary Medical Association* (Vol. 224, No. 8), the authors recommend that owners decrease their dogs' exposure to lawns or gardens treated with common herbicides and suggest routine cytologic urine exams in Scottish Terriers and other high risk breeds over six years old. The study adds to earlier research conducted by the National Institutes of Health in 1991 that found elevated rates of canine lymphoma in dogs exposed to lawn pesticides. According to the National Cancer Institute, about 38,000 men and 15,000 women are diagnosed with bladder cancer each year. Only about 30 percent of human bladder cancers develop from known causes. As Scottish terriers, often called Scotties, have a history of developing bladder cancer far more frequently than other breeds, Lawrence Glick-



man, VMD, DrPH, a professor of veterinary medicine at Purdue University decided to examine the dogs' diet, lifestyle and environmental exposures for a possible link to bladder cancer. Dr. Glickman's group obtained its results by surveying the owners of 83 Scottish terriers, all of which had bladder cancer and were of approximately the same age. "We found that the occurrence of bladder cancer was between four and seven times higher in the group exposed to herbicides," Dr. Glickman said. "The level of risk corresponded directly with exposure to these chemicals: The greater the exposure, the higher the risk." Environmentalists point

out that because EPA does not require neighbor notification of lawn care pesticide use, it is difficult for dog owners and others to take precautionary action by vacating the area and staying off treated lawns and landscapes.

## Mendocino, CA Becomes First County Free of GE Agriculture

The people of Mendocino county have spoken loud and clear, "Keep genetic engineering out of our backyards!" On March 2, 2004, the California county passed Measure H, an ordinance banning the growing of genetically engineered (GE) crops and animals, making it the first GE-free county in the nation. The ordinance specifically makes it "unlawful for any person, firm, or corporation to propagate, cultivate, raise, or grow genetically modified organisms in Mendocino County." Garnering 56.6% of the vote, Measure H proponents defeated the world's largest producers of genetically engineered food and seed, which pumped a record \$621,000 into a county of 47,000 voters, according to the Campaign for a GMO-Free Mendocino County. CropLife America, Monsanto, Dupont, Dow Chemical, and a consortium of other biotech multinational corporations shattered spending records in this small agricultural county, spending \$55 on each "no" vote cast. But the biotech industry was no match for thousands of Mendocino County farmers, business owners, vintners and families who joined the largest, most successful grass roots campaign the county has ever seen to fight the encroachment of genetically altered crops. "These multi-billion dollar corporations underestimated the savvy and determination of Mendocino County voters," said Els Cooperider of Ukiah, CA, a retired medical scientist and Ukiah business owner who helped spearhead the citizen-led initiative. "This is just the beginning of the revolution. We're the first county in the U.S. to prohibit the growing of genetically altered crops

and animals – but we won't be the last." Mendocino County's victory has already inspired people in nine other California counties to propose similar measures. *For more information on Measure H, contact Doug Mosel at the Campaign for a GMO Free Mendocino County, 707-485-6672.*

## Study Shows Newborns Benefit From Insecticide Phase-Outs

Science has shown what environmentalists have predicted, decreased pesticide exposure leads to healthier babies. According to a new study by researchers at Columbia University's Mailman School of Public Health, the federal phase-out of two organophosphate insecticides, chlorpyrifos and diazinon, in 2000 is beginning to benefit newborn babies by increasing their birth size. The study,

"Prenatal insecticide exposures, birth weight and length among an urban minority cohort," which will soon be published in the peer-reviewed journal *Environmental Health Perspectives*, found that women exposed during pregnancy had on average significantly smaller babies. The research involved a sample of 314 infants

of women in the New York City areas of Washington Heights, Central Harlem and the South Bronx. The researchers measured the levels of the two insecticides in blood drawn from the umbilical cords at birth, both before and after the ban, and correlated those levels with the babies' birth weight and length. Prior to January 1, 2001, newborns with combined insecticide exposures in the highest 26 percentile had birth weights averaging almost 200 grams (almost half a pound) less than infants with no detectable lev-

els. After January 1, 2001, the combined insecticide exposure levels had been reduced substantially, and impact on fetal growth was no longer apparent. "This human study confirms the developmental impact, shown previously in animal studies, of these insecticides," said Robin M. Whyatt, PhD, principal author of the study. "The fact that the ban was associated with such an immediate change in birth weight and length provides considerable evidence of cause and effect." The two insecticides had been among the most commonly used for residential pest control and were available in numerous household sprays. Both are still widely used in agriculture and continue to be found in the food supply. Environmentalists and farmworker groups believe that workers, farmers, and their families are not afforded the same protections as the general public. While consumers are beginning to see some of the benefits of the phase-out, many in the agricultural community, and their children continue to be exposed because farm use was allowed to continue.

## Montreal Will Ban Cosmetic Use Pesticides

There is more news of pesticide bans from our neighbors to the north. According to the Canadian Broadcasting Company (CBC), Canada's national public broadcaster, the City of Montreal is set to ban almost all cosmetic use of chemical pesticides, saying the new rules could be in place in some parts of the city this summer. According to city officials, the new bylaw is one of the strictest in North America. Montrealers will be allowed to use organic pesticides, and the law allows a loophole for golf courses and infestations. "This historic move shows political courage and long term vision in favor of sustainable development. It is one of the most severe bylaws in North America and will go a long way in protecting the health and well being of all Montrealers, especially our children," says Michel Gaudet, President of the Coalition for Al-



ternatives to Pesticides (CAP). "Since this is a health issue, I urge all the Boroughs of Montreal to implement the bylaw for this year, i.e., May 2004." Alan DeSousa is responsible for the environment on the city's executive committee. "We hope that people will buy into this and hope it's a good thing – we don't want to come with a heavy-handed approach," he said. People who use pesticides illegally could face fines starting at \$100, but Mr. DeSousa said he hopes people will comply voluntarily. The new rules will be in force by next spring, but some parts of the city could enact them this summer. For the past four years, CAP has devoted itself to the promotion of alternatives to pesticides, has proposed secure alternatives to safeguard health and the environment and has worked with other groups to help the public at large, mainly the municipalities to make a great ecological turn around. *CAP President Michel Gaudet recently spoke at Beyond Pesticides' 22<sup>nd</sup> National Pesticide Forum at the University of California. For a videotape of Mr. Gaudet's presentation, contact Beyond Pesticides.*

## Donald Trump "Fires" Plan for New Golf Course After Pesticide Concerns Are Raised by Community

Seven Springs Golf Course, you're fired! According to the *Associated Press*, Donald Trump has shelved plans to build the Seven Springs golf course in Westchester county, just outside of New York City, after concerns of drinking water contamination were raised by nearby residents. Local communities had expressed their feelings about the proposed golf course, which would have abutted Byram Lake, a reser-



voir for drinking water. Mr. Trump told a local TV news station that he changed the plans because people in the nearby town of Mount Kisco did not want a golf course. Residents were concerned with the original plan because they feared that the drinking water would become contaminated by fertilizers and pesticides used at the golf course. Instead, the land will be used to build 17 luxury houses. Michael

Gerrard, Mount Kisco's attorney, embraced the housing proposal, saying it was the lowest-impact project that could reasonably be expected at Seven Springs. It wouldn't require putting down nearly the amount of fertilizers and pesticides or cutting down as many trees as the golf course would, he said. "We regard this as a very positive development," Mr. Gerrard said. "We've come to the conclusion that a low-density development of this sort is much safer for Byram Lake than the golf course." According to the *Journal News*, the former plan for the golf course would have used a "linear adsorption system" – trenches around manicured parts of the course that would channel chemicals to carbon chambers to remove the pesticides. But residents questioned whether the system would work. Hundreds turned out to a state Department of Environmental Conservation hearing in 2001 and passed out little bottles of water with labels bearing a skull and crossbones and the words "Mount Kisco Water."

## Bayer Settles Fipronil Case With Crawfish Farmers for \$45 Million

A five-year legal battle between Louisiana crawfish farmers and the makers of Icon, Bayer CropScience (formerly Aventis Crop Sciences), will never make it to the courtroom. Lawyers for both sides

have agreed to a preliminary \$45 million settlement in the Icon class action suit, according to a March 30, 2004 *Gannett News* article. The farmers, who used the seed treatment Icon, which contains fipronil, on rice to kill water weevils, say they lost their crawfish crops in 2000 and 2001 because they used the product.

## Toxic Synthetic Pyrethroid Pesticides Found in Stream Sediments

A new study, "Distribution and Toxicity of Sediment-Associated Pesticides in Agriculture-Dominated Water Bodies of California's Central Valley," shows that synthetic pyrethroids, used increasingly nationwide in place of more heavily restricted organophosphate pesticides have accumulated in many creek sediments to levels that are toxic to freshwater bottom dwellers. Environmentalists point to the study as yet another example of why the shift to least toxic pest management means more than just switching poisons. The study, published in *Environmental Science and Technology* (April 2004), is the first to evaluate the effect of pyrethroids on sediment-dwelling organisms, such as midge larvae or shrimp-like amphipods, according to lead author and University of California, Berkeley, biologist Donald P. Weston. Dr. Weston notes that EPA uses the two organisms studied as indicators of the health of fresh water sediment. The research team collected sediment samples from 42 rivers, creeks, sloughs and drainage ditches in California's Central Valley and exposed amphipods and midge larvae to the sediments for 10 days. Twenty-eight percent of the sediment samples (20 of 71) killed amphipods at an elevated rate. In 68 percent of these sediments, the pyrethroids were at levels high enough to account for the deaths. Thus, while other pesticides may well have contributed to the amphipod deaths in some sediment samples, pyrethroids alone explain the toxicity in the vast majority of the sediment samples.

# Wreaking Havoc With Life

## Minute atrazine levels lead to hermaphroditic frogs, cancer

By Tyrone Hayes

I was a consultant for Novartis and Syngenta, the makers of atrazine. And I learned a lot.

For the past five years, I worked on the widely used herbicide atrazine. In agriculture, it is used on monoculture crops such as corn and sorghum and on stone fruits like cherries. It has been used for forty years, so many of us and many of the environments I talk about have been exposed for many generations. We use more than 76 million pounds annually in the U.S.<sup>1</sup> Atrazine one of the top contaminants of ground and surface waters.<sup>2</sup> In the U.S and probably in the world, it is the largest selling chemical manufactured by the largest chemical company in the world. It is used on our number one crop in the U.S., corn.

And, it is used to fight the most common botanical in the world, a weed called the common groundsel, which has evolved resistance to atrazine in many populations. It has been used in more than 80 countries. Ironically, although we just reregistered it in the U.S., the European Union (EU) banned it two months later. In fact, it has never been used in Switzerland, which is where Syngenta is based.

I am going to talk about a series of studies, most of which have been published.

Then I will get to the new work. My studies are designed to ask control questions in the laboratory about how atrazine impacts development, but also whether our laboratory data mean anything in the wild.

### Biological effects of atrazine

What atrazine does is the following. Normally, if you are a male, you should make testosterone. It is testosterone in humans that controls masculine development like deep voice, beard growth and sperm production. Atrazine turns on the enzyme



aromatase. Aromatase is responsible for converting androgen (a male hormone, such as testosterone) to estrogen.

So amphibians exposed to atrazine suffer two consequences. One, they are demasculinized or chemically castrated because they are losing the androgen. So for example, male frogs voice boxes do not develop. And secondly, they are feminized because now they are making the female hormone, estrogen or estrodial.

The consequences are the following. An African frog exposed to 0.1 parts per billion (ppb) atrazine developed two testes, two ovaries, followed by another testis and two more ovaries.<sup>3</sup> This is not a normal animal. The manufacturer argues

that there is background and we are just studying something that naturally occurs. You should not have six gonads and you should certainly not have a mixture of testes and ovaries in your body...even if you are a frog. They are pretty much like humans in that regard.

The next thing I am going to show you is a laboratory animal, a normal, healthy North American frog. I am going to show you that the same type of effect occurs in a North American frog. Under a microscope, a male frog has testicles with testicular tubules. The female has ovaries, with eggs or oocytes that have accumulated in the ovaries. These are normal animals.

A North American frog that has been exposed to 0.1 ppb atrazine exhibits two testes, so this frog is not a true hermaphrodite. But, the frog has developed eggs in its testis and the eggs are bursting through the surface of that testis.<sup>4</sup> That is not normal. So these are two laboratory studies that are very well controlled, so that we can look very specifically at the impact of atrazine.

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### Effects at minute levels

What I want to do now is give you some perspective. I keep referring to 0.1 ppb. Is this a big or a little number? If you are a visual person, 0.1 ppb or 0.1 micrograms per liter may mean nothing to you. So here is your visual. Imagine a grain of salt. Now divide the weight of that gram of salt by 1000. That is how much atrazine we are adding to these aquaria to produce

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*The following is excerpts from a talk that Tyrone Hayes, Ph.D., professor of integrative biology at the University of California (UC), Berkeley, gave to the 22nd National Pesticide Forum, Unite for Change: New Approaches to Pesticides and Environmental Health, April 2-4, 2004 at UC Berkeley.*

the kinds of effects being described. One thousandth of a grain of salt. It is almost nothing.

What I am going to show you now is whether these are what they call “ecologically relevant doses.” Atrazine formulations contain 2.9 to 29 parts per million for use on farms. So that is 290 million times what we are using in the laboratory.

## Exposure in the danger zone

The published literature shows the range of atrazine in various habitats runoff, temporary pools, permanent water and precipitation. If we look at the “danger zone,” the level of atrazine where we saw the effects in the lab (0.1 ppb) up to 10,000 ppb, all of the habitats fall within this zone. This means that there is enough atrazine in rainwater in Nebraska to make hermaphroditic frogs. There is enough atrazine in clouds. There is enough atrazine in snow in the Swiss Alps in Switzerland, where they do not even use atrazine, to make hermaphroditic frogs.

## Do effects occur in the field?

When looking at gonads from animals in the field, you can see testes with testicular tubules and nurse cells. But instead of sperm, you will notice it has oocytes (eggs). This is an animal from Wyoming.

Two years ago, the North Platt River in Wyoming was contaminated with atrazine above 0.1 ppb, and 92% of its frogs were hermaphrodites. Exposed animals had three testes filled with eggs. For whatever reason, they did not use atrazine this year and there are zero hermaphrodites. This is an unimaginable experiment. Contaminate an entire river (the contamination comes out of Colorado) and you get these effects. Remove the contamination and it goes away. The company is still arguing that it is just natural variation. If it was natural variation, the effects would be there every year.

## Can we blame atrazine?

We have taken these controlled laboratory models where we know it is atrazine. Then we go into the wild and we see these same effects where there is atrazine contamination. The problem is that the laboratory experiments are controlled and the wild data are real, but they are not controlled. So now I am going to show you something that combines the two.

In the spring, they do not just use atrazine. They use five herbicides, two fungicides and three insecticides in Nebraska. In the summer, there are two herbicides left over, atrazine and metolachlor. So the question we next ask is – is it just atrazine or do some of these other compounds in the field cause the problem and what might be the interactive effects of these pesticides.

We tested each one of these chemicals, individually or in combination. Everything is color coded and not labeled by chemical name – because now the industry wants to argue that I am on a mission and I have a bias. The codes are locked in a safe and it is not decoded until we get an answer. In addition, we looked at 3000 frogs, each individually housed and

## In EPA's Opinion, How Much Atrazine is OK?

EPA says it is “safe” to be exposed to more than 100 ppb atrazine and allows a limit of 3 ppb atrazine in your drinking water, based on theoretic cancer risks. However, the agency has never specifically tested atrazine at 3 ppb for its health effects. EPA uses large dose studies to determine cancer risks and other health problems, then extrapolates the data to determine the acceptable dosage. This is how they determined that 3 ppb is safe for you to drink. Keep in mind that the effects on amphibians are seen at 0.1 ppb. Pardon the violence in the analogy, but that is like if I shot you with a cannon, and then tried to convince you that the handgun was safe because it was smaller. That is how the decision was made about the safety of your drinking water.

In 1987, EPA declared atrazine a “Possible Human Carcinogen” based on data linking atrazine to cancer in rats. However, after review by the agency’s Scientific Advisory Panel, it was downgraded to “Not Likely to be Carcinogenic to Humans” in 2000. The panel said that it was “unlikely that the mechanism by which atrazine induces mammary tumors in female SD rats could be operational in humans.” According to Catherine Eiden, a senior scientist in EPA’s Health Effects Division, the agency is likely to raise the maximum allowable contaminant level, given the results of recent studies.

To determine whether industry played a role in shaping the EPA’s decision, the Natural Resources Defense Council (NRDC) filed a series of Freedom of Information Act requests with the White House and EPA, which failed to produce relevant documents. In November 2003, NRDC filed a lawsuit charging that the White House and EPA were withholding evidence. The following month, the White House released 22 documents, with most of their contents blacked out, including a memo from former Senator Bob Dole to a high-level White House official urging EPA not to restrict atrazine despite the environmental risks. The White House continues to withhold more than 80 other relevant documents.

numbered. This is why I loved Dr. Warren Porter’s talk (see *Pesticides and You*, Spring 2004, Vol. 24, No. 1), because we looked at the immune function, growth, development, and problems with the gonads. And we are finding much of the same types of effects in amphibians that you would find in humans – retarded growth, retarded development and gonadal and immune system problems.

When looking at the amount of time it takes frogs to complete metamorphosis in a control group (no pesticide

exposure), a summer group (exposed to two pesticides) and a spring group (exposed to ten pesticides), we see that the more chemicals they are exposed to, the longer it takes to metamorphose. So imagine metamorphosis being like birth. It is controlled by corticoids and thyroid hormone. Think about your size at metamorphosis as birth weight. The longer you are pregnant the bigger your baby should be. The opposite is happening with these animals. The longer they take to metamorphose, the smaller they are. So think of this as delayed delivery with low birth weight.

## Thyroid glands

Animals exposed to multiple chemicals develop a goiter, just like humans do. The thyroid gland is being affected. The consequence is that only atrazine causes the hermaphroditism, but when atrazine has all of its little friends along, you are exposed to atrazine longer. So the combination of chemicals is not synergistic in a way that it is causing more hermaphroditism, but they are delaying development so that the atrazine exposure is longer and increasing the effects.

## Bringing field exposure to the lab

Finally, we really wanted to bring the field home and put it in controlled conditions. So we literally did that. We collected 10,000 gallons of water from the North Platt River. This involved using the Best Western as temporary storage and going out under the cover of night in camouflage to do these experiments. We used frozen containers in an 18-wheeler to bring it

home. It might seem like little boys designed this experiment, but there is a point to it.

In 2001, we had a contaminated river. We brought back the water, frozen. In 2003, there is no contamination, and we collected that water. So here is what we can do. Using the thawed water, we ask, "Can we make those frogs look like they did two years ago if we put them in that water we saved from two years ago?" So we will really go full circle from lab to field.

People do not get it. When I talk in Nebraska, I am talking about something that comes off of your food. I also work in

Africa in Uganda. I guarantee you, if I told the residents of Nabugabo that the water runoff from crop fields, which is put in containers that is used for all of the drinking and bathing water for their community, makes frogs develop eggs in their testes, I guarantee they would see the connection.

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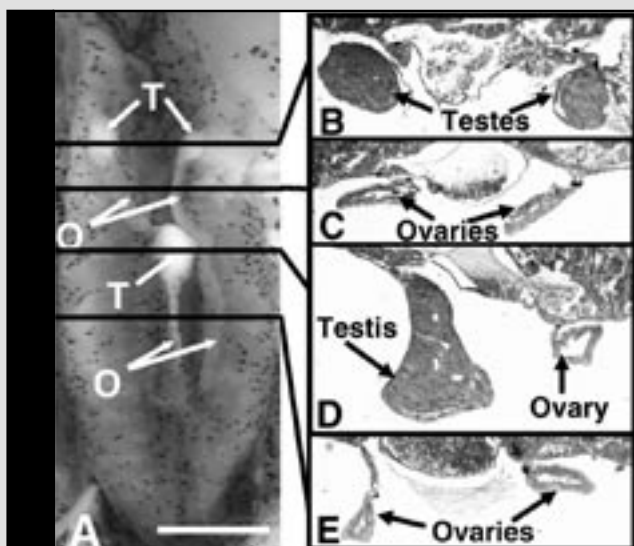
**I used to think that there was a connection between environmental health and public health. I no longer think that. They are one and the same.**

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## The breast cancer connection

I used to think that there was a connection between environmental health and public health. I no longer think that. They are one and the same. The people that we have to worry about even more than the "every day people," (the people in this room, the people that I go to school with, the people in the ivory tower) are the farmworkers who are exposed to high levels all of the time.

This is relevant to humans. People often say, 'It is just frogs, so who cares?' Well it does not matter whether you are a frog, a dog, a bat, a cat or a human. The compounds and the genes and the hormones that we are talking about are the same.



**Fig. 1.** Gonads of a control postmetamorphic male (A and C) and female (B and D) *X. laevis*. A and B show the entire dissected kidney-adrenal-gonadal complex preserved in Bouin's fixative. C and D show 8  $\mu\text{m}$  of transverse cross-sections through the animals' right gonad stained with Mallory's trichrome stain. FB, fatbody; K, kidney. Arrows (in A and B) show the anterior and posterior ends of the animals' right gonads. The yellow color in A and B is a result of fixation in Bouin's fixative. Without fixation, the gonad is transparent. The ovary is distinguished by its greater length, lobed structure, and melanin granules. Although some specimens' ovaries lack pigment (especially atrazine-treated animals), testes never have melanin in this species. Histologically, the ovary is distinguished by the ovarian vesicle (hole in the center) along its entire length and the internal ring of connective tissue (in blue). Note the melanin granules (black) in the connective tissue in D.

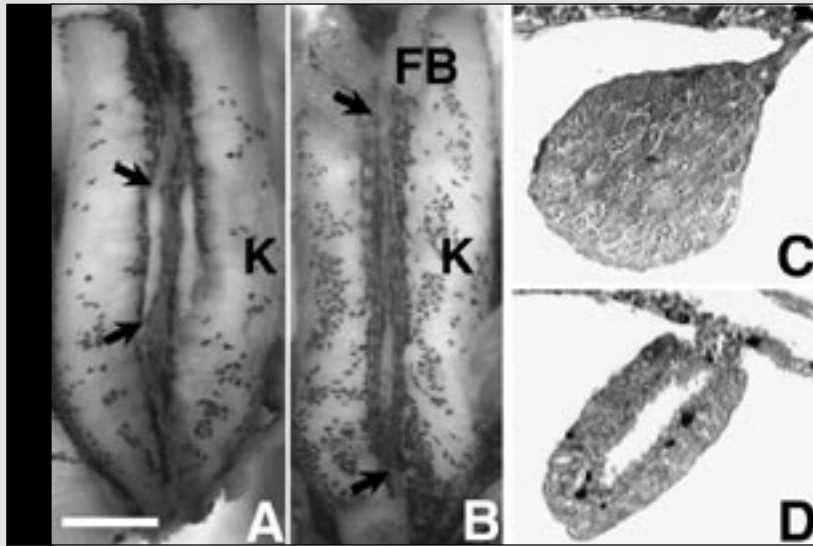


Fig. 2. An atrazine-treated hermaphrodite. The specimen shown was treated with 1 ppb atrazine. A shows the entire dissected kidney-adrenal-gonadal complex. B-E show 8  $\mu\text{m}$  of transverse cross-sections (stained with Mallory's trichrome stain) through the areas indicated by the lines in A. [Bar = 0.1 mm (A) and 25  $\mu\text{m}$  (B-E)]. FB, fatbody; K, kidney; O, ovary(ies); T, testis(es). Note the absence of pigment in the ovaries, which was typical of hermaphrodites.

I spend a lot of time in hotel rooms now where they deliver *USA Today*. On the front page the other day was an article about a brand new cancer drug. 40,000 women per year die of cancer, and they have a new drug that is 92% effective at blocking breast cancer return. The drug works the following way. Aromatase converts testosterone to estradiol and estradiol binds to a receptor and causes breast cancer cells to divide. The typical treatment is tamoxifen, which blocks the estrogen receptor. This new breast cancer drug, called exemestane, reduces aromatase, so it reduces the available estrogen to begin with. Now this is crazy, because what atrazine does, and one million people are exposed per day, is just the opposite of our new breast cancer treatment. We know that in humans, it turns on aromatase, promotes estrogen production and breast cancer. So the chemical companies can sell you the dope and the antidote.

## Frogs and the human fetus

I have to make one more point. People always ask, why frogs? Well what happens is the following: these tadpoles have the ability to metabolize the pesticides and urinate it out, but they live and drink and reabsorb their urine all the time. We can make this analogy with another aquatic organism, that can also metabolize the pesticides, but they live and drink and reabsorb their urine all of the time – a human fetus.

Recently, I was in Minnesota and I heard someone read a passage that I think expresses this better than I could. The passage is about a woman who just had amniocentesis: “Before it is baby pee, amniotic fluid is water. I drink water and it becomes blood plasma, which suffuses through the amniotic sac and surrounds the baby who also drinks it.” An then it goes on to talk about how that water was in creeks and rivers and rains, and the last line of the paragraph is: “Whatever is inside humming bird eggs is inside my womb and whatever is in the world’s water is here in my hands.” And I thought that just expressed what I was trying to say. And, of course, this book is *Having Faith*, by Sandra Steingraber.

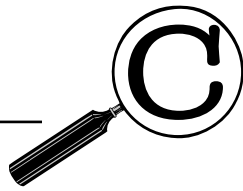


Tyrone Hayes, who received his B.A. in Biology from Harvard and Ph.D. in integrative biology from the University of California (UC) Berkeley, is a specialist in the developmental endocrinology of amphibians, whose work encompasses a “wide sweep in biology.” An internationally recognized researcher, he is noteworthy for the large number of undergraduate students who work in his laboratories, co-author papers,

and present at professional societies. Dr. Hayes is a tenured professor at UC Berkeley.

## Notes

- 1 Environmental Protection Agency. 2003. “Atrazine Interim Reregistration Eligibility Decision (IRED) Q&As.” <http://www.epa.gov/pesticides/factsheets/atrazine.htm>.
- 2 Hamilton, Pixie A., et. al. 2004. “Water Quality in the Nation’s Streams and Aquifers-Overview of Selected Findings, 1991-2001.” U.S. Geological Survey.
- 3 Hayes, Tyrone B. 2002. “Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses.” *Proceedings of the National Academy of Sciences*. Vol. 99, No. 8.
- 4 Hayes, Tyrone B. 2003. “Atrazine-Induced Hermaphroditism at 0.1 ppb in American Leopard Frogs (*Rana pipiens*): Laboratory and Field Evidence.” *Environmental Health Perspectives*. Vol. 111, No. 4.



## ATRAZINE

**W**hat is Atrazine? The most widely used group of herbicides since their development in the 1950's, common triazines include atrazine, simazine, cyanazine, ametryn, prometryn, and metribuzin. Annually, 75–100 million pounds of atrazine are used, making it the number one pesticide by volume in the U.S. The basic manufacturer of atrazine is Syngenta. Dow AgroSciences also produces atrazine products.

The Environmental Protection Agency (EPA) classifies atrazine in toxicity class III (on a scale of I to IV, I being the highest acute toxicity class). Absorbed by plants, the triazines act systemically to inhibit photosynthesis. Crop plants are able to partially metabolize or otherwise detoxify the triazines, resulting in the compounds' somewhat selective effect. Thus, the atrazine is used for broadleaf and grassy weed control in a variety of crops, including corn, sorghum, sugarcane, pineapple, Christmas trees, as well as in conifer restoration plantings.<sup>1</sup> Annually, 75% of all corn, 58.5% of all sorghum, and 76% of sugarcane grown are treated with atrazine, mostly as a pre-emergent. It is also used as a nonselective herbicide on turf, including golf courses and residential lawns. Due to the nature of atrazine, its use on lawns is usually limited to the Southeast, specifically Florida. There are no public health uses.<sup>2</sup>

In 1990, EPA classified atrazine as a Restricted Use Pesticide (RUP), which included label amendments that reduced application rates for agricultural uses and limited the maximum annual application rate for industrial weed control. It also restricts the sale and use to certified applicators or persons under their supervision. However, even as an RUP, atrazine contained in lawn care products can be purchased over the counter for unsupervised residential use. Children are put at risk for post-application dermal exposures with ordinary play on lawns. Alarming, the common hand-to-mouth behavior of children puts them at risk for oral exposure as well. Adults can also be exposed dermally, especially when conducting higher contact activities such as heavy yard work. Inhalation, oral and dermal exposures are also concerns for adults during application. In January 2003, the label for home application formulations was changed to reduce, but not ban, residential uses of atrazine, leaving the route of exposure open.

In October 2003, which was the settled deadline to incorporate threats to amphibians in its atrazine risk assessment, EPA announced that it had negotiated a deal with industry that would not require any new restrictions on atrazine use. The decision came despite several published scientific studies documenting adverse effects on amphibians linked with atrazine exposure. In November 2003, the Natural Resource Defense Council (NRDC) filed a lawsuit charging EPA, the White House Office of Management and Budget (OMB), and the White House

Council on Environmental Quality for violations of the *Freedom of Information Act* (FOIA) by refusing to disclose documents regarding the nature of industry involvement in EPA's assessment of atrazine's adverse effects.

### **Acute Toxicity**

Most triazines have moderately low acute oral toxicity, with rat LD50's ranging from 1.4-5.0 mg/kg. Atrazine falls in the middle of this range, with a rat LD50 = 3.08 mg/kg. However, fatigue, dizziness, nausea, abdominal pain, diarrhea, vomiting, and irritation of the eye, skin and respiratory tract, allergic eczema, or asthma may follow exposure.<sup>3</sup> Rashes have also been reported with exposure. Triazines are known to be skin sensitizers and photosensitizers for both humans and other animals.

In animals, triazines are not retained for extended periods. Atrazine rat metabolism studies found 65% was eliminated in the urine and 15% was retained in body tissues, mainly in the liver, kidneys, and lungs.<sup>4</sup> The most common metabolic reactions are amine dealkylation and side chain oxidation.

### **Chronic Toxicity**

Animals given an oral dosage of atrazine for six months showed respiratory distress, paralysis of the limbs, structural and chemical changes in the brain, heart, liver, lungs, kidney, ovaries, and endocrine organs, as well as growth retardation. In a 2-year study with dogs, 7.5 mg/kg/day caused decreased food intake and increased heart and liver weights, increased adrenal weight, lowered blood cell counts, and occasional tremors or stiffness in the rear limbs.<sup>5</sup>

Atrazine has also been implicated in the development of sensory motor polyneuropathy in a farmer whose skin was exposed over several days.<sup>6</sup>

### **Carcinogenicity**

EPA states atrazine is "not likely to be carcinogenic to humans," despite numerous studies that suggest otherwise. The chemical has been shown to cause cancer in the mammary glands of rats.<sup>7</sup> One study showed that women workers exposed to atrazine were nearly three times more likely to suffer ovarian cancer.<sup>8</sup> A study conducted by Syngenta found a statistically significant increase in prostate cancer among longtime workers at its St. Gabriel, LA atrazine production facility. Epidemiological studies have linked triazine exposure to increased risk of non-Hodgkin's lymphoma.<sup>9</sup> In 2002, research by the National Lymphoma Foundation of America showed an increase in lymphoma in populations with higher exposures to pesticides. Atrazine was among the herbicides most frequently associated with the increased incidence and/or with mortality.



## Endocrine Disruption

Atrazine at low concentrations interferes with the production and activity of sex hormones in salmon, causing decreases in the production of sperm.<sup>10</sup> Synergistic effects were detected in mice exposed to aldicarb, atrazine and nitrate at levels of contamination within the range often encountered in U.S. water supplies.<sup>11</sup> A U.S. Geological Survey National Water Quality Assessment study found alterations in sex steroid hormones (estrogen and testosterone) and vitellogenin (egg protein produced by females) in blood of wild carp that appear to be related to certain chemical groups including atrazine dissolved in water.<sup>12</sup> Later research began detecting effects in humans. A 2003 study found elevated levels of pesticide metabolites, including atrazine, in men's urine samples, correlated with poor semen quality.<sup>13</sup>

## Frogs As Indicators of Toxicity

A 2002 study by Tyrone Hayes, Ph.D. of the University of California, Berkeley, found that male Leopard Frogs dosed with >0.1 part per billion (ppb) of atrazine in water developed dramatic female sexual characteristics, including retarded gonadal development (gonadal dysgenesis) and testicular oogenesis (hermaphroditism).<sup>14</sup> In addition, Joseph Kiesecker of Pennsylvania State University tested the role that pesticides, including atrazine, play in frog deformities. His findings suggest that pesticides severely weaken the immune system, making frogs much more susceptible to parasitic infection and deformities.<sup>15</sup> Scientists emphasize the importance of these findings when the threat is translated to human health. Environmentalists also hold concerns for other wildlife facing risks from atrazine exposure, such as sea turtles in the Chesapeake Bay, salamanders in Texas, freshwater mussels in Alabama, and fish in the Midwest (see article by Tyrone Hayes, PhD, on page 10).

## Environmental Fate

**Soil:** Atrazine is highly persistent in soil, and can persist for longer than 1 year under dry or cold conditions.<sup>16</sup> Its half-life is between 60 and 100 days.

**Plants:** Plants can absorb atrazine through the roots and sometimes through the foliage. Once absorbed, it accumulates in the growing tips and the new leaves of the plant, inhibiting photosynthesis in susceptible plant species. In tolerant plants, it is metabolized. Atrazine increases the uptake of arsenic by treated plants.<sup>17</sup>

**Water Contamination:** As the second most common pesticide groundwater contaminant<sup>18</sup>, atrazine shares characteristics with other triazines which make them serious threats to groundwater: high leaching potential, persistence in soils, slow hydrolysis, low vapor pressure, moderate solubility in water, and moderate adsorption to matter and clay. Hydrolysis of atrazine in water, important for the disappearance of the chemical if it is followed by biodegradation, is slowed in water with a neutral 24pH. Atrazine has been detected in each of 146 water samples collected at eight locations from the Mississippi, Ohio and Missouri Rivers and their tributaries. Atrazine concentrations of 27% of these samples were above EPA's maximum contaminant level (MCL).<sup>19</sup>

Despite the problematic nature of atrazine as a water contaminant, EPA announced a deal in October 2003 to allow Syngenta to assume responsibility for testing U.S. waterways for contamination of the very chemical they produce. The program began in March 2004, and at its peak will only cover 3.4% of the 1172 highest-risk watersheds. The approach was developed by EPA, atrazine manufacturers, U.S. Department of Agriculture and grower groups, barring environmentalists from the negotiation.

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# Getting the Drift on Chemical Trespass

## Pesticide drift hits homes, schools and other sensitive sites throughout communities

By Kagan Owens and Jay Feldman

As suburban sprawl extends further into the countryside, the numbers of people who live, play and work near agricultural land is increasing. Due to pesticides drifting, thousands of individuals are directly affected by adjacent or surrounding agricultural fields where pesticide use totals nearly a million pounds a year. Pesticides used on lawns, ornamentals and trees also drift on to neighboring property. Both scenarios result in chemical trespass causing involuntary exposure. Government and independent studies show that drifting pesticides pose serious environmental and human health risks miles away from the treated fields.<sup>1</sup> With 77% of all pesticides in the U.S. being used in agriculture,<sup>2</sup> people, especially vulnerable high risk population groups like children, the elderly and infirm, are directly exposed to pesticides drifting on to homes, schools, health care facilities and other sensitive sites throughout communities.

According to the U.S. Environmental Protection Agency (EPA), "Each year, states receive about 2,500 complaints of drift from individuals."<sup>3</sup> In 2002, nearly half of the reported pesticide illness cases in California were individuals who were exposed as a result of pesticide drift.<sup>4</sup> Researchers believe that reported occurrences are a fraction of actual incidents.<sup>5</sup>

While EPA has proposed changes to product labels that will instruct users to "not allow spray to drift from the application site...,"<sup>6</sup> the health effects associated with drift exposure are not calculated or incorporated into agency risk assessments. Could EPA allow pesticides to be used if it had to calculate the real world impacts of drifting chemicals on people suffering cancer, neurological disease, asthma, etc.? Are there requirements EPA could impose on users to prohibit drift under penalty of law? Are drift reduction or mitigation strategies effective? Should the need to stop drift require the adoption of feasible non-toxic alternatives (e.g. organic)?

### What is pesticide drift?

Pesticide drift is an inevitable problem in pest management strategies that rely on spray and dust pesticide formulations. There are essentially two types of drift: particle drift (off-target movement during application) and vapor drift (off-target movement when a pesticide evaporates from a sprayed surface). EPA does not fully regulate particle drift, and it altogether ignores vapor drift in its regulatory definition of drift.<sup>7</sup> Vapor

drift is known to travel much further than particle drift.<sup>8</sup>

Although pesticides can drift when applied from a truck or hand held applicator, of greatest concern is the aerial application of pesticides, where up to 40% of the pesticide is lost to drift.<sup>9</sup> It is estimated that less than 0.1% of an insecticide reaches the target pests. Therefore, more than 99% of the applied pesticide is released and left to impact the surrounding environment.<sup>10</sup> Even the newer ultra low volume technology (ULV) under ideal weather conditions results in only approximately 25% of an herbicide reaching the target area.<sup>11</sup>



Photo by LSU Ag Center

### Pesticides drift for miles

A 2001 study by Texas A&M University researchers shows that pesticides can volatilize into the gaseous state and be transported over long distances fairly rapidly through wind and rain.<sup>12</sup> A U.S. Geological Survey report reached similar conclusions, finding, "After they are applied, many pesticides volatilize into the lower atmosphere, a process that can continue for days, weeks, or months after the application, depending on the compound. In addition, pesticides can become airborne attached to wind-blown dust." The report also documents that pesticides in rainfall collected in Modesto, California exceeded state guidelines for the protection of aquatic life in most samples.<sup>13</sup>

In *Every Breathe You Take*, Environmental Working Group reports on independent scientific monitoring that finds dangerously high concentrations of the neurotoxin chlorpyrifos in the air that many residents breathe every day. Chlorpyrifos is an organophosphate pesticide whose residential uses are being phased out, but continues to be used in agriculture, for public health mosquito control and on golf courses. The report finds that more than 22,000 children in three counties attend school near sites of heavy use of toxic pesticides.<sup>14</sup>

Another report, *Secondhand Pesticides*, summarizes data collected throughout California and finds that airborne pesticide levels routinely exceed acceptable health standards miles from where they are used. More than 90% of pesticides used in California are prone to drift, and 34% of the 188 million pounds of pesticides used in 2000 in the state are considered highly toxic to humans, according to the report. Concentrations of the pesticides chlorpyrifos and diazinon, another organophosphate pesticide whose residential uses are being phased out, were found near spray areas in concentrations that exceeded acceptable health levels by 184 and 39 times, respectively. The report also reveals that for 45% of pesticides applied in California, the concentrations of pesticides in air peak long after the application is complete-between eight and 24 hours after an application starts.<sup>15</sup>

Studies also show that pesticides drift indoors. For example, a 1991 EPA indoor pesticide study on children's exposure shows that for newer and older homes alike, "residues of many pesticides are found in and around the home even when there has been no known use of them on the premises."<sup>16</sup> In a 2003 study published in *Environmental Science and Technology* on indoor toxins in homes, researchers found varying and alarming levels of some of the most commonly used pesticides in dust concentrations in sampled homes. Most concerning is that 63% of the homes tested contain the commonly used herbicide 2,4-D,<sup>17</sup> showing that pesticides can be tracked indoors<sup>18</sup> or drift in through poorly sealed or open windows and doors.

## Cause for concern

Because of documented exposure patterns resulting from drift, advocates for children and other sensitive population groups are particularly concerned. Adverse health effects,

such as nausea, dizziness, respiratory problems, headaches, rashes, and mental disorientation, may appear even when a pesticide is applied according to label directions. Pesticide exposure can adversely affect the neurological, respiratory, immune, and endocrine systems, even at low levels. A recent study found organophosphate pesticides cause genetic damage linked to neurological disorders such as attention deficit hyperactivity disorder and Parkinson's disease.<sup>19</sup> Several

pesticides, such as pyrethrins and pyrethroids, organophosphates and carbamates, are also known to cause or exacerbate asthma symptoms.<sup>20</sup> Because most of the symptoms of pesticide exposure, from respiratory distress to difficulty in concentration, are common in children and may also have other causes, pesticide-related illnesses often go unrecognized and unreported.<sup>21</sup>

Studies show that children exposed to pesticides suffer elevated rates of leukemia, brain cancer, and soft tissue sarcoma.<sup>22</sup> According to EPA's Guidelines for Carcinogen Risk Assessment, children receive 50 percent of their lifetime cancer risks in the first two years of life.<sup>23</sup>

A National Cancer Institute researcher who matched pesticide data and medical records in ten California agricultural counties recently reported that pregnant women living within nine miles of farms where pesticides

are sprayed have an increased risk of losing an unborn baby to birth defects.<sup>24</sup> A 1996 study found that living within 2600 feet of an agricultural area increased the risk of developing brain cancer by two-fold, with astrocytoma increased by 6.7-fold.<sup>25</sup>

## State preemption grew out of drift

In 1979, Mendocino County, California was among the first local jurisdiction in the country to pass an ordinance prohibiting the aerial application of phenoxy herbicides because of drift. The measure was passed after an incident in 1977 that resulted in herbicide drift on school buses nearly three miles away from the application site. After a California State Supreme Court decision upheld the right of citizens to adopt more protective standards than the state and federal government (*The People v. County of Mendocino*, 1984), the California legislature passed legislation taking away that right. The constitutionality of the law was upheld in the Court of Appeals for the Third Appellate District (1986).



Photo by U.S. Department of Agriculture

**Table 1. State Buffer Zone Requirements For Agricultural Pesticide Applications<sup>32</sup>**

STATE	APPLICATION	DIMENSIONS	SITES
Alabama	Aerial application.	400 ft.	Schools, hospitals, nursing homes, places of worship.
Arizona	Certain odoriferous pesticides.	1/4 m.	Schools, daycares, health care institutions, 25+ residences adjoining field.
	Certain highly toxic pesticides.	400 ft.	Health care institutions.
	Certain highly toxic liquid pesticides.	100 ft (aircraft) or 50 ft (ground).	25+ residences adjoining field.
	Aerial application, certain highly toxic pesticides.	300 ft.	25+ residences adjoining field.
	Certain highly toxic pesticides.	1/4 m.	Schools, daycare centers.
Connecticut	Dust pesticides.	100 ft.	Public highway.
	Aerial application.	1/2 acre.	Municipal or private owned public parks, playgrounds, swimming areas.
Louisiana	Commercial aerial application.	1,000 ft.	Inhabited structure, school grounds during school hours.
Massachusetts	Aerial application.	150 ft.	Schools.
New Jersey	Aerial application.	300 ft.	Occupied schools, hospitals, nursing homes, places of religious worship, business or social buildings.
	Gypsy moth application.	2 m. (grade school), 2 1/2 m. (high school).	Schools, during commuting hours.
North Carolina	Aerial application.	300 ft.	Occupied schools, hospitals, nursing homes, places of worship, business or social buildings and properties.
	Aerial applications.	25 ft.	Public roads.
	Aerial applications.	100 ft.	Residences.

The issue of federal preemption of local ordinances made its way to the U.S. Supreme Court and it ruled in 1991 in *Wisconsin Public Intervenor v. Ralph Mortier* that federal law (the *Federal Insecticide, Fungicide and Rodenticide Act*) does not preempt local restrictions. The pesticide lobby then went to all states without preemption clauses seeking and getting, in most cases, amendments to state laws that specifically preempt local jurisdiction. Today, only ten states allow their local jurisdictions to restrict pesticide use.

## Buffer zones

Buffer zones, areas where pesticide spray applications are prohibited, can reduce unconsented exposure from spray drift on

to school property, residential areas and other sensitive sites. Seven states have recognized the importance of controlling drift by restricting pesticide applications around these sites. State required buffer zones range from 100 feet to 2 1/2 miles, depending on the application method, pesticide type and site to be protected from potential drift. (See Table 2)

The U.S. District Court in Seattle issued an injunction in January 2004, as a result of *Washington Toxics Coalition, et al. v. EPA*, that put in place no-spray zones of 100 yards for aerial applications and 20 yards for ground applications of more than 30 pesticides from “salmon-supporting waters” in west coast states. The judge’s ruling in the case found EPA out of compliance with the *Endangered Species Act* for failing to protect salmon from harmful pesticides.<sup>26</sup>

**Table 2. State Notification Requirements For Agricultural Pesticide Applications<sup>33</sup>**

STATE	APPLICATION TYPE	NOTIFICATION TYPE, APPLICATION DISTANCE	SITE
California	Aerial application, phenoxy herbicides, timber production.	Post sign, 1 m.	All property owners.
	Aerial application, phenoxy herbicides, timber production.	Mail notice, 300 ft.	Residents requesting notice.
Connecticut	Restricted use pesticide.	Post sign.	Neighboring property.
	Aerial application.	Written consent, 200 ft. (helicopter), 300 ft. (fixed wing).	Landowners and residents.
Maine	Pesticide applications.	Request to be notified, 500 ft.	Residential buildings, school buildings, playgrounds, athletic fields; commercial buildings, places of worship; recreational areas.
Massachusetts	Aerial applications.	Post sign, 500 ft.	100 feet around structures (residential, commercial, municipal, hospitals, schools, gathering places), recreation areas.
New Jersey	Aerial applications.	Written consent, 100 ft.	Private residence.
Pennsylvania	All applications.	Registry, Contiguous land.	Residence.
Texas	Airblast and mistblowing applications.	Request notification, 1/4 m.	Daycare, schools, hospitals, clinics, nursing homes; those with chemical sensitivities reside and work.
Wisconsin	Aerial application.	Request notice, 1/4 m.	Residence.
	Aerial application.	Post notice, 300 ft.	Residence, labor camp, school, playground, daycare, health care, commercial or industrial facility, public recreation area.

## Mitigating pesticide drift

EPA's standard pesticide label requirement, which instructs the user to avoid drift, is viewed as inadequate and unenforceable. Community members often advocate for sustainable, organic alternatives to pesticide use to avoid altogether the harmful effects of pesticide drift.

Technical fixes have limited ability to control drift. Despite improved engineering of nozzles and droplet size, real world experience demonstrates that applicators are often not trained to use the technology correctly and frequently spray in weather conditions that exacerbate drift. The fact that acute poisonings still occur with disturbing regularity (sub-acute or chronic poisonings are even more common) suggests that more of the same "technology enhancement" approaches will not solve the problem.<sup>27</sup>

■ **Buffer Zones.** To protect against vapor chemical drift, meaningful buffer zones require a two-mile radius around the residential and school property and other sensitive sites. Aerial applications should have a larger buffer zone, at least three-miles encircling the designated property. No-

deposit buffer zones, which reduce the impact of particle drift, should encompass a minimum of 400 feet.

- **Time of Day.** Ultimately, buffer zones should be in effect at all times of the day, especially for sensitive sites such as residential areas, schools and hospitals. For schools, it is critical for spray restrictions to be in place, at a minimum, during commuting times and while students and employees are on school property to protect against airborne exposure.
- **Communication.** Farmers should meet with nearby property owners, residents, and school officials to talk about which pesticides are planned for use, establish emergency plans for accidental exposure, and share schedules when certain sensitive sites, such as parks and schools, will be in use.
- **Notification.** Ideally, pesticide applicators should provide 48-hour prior notification to all occupants and users of sensitive sites within a three-mile radius. Notification, at a minimum, should include the time and location of the application, the pesticide product name, known ingredients,

and applicator contact information. Currently, eight states provide some type of notification of agricultural pesticides to nearby property occupants and users. (See Table 2). Twenty-one states provide some type of notification of lawn and landscape pesticide applications to abutting property. (See page 16).

- **Wind Breaks.** The use of natural or artificial wind shields or breaks can help deflect and contain spray drift away from sensitive areas.<sup>28</sup>
- **Pesticide Choice.** Because completely eliminating drift is virtually impossible, growers and pesticide applicators should use the least toxic substances. Products with label temperature restrictions should be avoided. Avoid using chemicals that volatilize rapidly from moist soil, such as butyl ester or butoxyethanol ester, because they are more likely to result in vapor drift. Application of the most toxic pesticides, including carcinogens, endocrine disruptors, reproductive toxins, developmental toxins, neurotoxins and pesticides listed by EPA as a toxicity category I or II pesticide, should be prohibited from use.
- **Application Equipment.** Drift increases significantly as boom height on spray equipment increases. When boom height doubles, drift increases 350%. Sprayers should be set up to produce the largest droplets (at least 200 microns). Large droplets are more likely to maintain momentum, actually reach the target pest, and not get carried away with air movement. Other equipment considerations include spray pressure, nozzle size, nozzle orientation, vehicle operating speed, shields on sprayers and nozzles and application rate. Ultimately, aerial and other problematic spray technologies should be prohibited altogether.
- **Weather.** Application of a pesticide should never take place when a sensitive area is downwind, no matter the wind speed. Drift potential decreases as wind speeds decrease. Technicians identify optimal conditions as three to ten miles per hour winds blowing away from sensitive areas. Other weather considerations include: air temperature, relative humidity, topography and atmospheric stability (check for temperature inversion which can cause small-suspended droplets to move long distances).<sup>29</sup>
- **Enforcement of Pesticide Regulations.** State pesticide lead agency inspectors should routinely inspect planes, equipment, and application sites to ensure that regulations are being followed, and to prevent potentially damaging exposure to drift from pesticide applications.<sup>30</sup> Drift incidents should be reported to state enforcement agencies, which must, under federal pesticide law, conduct an investigation and a response within 30 days.

## Detecting Drift

There are several ways to identify whether a pesticide has drifted on to non-target property. The obvious would be if

a cloud of pesticide drift was visually evident or if there are damaged crops or vegetation. But drift is usually invisible. Therefore, drift can be documented through the use of cards, filters, panels, plastic, and air sampling equipment.

After collecting drift samples, it is best to know what chemicals are being used and collected because analytical laboratories evaluating the samples charge per pesticide. (Find a lab through the American Association of Laboratory Accreditation at [www.a2La.org](http://www.a2La.org).) If cards are used, knowing whether the pesticide is water or oil based will guide which type of card to use. It is also important that the collecting device be placed appropriately on the property. In addition, samples need to be collected as soon as possible after the suspected drift, preferably within two hours, and placed in a sealed plastic bag and in a cold, dry place in order to preserve the pesticide before it begins to breakdown. Due to the complexities and costs associated with detecting pesticides, please contact Beyond Pesticides for advice on identifying which methods are most appropriate and a strategy for where and how to set up the detection unit.

- **Cards.** Water and oil-sensitive cards can show pesticide droplet size and distribution. Simply attach cards to wherever drift may be taking place, such as along the property's fence line, trees, garden or structure. Drawbacks: These cards are sensitive to not only pesticides. Very fine droplets may not get detected. (50 cards per pack, \$39.95 for water-sensitive, \$34.95 for oil-sensitive, [www.gemplers.com](http://www.gemplers.com))
- **Filters.** Filter paper can be used to capture the pesticide and sent to a lab to identify the pesticide concentration. Because you will not be able to see if the filter captures pesticide drift, it should be placed next to cards. Drawbacks: Filters need to be carefully placed and handled. (Whatman Grade No.1, 100 filter papers, \$4.59, [www.sargentwelch.com](http://www.sargentwelch.com))
- **Panels.** Drive a stake in the ground and attach a 12"X12" piece of cardboard covered with a sheet of aluminum foil to the top with a small roofing nail. Use caution and spray the upper surface with a little sticky tack. The acetone carrier will dry in a few seconds leaving a film that will trap pesticides. Once the pesticide has been collected, roll the foil up and carefully store it. Drawbacks: Same as with filters.
- **Plastic.** Black plastic garbage bags can be placed around the property as a way to detect pesticide droplets. It is easy and probably the least expensive way to detect drift. Drawbacks: Whether or not a pesticide will show depends on the droplet size.
- **Air Sampling Equipment.** Air sampling equipment to detect pesticides can be rented or purchased. (SKC, Inc., [www.skinc.com](http://www.skinc.com)) Available to select community groups only, the Drift Catcher is being used by the Pesticide Action Network North America to collect and measure air samples. Drawbacks: Equipment is very expensive.

## If drift has harmed you

If pesticide drift is suspected as causing harm to you or your property: 1) evacuate the area; 2) get medical attention; 3) find out what chemicals were used; and 4) contact the state's lead pesticide agency and file a complaint while requesting that it send an investigator to take residue samples. It is important to file a written complaint with copies to elected officials. The state is then responsible for carrying out an investigation and taking an enforcement action (or decid-

ing not to) within 30 days. If the state fails to do this, it becomes the EPA's responsibility. Follow up on all phone conversations with a letter confirming what was discussed. Send around copies of letters, listing at the bottom of the letter, all those to whom the letter was distributed, including, U.S. EPA, the Governor and elected officials. This is critical if the lead agency is not helpful. See *What To Do In A Pesticide Emergency* on the Beyond Pesticides website, [www.beyondpesticides.org](http://www.beyondpesticides.org)<sup>31</sup> Contact Beyond Pesticides at 202-543-5450, [info@beyondpesticides.org](mailto:info@beyondpesticides.org).

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## Notes

(For a fully cited version of this article, see [www.beyondpesticides.org](http://www.beyondpesticides.org))

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# State Lawn Pesticide Notification Laws

Over the last decade, public concern about the potential hazards associated with chemical lawn care products and services has steadily increased. According to the U.S. EPA, 206 million pounds of pesticides are applied on non-agricultural lands. Of that, at least 70 million pounds of pesticides are applied to lawns, including residential lawns, golf courses and parks. As a result, there is widespread public exposure to pesticides in towns, cities, suburban and rural areas. With this backdrop, Beyond Pesticides recommends the adoption of alternative methods of lawn care that do not rely on hazardous pesticides and public notification of pesticide applications.

## Notification

Notification of pesticide applications provides the public with the opportunity to take precautions to avoid direct exposure to hazardous pesticides. Twenty-one states have adopted laws requiring notification of lawn, turf and ornamental pesticide applications by hired applicators. Concerns over the potential public exposure of these pesticides have lead states to pass laws that warn people of a lawn application by posting notification signs, establishing registries or providing prior notification to abutting property owners. Because only 19% of U.S. households hire a lawn professional, some states also require that homeowners provide notification to neighboring property. State notification laws usually indicate where, when, and what pesticide has been or will be applied and by whom. State notification requirements vary in specifics, but where prior notification is required, it generally provides notice 24 to 48 hours in advance.

**Posting.** Twenty states require that commercial applicators post notification signs when a pesticide is applied to a lawn. Most states require that notification signs be posted in a conspicuous point of access to the treated property and left in place for 24 hours. Warning signs vary in language, but usually state, "Lawn Care Application: Keep off the Grass." In Connecticut, homeowners and commercial applicators are required to post notification signs if applications are made within 100 square feet of unfenced turf. Wisconsin pesticide retail stores are required to provide warning signs to homeowners when they purchase pesticides. The U.S. District Court in Seattle requires in-store notices to consumers on lawn chemicals and endangered salmon in west coast states.

**Registries.** Thirteen states require that a state agency or, in some cases, individual companies, establish a registry for people to sign up for prior notification when an adjacent property is treated with a pesticide by a commercial applicator. Generally, the states with such laws include provisions that require an applicator to inform any person on the registry of an upcoming pesticide application to property adjacent to their property. Some states, including Florida, Maryland, and Pennsylvania, have the additional requirements that individuals requesting notification provide documentation and certification from a physician. Registries only provide prior notice to those who

make a prior request to be notified and therefore are limited in providing adequate warning to the public.

## State preemption of local laws

Forty states preempt local ordinances on pesticides. However, two of those states, Minnesota and Montana, allow municipalities to adopt specific language regarding posting for commercial turf pesticide applications. Under New York state lawn notification law, counties can adopt specific provisions that require commercial applicators to provide 48 hours prior notice to all neighbors if treatment occurs within 150 feet of abutting property and require homeowners post notification signs of lawn application. (Six counties have set these requirements.) *For a list of states that preempt local pesticide ordinances, see Pesticides and You, vol. 18(4):10 or see [www.beyondpesticides.org](http://www.beyondpesticides.org).*

## Lawn Pesticide Application Laws

STATE	NOTIFICATION
Colorado	Posting/Registry
Connecticut	Posting/Registry
Florida	Posting/Registry
Georgia	Posting
Illinois	Posting/Registry
Indiana	Posting
Iowa	Posting/Registry
Kentucky	Posting/Registry
Maine	Posting/Registry
Maryland	Posting/Registry
Massachusetts	Posting
Michigan	Posting/Registry
New Hampshire	Posting
New Jersey	Posting/Registry
New York	Posting
Ohio	Posting
Pennsylvania	Registry
Rhode Island	Posting/Registry
Vermont	Posting
Washington	Posting/Registry
Wisconsin	Posting/Registry



Pesticide-free lawns are important for the health of your family, the environment and the community. Display a Pesticide Free Zone lawn sign in your yard (\$10ppd, contact Beyond Pesticides).



# THANK YOU

## 22nd National Pesticide Forum Sponsors!

Beyond Pesticides teamed up with Californians for Pesticide Reform and Pesticide Action Network North America to make the 22nd National Pesticide Forum, Unite for Change: New Approaches to Pesticides and Environmental Health, a huge success. This year's conference was held April 2-4, 2004 at the University of California, Berkeley, Clark Kerr Conference Center. We would like to thank the presenters, all the conference attendees, UC Berkeley and a special thanks to the sponsors whose support allowed this event to transpire. Thank you!

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## Fresh Choices: More Than 100 Easy Recipes for Pure Food When You Can't Buy 100% Organic.

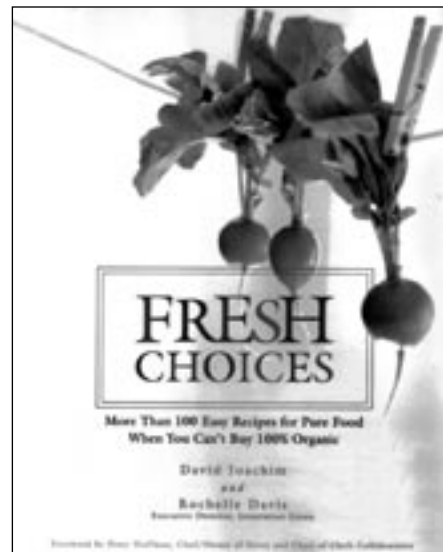
David Joachim and Rochelle Davis, Rodale Inc., New York, NY. ©2004, 306 pages, \$18.95

This is no ordinary cookbook. In fact, when you first flip through it to check out the recipes you may quickly find yourself absorbed in one of the concise but well thought out articles. It is as much about teaching the value of organic food, the history of our agricultural system and the politics and regulations around it, as it is about making grilled fontina and mushroom sandwiches, blackened tofu, or Jamaican pork chops with pineapple black bean sauce.

The book is chock full of bits of information on choosing organic or just being an eco-wise shopper that could otherwise take years to learn. Understand the difference between poultry labels that read “natural,” “USDA organic,” “certified

organic,” or “free farmed.” Learn which seafood is considered low-mercury and how to substitute one fish for another, know what is really in your fruit juice and how to get the most nutrition out of your options, and how to get the most flavorful fruits and vegetables by knowing their season. Although we can often buy fresh produce year-round in our local market, buying when the produce is in season means that it won't be shipped from as far away (saving on fuel consumption and supporting local production), and will likely be more succulent and savory. Summertime will have us looking forward to luscious fruits and vegetables like apricots, bananas, cherries, melons, asparagus, beets, watercress, eggplant and wax beans.

Certain fruits and vegetables are higher in pesticide residues than others. Is washing enough, or should you chop



and peel, or forget it and buy organic? This book gives you insights like these and much more. Oh yes, and there's recipes too. The recipes are creative and enticing and best of all, you won't be searching out-of-the-way gourmet stores for the ingredients.

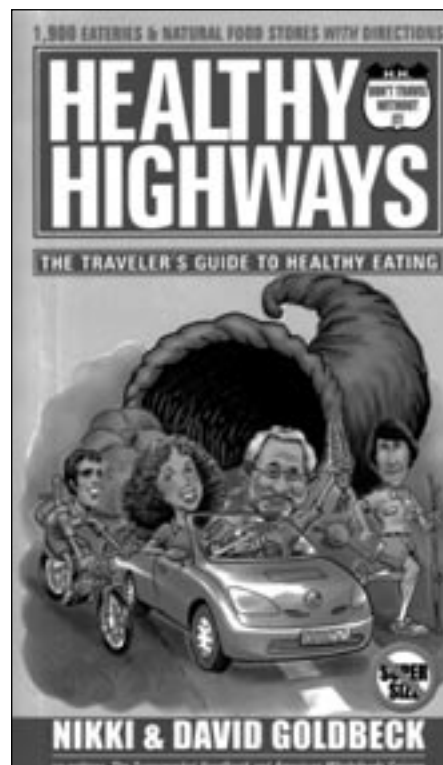
## Healthy Highways: The Traveler's Guide To Healthy Eating. 1,900 Eateries and Natural Food Stores With Directions.

Nikki and David Goldbeck. Ceres Press, Woodstock, NY. ©2004, 421 pages, \$18.95

Whether you are taking a roadtrip or just have a ways to go to visit family or friends, this book can help you avoid the supersized, calorie laden, high-fat meals offered by mini mart gas stations or road stops. With this guide, no matter which state you are in, you can find a place to get a healthy snack, meal or store to purchase healthful or vegetarian groceries somewhere along your route. The featured eateries range from drive-through to gourmet, organic meat to vegetarian. Food stores include large chains, co-ops and independents. At the very least you should be able to find some prepackaged

whole foods, bottled natural drinks and healthy snacks. Each entry includes the address, phone, hours of operation and local directions from the nearest highway or main road which are also keyed to a statewide map. With this guide you can even map your own “healthy food chain” and discover great restaurants in the process.

Perhaps the only problem is that you won't find a healthy eatery or food store in every town or pit stop along the way; some states definitely have a greater abundance than others. But of course, that's not the book's fault. Indeed, by patronizing the stores we believe in and helping their popularity and growth, maybe one day we won't need a guide.



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To say thank you, Beyond Pesticides will be giving away "Pesticide-Free Zone" lawn signs to every member that sends in 20 lids and 6-month memberships to each non-member that sends in 20 lids. If you send in 20 lids, let us know and we'll send your sign. The aluminum enameled Pesticide-Free Zone lawn signs are eight inches in diameter, will not rust and will retain their bright colors for years.



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