

Volume 39, Number 3 • Fall 2019

Pesticides *and* You

Fighting for the Environmental Rights of Lake Erie

A community rallies to protect its lake, corporate polluters overrule city in Ohio legislature

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Keeping Organic Strong

The importance of public participation in maintaining the integrity of organic standards and labeling

Tracking Biodiversity: Fungi—Underappreciated as Friends, Overrated as Foes

EPA's Scientific Malpractice and Health and Environmental Threats Escalate

There's a chipping away at public health and environmental protections. It goes largely unnoticed, lost in the big news events that capture public attention. In this issue of *Pesticides and You*, we show a pattern of ignored science—no longer being applied to decisions that have direct impact on the most vulnerable, from children to ecosystems.

A pattern of abuse

The decision that stands out as immoral is the agency's ongoing effort to eliminate protections for children from neurotoxic pesticides, most recently with EPA's proposal to allow children's exposure to the highly neurotoxic synthetic pyrethroid insecticides to increase by three times. It's a simple maneuver that could easily go unnoticed—just reduce the safety threshold that has been in place (already not protective enough) from 3x to 1x. This follows EPA's announcement that it was not going to take the insecticide chlorpyrifos off the market in 2017, after the agency had determined in 2015 that adverse effects to brain development in children warranted its removal from the market. The laws governing pesticides, and toxics generally, put trust in the scientific oversight performed by agencies, and in so doing vest the agencies with discretionary authority to apply science in an evenhanded and unbiased way.

Embracing precaution wholeheartedly

This situation provides the basis—the legitimacy, the mandate—for states and local governments to adopt a precautionary approach to the regulation of pesticides. The federal system, and the state apparatus that depends on it, cannot ensure the public that their health and environment are being protected, so precaution is critically and urgently needed as a matter of policy.

The problem is not just glyphosate (Roundup)

If we thought that the problem was contained to the worst chemicals that make headlines or are the subject of lawsuits, that's not the case. With the deadly weed killer paraquat, EPA is simply dismissing the science on the link to Parkinson's disease and fails to consider the chronic and endocrine disrupting effects. An in-depth *Beyond Pesticides'* analysis, provided in public comments to the agency with 15 groups in December, critiques the agency's failure to correctly apply basic information, such as calculating effects from dietary pesticide residues with exposure levels below those estimated to be taking place. By now, many are aware of EPA's decision not to restrict glyphosate (Roundup), ignoring the World Health Organization's determination of its cancer causing properties.

The local response

Despite increasing community awareness of Bayer Monsanto's deceptive "science" and EPA's collusion with the chemical industry, glyphosate use is still widespread. Kudos to those who have stopped use. However, parks departments and school districts often defer to EPA. And then there's the herbicide atrazine, a known endocrine disruptor that causes hormonal effects and birth defects. A memo released by EPA in November announces a proposal to increase the amount of the atrazine allowed in U.S. waterways by 50%.

EPA has clearly abused the public trust. Virtually every EPA decision, purported to be science-based, is filled with either errors of science or an outright decision to ignore the facts.

Looking to local action and the backlash

People and communities are ready to act. We write in this issue about the City of Toledo, Ohio, which adopted a novel approach to protecting Lake Erie with the adoption of a Bill of Rights—enabling residents to sue on behalf of the lake, and protect it from the contamination it endures. Similarly, the people of Lincoln County, Oregon voted to stop exposure from aerial drift when the state agriculture department, the primary enforcement authority, would not act.

However, the chemical industry has successfully lobbied for state law that preempts local jurisdictions from adopting restrictions more stringent than the state. They've used anti-democratic state law to shut down Lincoln County's ban on aerial spraying. In Ohio, the Chamber of Commerce moved an eleventh hour amendment to unrelated state legislation denying Toledo's right to implement the bill of rights.

Local leaders are starting to push back. Constituents of members of Congress successfully blocked a Farm Bill amendment this year that would have codified federal preemption of local authority to restrict pesticides. The amendment failed, but the industry will be back. Similarly, in states that allow their local jurisdictions to restrict pesticides, the industry is repeatedly seeking to insert preemption language into state law—especially in Maine and Maryland. Meanwhile, efforts are moving to repeal preemption in states where it is in place—so communities can protect their residents from pesticide drift, run-off, and non-target effects to ecosystems, as pesticides move throughout the community off the sites where they are applied.

Local authority is especially important with the current erosion of science at the highest levels of public safety standard setting.

Best wishes for the new year.

Jay Feldman,
executive director of
Beyond Pesticides





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Pesticides and You ©2019 (ISSN 0896-7253) is published four times a year by Beyond Pesticides. Beyond Pesticides, founded in 1981, is a voice for health and the environment, promoting protection from pesticides and safe alternatives; donations are tax-deductible.

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Printed on 100% post consumer waste with soy inks.

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Can I Trust the World Health Organization on Glyphosate (Roundup)?

I've been advocating to eliminate glyphosate and other toxic pesticides to my local officials, and I've made some good progress. But right now, I need to push back against claims from some decision makers that IARC and the World Health Organization can't be trusted when they say glyphosate is carcinogenic. Can you provide me with some additional background about how the decision was made? And are there other countries or organizations that have agreed with their assessment?

Carol, Rochester, NY

Carol,

The International Agency for Research on Cancer (IARC) is an agency within the United Nations' World Health Organization. Since 1965, IARC has been the leading international body in making scientific determinations identifying carcinogenic hazards to humans. IARC employs a "strength of evidence" assessment, basing the carcinogenicity of a chemical on whether it is capable of increasing the occurrence of malignant growths, reducing their latency (time between exposure and the onset of cancer), or increasing the severity or multiplicity of such growths. Prior to classifying a chemical, 17 experts from 11 countries analyze scientific studies and data for approximately one year before meeting together in a Working Group in an attempt to reach a consensus evaluation. Consideration is given to exposure data, studies of cancer in humans, studies of cancer in experimental animals, and mechanistic and other relevant data.

IARC's classification of glyphosate as a group 2A probable carcinogen has been subject to intense criticism from compromised regulatory bodies and the chemical industry. IARC has responded to criticisms of its evaluation process through a response document. (See "IARC response to criticisms of the Monographs and the glyphosate evaluation," prepared by the IARC Director, January 2018.) It notes, "Since the evaluation of glyphosate by the IARC Monographs Program in March 2015, the Agency has been subject to unprecedented, coordinated efforts to undermine the evaluation, the program and the organization. These efforts have deliberately and repeatedly misrepresented the Agency's work. The attacks have largely originated from the agrochemical industry and associated media outlets."

Unfortunately, the U.S. Environmental Protection Agency (EPA) has joined the agrochemical industry in these attacks. One EPA official within the Office of Pesticide Programs infamously told a Monsanto employee, "If I can kill this I should get a medal," related to his attempts to quash a separate health-based evaluation of glyphosate by the U.S. Department of Health and Human Services (DHHS). Despite the attempts of an apparently corrupt EPA official, DHHS' Agency for Toxic Substances and Disease Registry (ATSDR) released its first draft on the Toxicological Profile for Glyphosate. Top-line



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findings were consistent with IARC's conclusions on the carcinogenicity of glyphosate. Importantly, cancer was not the only subject in ATSDR's review of glyphosate. It also reviewed the chemical's effects on: body weight, pulmonary and cardiovascular health, gastrointestinal and nervous systems, kidney and liver, skeletal system, endocrine system, effects on the immune system, developmental and reproductive systems, and the eyes and skin.

Particular to glyphosate, the Danish government has concurred with IARC's cancer determination, Austria has moved to ban the chemical, France is phasing the chemical out by 2021, Germany is phasing use out by 2023, and the Netherlands has imposed significant restrictions. In regard to pesticide use in general, over 140 communities in the U.S. have enacted pesticide reform laws, restricting the use of toxic pesticides in a manner that best protects their residents' health and the local environment.

We hope your local leaders find this information helpful in wading through the intense lobbying and propaganda pushed out by the chemical industry in an attempt to challenge grassroots efforts like your own. Be confident that the precautionary approach that you're advocating is the best way to protect public health and the environment from hazardous chemical exposure, and the correct choice for the future of land management in your community.

SHARE WITH US!

Beyond Pesticides welcomes your questions, comments, and concerns. Have something you'd like to share or ask us? We'd like to know! If we think something might be particularly useful for others, we will print your comments in this section. Mail will be edited for length and clarity, and we will not publish your contact information. There are many ways you can contact us: Send us an email at info@beyondpesticides.org, give us a call at 202-543-5450, or send questions and comments to: 701 E Street SE, Washington, DC 20003.

Feeding the World with Organic Agriculture

I recently saw a news article that talked about how organic can't feed the world. It said yields are too low and that we'd need more land than is available to match what "conventional" (chemical-intensive) can provide. Is organic really the answer if it can't feed the world?

Medha, Red Bluff, CA

Medha,

What's often lost in the discussion over whether one form of agriculture or another can "feed the world" is that we're not currently feeding the world. The United Nations' Food and Agriculture Organization estimates that at least 820 million people don't have enough to eat; 15 million of those people reside in the United States. So to start, if we do intend to feed the world, we have a lot of work to do to ensure that everyone has access to food.

Further, and specific to the U.S., a lot of conventional food currently being grown is not reaching consumer plates. It's going into gas tanks in the form of corn ethanol or soybean biodiesel. Organic versions of these crops are generally not being used for these purposes. This points to an urgent need to readjust farming incentives and subsidies that drive chemical-intensive monocrop production over research and additional funding for diversified organic systems.

Studies comparing chemical-intensive to organic crop production have varied results, but there are generally indications that for most food commodities, organic can match or come close to conventional systems. It varies by the crop being investigated, and on-farm production methods, but an important context within this discussion goes back to government supports. Reports indicate that over \$20 billion in subsidies go to farming annually, with about 39% of farms receiving government funds. The vast majority of these subsidies are not going to small-scale organic farmers, but rather to the industrial agricultural row crop (corn, soybean, wheat, cotton, rice) producers. The same chemical industry arguing that organic farming isn't competitive is spending millions of dollars lobbying lawmakers to tilt the playing in ways that hold back organic growth, from research investments in chemical-intensive practices to allowances of harmful chemical residues in our food and water. Deliberate public investments into research and development for organic farming is certain to result in further breakthroughs in yield and efficiency.

As a 2017 United Nations Food and Agriculture Organization report found, "Without or with minimal use of toxic chemicals, it is possible to produce healthier, nutrient-rich food, with higher yields in the longer term, without polluting and exhausting environmental resources." We can "feed the world" through organic practices. But in order to do so we need to demand changes that prioritize public health and environmental protection and make larger investments in alternative farming systems.

FROM THE WEB

Beyond Pesticides' Daily News Blog features a post each weekday on the health and environmental hazards of pesticides, pesticide regulation and policy, pesticide alternatives, and cutting-edge science, www.beyondpesticides.org/dailynewsblog. Want to get in on the conversation? "Like" us on Facebook, www.facebook.com/beyondpesticides, or send us a "tweet" on Twitter, @bpncamp!

Excerpt from Beyond Pesticides Daily News Blog

(11/26/2019): Bayer Monsanto Skirts Felony Charge for Applying Banned Pesticide in Hawaii, by Calling on Connections at Justice Department. Bayer Monsanto endangered public health and the environment by knowingly storing and applying the highly hazardous and banned insecticide methyl parathion in Maui, Hawaii, according to a release from the U.S. Attorney's office for the Central District of California.

Nikki comments via Facebook: No way, this has to stop. Corporations and their managers MUST be held accountable and charged with crimes. No more evasion.

Kate comments via Twitter: A drop in the bucket for them and they are still spreading illegal poisons, impacting human and environmental well-being. Failure of justice.

Excerpt from Beyond Pesticides Daily News Blog

(12/10/2019): EPA Gives Go-Ahead for Mass Poisoning of Fox, Coyote, and other Wildlife Predators. Thousands of fox, coyote, and other carnivores will continue to be poisoned to death by hydrogen cyanide after the Trump Administration's Environmental Protection Agency (EPA) re-approved the use of M-44 "cyanide bombs" earlier this month.

David comments: Additionally, the removal of predators allows their prey to spiral out of control unchecked, creating ecosystem imbalance, and a ripple effect will occur as the food sources of lesser wildlife become threatened.

Darcy comments: This practice is ridiculous! Allowing hunting on the overpopulated species I can see, but blindly killing anything that comes into contact with the poison is ludicrous. Wildlife, pets, children cannot read the warnings!

Shirley comments: This is outrageous! EPA seems to get totally unstrung over the smallest thing—but putting off very toxic bombs to have animals die a terrible death—is okay? I don't think so. Where is the sensible reasoning in this tactic? Chemical Poisons Reduction Act of 2019 is certainly necessary if EPA can't be logical on the subject themselves. Knowing what I know about EPA—this procedure they are advocating is truly obscene and INSANE.



We Will Never Forget Bhopal

December 2 marks the 35th anniversary of the world's worst industrial chemical accident in Bhopal, India. During the night of December 2, 1984, the Union Carbide pesticide manufacturing plant released the highly toxic gas methyl isocyanate (MIC) into the air of Bhopal. MIC is used in the production of carbamate insecticides carbaryl (Sevin®), aldicarb (Temik®), and a formulation of carbaryl and gamma-hexachlorocyclohexane (g-HCH) (Sevidol®). The reports were horrifying—an estimated 25,000 people died from direct effects of the exposure, and hundreds of thousands suffer from permanent disabilities or chronic problems.

The health effects were not limited to those exposed that night. Generations of children suffer from birth defects as a result of the accident, including what

one doctor described as 'monstrous births.' Many people are still exposed to the contaminated site and chemicals released from it. Big and small, industrial accidents and daily exposure of workers and communities near to production facilities for pesticides and their ingredients are an integral part of the cradle-to-grave harm that occurs as long as pesticides are used in food production and managing landscapes. "Having visited Bhopal and spoken with the victims of the horrific explosion, as well as those who are victimized by daily pesticide exposure across the globe has motivated me to commit all my energy to the transition to a world without toxic pesticides," said Jay Feldman, executive director of Beyond Pesticides. Organic agriculture eliminates the use of toxic chemicals

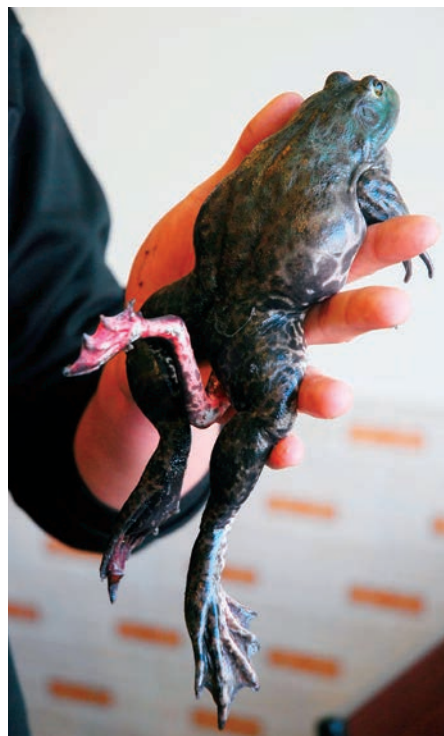
in food production. The transition from conventional chemical-intensive land management to organic systems is the key step to preventing chemical accidents and daily exposures, while eliminating petroleum-based synthetic pesticides, protecting biodiversity, and reversing climate change," said Mr. Feldman.

Trump Administration Issues Broad Weakening of Protections from Pesticides

There has been a marathon of deregulation in the Trump administration that benefits the pesticide industry.

ATRAZINE

The U.S. Environmental Protection Agency (EPA) announced a proposal to increase the amount of the weed killer atrazine allowed in U.S. waterways by 50% during the chemical's registration review—a stark reversal of previous proposals to significantly reduce atrazine levels in the environment. Atrazine, a broadleaf herbicide, is linked to endocrine disruption, neuropathy, and cancer. It disrupts the sexual development of frogs at levels far below the current allowed concentrations by EPA. Studies by Tyrone Hayes, PhD, University of California, Berkeley, and others have shown that concentrations as low as 0.1 ppb turn tadpoles into hermaphrodites. A 2009 study links birth defects to the



Frogs exhibit birth defects.

relative concentrations of atrazine and other pesticides in drinking water at the time of conception.

EPA's proposal would increase the Concentration Equivalent Level of Concern (CELOC), a limit established to protect aquatic organisms, by 50%. The new EPA position reverses its 2016 assessment based on a finding that *levels of concern for chronic risk are exceeded by as much as 22, 198, and 62 times for birds, mammals, and fish, respectively.*

PYRETHROIDS

EPA stripped away protections that limit children's exposure to a class of chemicals associated with childhood cancer, autism, and other learning disorders. The result of the agency's actions will dramatically increase the use of synthetic pyrethroids, insecticides found in indoor and outdoor bug sprays, bug bombs, and often used on conventionally grown fruits

and vegetables. The agency, without scientific support, is eliminating the safety factor for children and allowing exposure to increase by three times. Pyrethroids are a common class of neurotoxic insecticides that have been repeatedly linked by peer-reviewed studies to neurological issues. They are also extremely damaging to non-target invertebrates, according to EPA's own analysis.

PARAQUAT

EPA is downplaying the connection between exposure to the herbicide paraquat and the development of Parkinson's disease, per registration review documents released by the agency in October. Although unsurprising given the current administration's track record of defending some of the most heinous chemicals still on the market, the review nonetheless marks a low point for scientific integrity within EPA's Office of Pesticide Programs, according to advocates. In a similar manner to how the agency conducted its epidemiological evaluation of pyrethroids, EPA made broad statements dismissing scientific evidence as insufficient. While the chemical has been banned in the European Union since 2007, as a 2016 *New York Times* exposé found, millions of pounds are still being imported into the U.S. from other countries and sprayed on nearly 15 million acres of U.S. cropland. Advocates are pushing for Congressional passage of HR 3817, the *Protect Against Paraquat Act*, introduced by Congresswoman Nydia Velazquez (D-NY).

ENDANGERED SPECIES

The Trump Administration has reignited the attack on the *Endangered Species Act* (ESA), one of the most effective environmental laws in restoring threatened and endangered species and their habitat. New rules will: (i) weaken the consultation process designed to prevent harm to endangered animals and their habitats from federal agency activities; (ii) curtail the designation of critical habitat and weaken the listing



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process for imperiled species; and (iii) eliminate all protections for wildlife newly designated as "threatened" under the Act. With species declining across the globe, protecting those already at heightened risk is a major goal of environmental organizations. An important provision of the Act is the requirement that every federal agency that proposes to authorize, fund, or carry out an action that may affect a listed species or its critical habitat must consult with the U.S. Fish and Wildlife Service and National Marine Fisheries Service. Although many species—including the bald eagle, Florida manatee, and California condor—have been protected and brought back from the brink of extinction under the ESA, an estimated 500 species have disappeared in the past 200 years. With these serious rollbacks, pesticide use will exacerbate the loss of species.

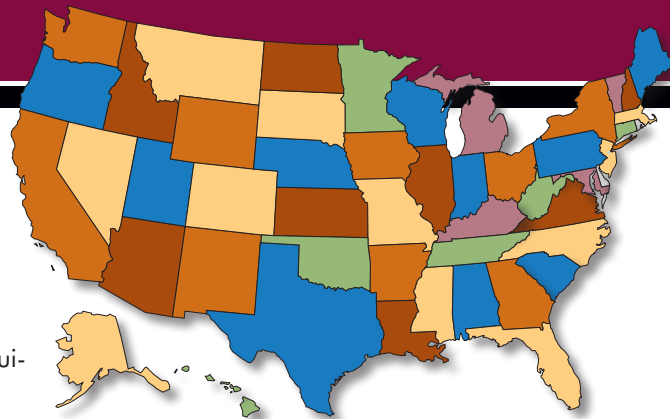
HONEY BEE DATA

The U.S. Department of Agriculture (USDA) is suspending indefinitely the data collection for its Honey Bee Colonies Survey and Report. The move came less than three weeks after EPA once again

approved "emergency" uses of the pesticide sulfoxaflor, a bee-killing compound similar to the notorious neonicotinoids, insecticides that contribute significantly to the phenomena of pollinator collapse ("colony collapse disorder") and massive insect loss ("insect apocalypse") that are underway worldwide.

FROM ORGANIC TO GENETICALLY ENGINEERED

The People's Garden, a show place for organic production when it was established on the grounds of USDA on the national mall in 2009, has been renamed and remodeled to highlight genetically engineered (GE) crops and farming techniques that directly counter the organic movement. The new exhibit, entitled "Voice of the Farmer," is part of the "Trust in Food" initiative of *Farm Journal* magazine. Ironically, the former name of the garden honored President Abraham Lincoln's description of USDA as "The People's Department." The People's Garden initiative supported a collaborative effort of over 700 local and national organizations working to advance community and school gardens.



City of South Miami Becomes First Organic Community in Florida

The City of South Miami in October became the first organic community in the state of Florida, passing a landmark ordinance limiting hazardous pesticide use on public property in favor of safer practices. An increasing number of communities in the state have begun to restrict the use of toxic pesticides, with North Miami passing an Integrated Pest Management plan last year, and Miami, Stuart, and Key West banning glyphosate. South Miami, embracing organic under the direction of Mayor Phillip Stoddard, PhD—also a professor of Biological Science at Florida International University—has a history of leading the state in the protection of public health and the environment. In 2014, the city declared South Miami a wildlife sanctuary, thereby restricting the use of highly toxic mosquito spraying. The move protected populations of the state’s rare and endemic wildlife, such

as the Florida bonneted bat, which begins to feed on mosquitoes in the spring at the same time spraying usually begins.



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Fungicides Linked to Ecosystem Disruption, Algal Blooms

Commonly used fungicides induce trophic effects cascading down the food web and leading to the overgrowth of algae, according to research published in the journal *Chemosphere*. Real world complexities not studied under current regulatory review lead to the allowance of significant adverse effects not just on individual species, but entire ecosystems. Researchers investigated how fungal parasites known as chytrids control the growth of phytoplankton. While some strains of chytrids are notorious for their impact to frog species, some do in fact provide important stopgaps within ecosystems. “By infecting cyanobacteria, parasitic fungi limit their growth and thus reduce the occurrence and intensity of toxic algal blooms,” says Institute of Freshwater Ecology and Inland Fisheries (Berlin) researcher Ramsy Agha, PhD, co-author the study. “Whereas we usually perceive disease as a negative phenomenon, parasites are very important for the normal functioning of aquatic ecosystems and can—as in this case—also have positive effects. Pollution by fungicides can interfere with this natural process,” the researcher adds.

exposure to both fungicides results in a significant reduction in infections by the chytrid parasite, facilitating harmful algae blooms by suppressing fungal pathogens that otherwise control their growth.

The agricultural fungicides tebuconazole and azoxystrobin were tested on chytrid-infected toxic bloom-forming cyanobacteria in a laboratory setting. At real world concentrations,



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Monsanto's Trail of Contamination and Poisoning

MONSANTO POISONS THEN SHIRTS LAW IN HAWAII

Bayer Monsanto endangered public health and the environment by knowingly storing and applying the highly hazardous and banned insecticide methyl parathion on Maui, Hawaii, according to a release from the U.S. Attorney's office for the Central District of California. While the company admitted the crime, it went to work to get the crime and charges downgraded from criminal to a misdemeanor. According to reports from the Project on Government Oversight (POGO), the California U.S. Attorney's office was prepared to file full felony charges against the company for its violation of federal pesticide and hazardous waste disposal laws. Bayer Monsanto went to the Department of Justice, according to this report, and negotiated the downgraded charge. As POGO indicates, circumventing the long-held tradition of autonomy within U.S. Attorney offices is intended to occur only "in the most unusual of circumstances." Filed in court documents in the case against Monsanto was an internal 2018 email citing a White House commitment to the company: "We have Monsanto's back on pesticides regulation. We are prepared to go toe-to-toe on any disputes. . . . Monsanto need not fear any additional regulation from this administration. "

ATTACK ON CALIFORNIA AUTHORITY TO RESTRICT PESTICIDES

EPA is challenging a California required pesticide label that discloses that the herbicide glyphosate may cause cancer. The move comes after the state of California listed glyphosate on its Prop 65 list of chemicals known to cause cancer, birth defects, or other reproductive harm. While a state judge gave the Prop 65 warning labels the go-ahead, a prior ruling from U.S. District Court



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Judge William Shubb, a President H.W. Bush appointee, in Sacramento placed a preliminary injunction on the California requirement that remains in place today. The state added glyphosate to its Prop 65 list after the International Agency for Research on Cancer (IARC) designated the chemical as a group 2A carcinogen (probably cancer causing). Under Prop 65, California regulators are required to provide "clear and reasonable" warning labels when any one of four requirements in the law are triggered. IARC's designation by the state as an "authoritative body" thus prompted the listing. In the agency's press release, EPA Administrator Andrew Wheeler said, "It is irresponsible to require labels on products that are inaccurate when EPA knows the product does not pose a cancer risk." We will not allow California's flawed program to dictate federal policy."

GROUPS CALL FOR GLYPHOSATE BAN

Sixteen organizations representing health, environmental, farmer, and farmworker communities joined together in September to call on EPA to remove glyphosate from the market. The groups cite a combination of high-profile lawsuits, environmental impacts, increasing reports of weed resistance, and growing public concern over the health effects of glyphosate in their comments on EPA's interim reregistration review decision for the chemical. The comments warn that EPA is further damaging the public's trust in the agency's review process for toxic pesticides. The groups challenge EPA's attack on IARC, citing it being in the "forefront of scientific determinations on carcinogenicity since its founding prior to EPA in 1965."

Brain Damaging Pesticides Banned in EU, while Ban Proposed in New York

In early December, the European Union (EU) voted to ban the neurotoxic insecticides chlorpyrifos and chlorpyrifos-methyl from use beginning February 1, 2020. Shortly after, the Governor of New York, Andrew Cuomo, vetoed legislation to ban chlorpyrifos and instead issued an immediate ban on aerial application, and proposed a regulatory phase-out that bans all uses by December 2020, except use on apple tree trunks by July 2021. The proposal is subject to a public comment period.

The EU regulatory committee decided not to renew approvals following a European Food Safety Authority (EFSA) finding, released in August, that there is no safe exposure level for chlorpyrifos. In the absence of federal action on the pesticide in the U.S., individual states are deciding to stop its use.



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Chlorpyrifos damages fetal brains and produces cognitive and behavioral dysfunctions, particularly in children. Prenatal and early life exposure to chlorpyrifos is linked to lower birth weight and neurodevelopmental harms, including reduced IQ, loss of working memory, attention disorders, and delayed motor development. Farmworkers are at heightened risk of acute exposure effects of the chemical (including accidents and spills), which can cause respiratory paralysis and even death.

A study published by University of California Berkeley researchers in the *Proceedings of the National Academy of Sciences*—among the first to use advanced brain imaging to assess cortical activation—shows altered brain activity during tasks that call on executive function in teenagers from California’s Salinas Valley (the site of significant organophosphate use) whose mothers were exposed prenatally.

Tracking Bees

INSPECTOR GENERAL: EPA’S EFFORTS TO PROTECT BEES FALL SHORT

The Office of the Inspector General (OIG) for EPA released a report this summer criticizing EPA’s oversight of states’ Managed Pollinator Protection Plans (MP3s). OIG audited the agency’s performance in overseeing MP3s, voluntary plans adopted at the state level with the goal to “reduce pesticide exposure to pollinators (generally, honey bees managed and contracted out to growers for pollination services) through timely communication and coordination among key stakeholders.” The report includes findings that EPA has: no means to evaluate the national impact of MP3s; not developed a strategy to use data from a planned fall 2019 survey to evaluate either the national impact of MP3s or the agency’s support of state MP3 implementation efforts; and, focused primarily on acute risks (those that occur during a single exposure to a specific pesticide), and gives insufficient attention to chronic exposures to pesticides and to native pollinator protection activities. The MP3 program began in 2014 when President Barack Obama issued a memo

establishing a Pollinator Health Task Force (PHTF), directing federal agencies to take action to improve the health of bees and other pollinators.



STUDY AGAIN CONFIRMS IMPORTANCE OF BEES

Bees offer greater economic benefits to farmers than synthetic inputs, according to a large-scale field study published in *Proceedings of the Royal Society B* (biological research) in October. Addressing the ongoing question regarding the costs and benefits of biodiversity as compared with chemical use in agriculture, the researchers’ conclusion are captured in the title of their article, “Bee pollination outperforms pesticides for oilseed crop production and profitability.” Data for the study was collected over six years from 294 oilseed rape (OSR) fields in France with various levels of soil quality, fertilizer and pesticide applications, and pollinator abundance. Researchers measured pollinator biodiversity with nets and traps at the field sites. Farmers offered data on yield, costs, and profits. The study analyzed combined effects of inputs on OSR yield and found that bee abundance is the only variable that has a positive effect on profitability.

EPA's Proposal to Eliminate Animal Testing May Speed Up Pesticide Safety Reviews, but at What Cost?

Any new assessment protocols must consider alternatives to toxic pesticide use

TERRY SHISTAR, PHD

When U.S. Environmental Protection Agency (EPA) Administrator Andrew Wheeler announced that EPA will be phasing out testing of chemicals on animals¹ and replacing it with “computational toxicology (based on computer modeling),” the reaction was mixed. Environmentalists who work in the field of risk assessment pointed out the inadequacies of *in vitro* (in glass containers) and *in silico* (computer-based) methods of assessing risk. Meanwhile, animal rights organizations support the move. Could it be that both are wrong—or at least shortsighted—in their reactions?

The announcement from EPA came in September, 2019: “Today’s memo directs the agency to aggressively reduce animal testing, including reducing mammal study requests and funding 30% by 2025 and completely eliminating them by 2035,” said Mr. Wheeler. “We are also awarding \$4.25 million to advance the research and development of alternative test methods for evaluating the safety of chemicals that will minimize, and hopefully eliminate, the need for animal testing.”

Jen Sass, PhD of the Natural Resources Defense Council (NRDC) says, “Phasing out foundational scientific testing methods can make it much harder to identify toxic chemicals—and protect human health.”² Scientists Laura Vandenberg, PhD and Tom

Zoeller, PhD, University of Massachusetts Amherst, agree, saying, “Cell- and computer-based approaches cannot reproduce effects that occur in the whole animal, especially during development.”³

But Amy Clippinger, PhD, director of the regulatory testing department for People for the Ethical Treatment of Animals (PETA), says, “PETA is celebrating the EPA’s decision to protect animals certainly—but also humans and the environment—by switching from cruel and scientifically flawed animal tests in favor of modern, non-animal testing methods.”⁴

USING COMPUTATIONAL TOXICOLOGY

The computer-based methods encompassed by the term “computational toxicology” offer great promise for reducing toxic chemicals. In order to be protective, however, they must be used in concert with other methods and embedded in a regulatory system that requires chemicals to be removed from the market when hazards or safer alternatives are demonstrated. In other words, they must be part of an alternatives assessment process that questions their essentiality or necessity, given the availability of nontoxic methods or products. The methods should be used with a precautionary approach—in other words, if a chemical “fails” a computer model (or *in silico* test), it should not be allowed to be marketed. However, materials that “pass” such tests should move on to *in vivo* (in organisms) and *in vitro* tests to ensure that the complexity

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of endocrine and other physiological functions is fully considered. This approach takes on more urgency as part of a general national and worldwide emergency to eliminate fossil fuel-based pesticide production and use in an effort to confront the climate crisis and dramatic declines in biodiversity.

THE ARGUMENT FOR ELIMINATING ANIMAL TESTING

There are many reasons to avoid toxicological testing on animals. The primary argument against animal testing is that it inflicts pain and suffering on nonhumans without their consent, for purposes that do not benefit the experimental animal. This may be expressed in terms of rights—“Animals have a basic moral right to respectful treatment. . . . This inherent value is not respected when animals are reduced to being mere tools in a scientific experiment.”⁵

EPA’s concern for animals, however, is not the primary motivation for shifting away from testing toxic chemicals on animals. For several years, EPA has been researching efforts to estimate real world chemical interactions and exposure through computer models, known as “computational toxicology,” in the belief that they offer some promise for identifying chemicals that adversely affect the endocrine system and have other toxic effects and speeding up reviews.

Computational toxicology uses computer models to combine data generated by a variety of real world tests, both *in vivo* and *in vitro*, with theoretical knowledge based on factors like structural relationships to chemicals with known toxicological properties. These models replace risk assessments based on testing of actual organisms with “toxicity-pathway-based risk assessments” based on virtual organisms having virtual tissues composed of virtual cells that interact with virtual chemicals. Exposure estimates are also based on computer models of how toxic chemicals and their metabolites reach cells in

the body where they can affect physiological processes. The assessment of virtual risk produced by this process is anticipated to replace conventional risk assessment over the next decade or two.

The failure of EPA to test pesticides for their potential endocrine disrupting effects,⁶ required by Congress more than 20 years ago by the Food Quality Protection Act (FQPA) of 1996, has driven the movement within the agency to adopt nonanimal testing procedures. To help meet the requirements of the act, EPA sponsored a National Research Council (NRC)/National Academy of Sciences report, *Toxicity Testing in the 21st Century—A Vision and a Strategy* (2007), which recommended the use of “computational toxicology.”⁷ With this approach, some in the agency suggest that they would be more successful in implementing the Tiered Protocol for Endocrine Disruption (TiPED), a five-tier testing protocol—ranging from broad *in silico* (computer simulation) evaluation through specific cell- and whole organism-based assays—developed by a multi-disciplinary group of independent scientists.

ANY OVERHAUL MUST INCORPORATE A PRECAUTIONARY APPROACH

While computational toxicology promises to eliminate the logjam in screening a large number of pesticides for their endocrine disrupting properties, and also presents a way to screen industrial chemicals coming on to the market—and could be used in overhauling the *Toxic Substances Control Act* (TSCA) review process—new models do not inherently address the need for a precautionary regulatory approach to toxic chemical approval. In fact, a precautionary approach makes the maximum use of existing data and minimizes the extensive animal testing conducted under current toxic chemical regulatory testing protocols.

It should be kept in mind that the need for testing toxic or potentially toxic chemicals only arises because the release of such chemicals in a way that exposes humans and others is under consideration. If we were committed to living without toxic chemicals, or at least a significant number, then we would not need to test chemicals to determine how toxic they are.

THE ARGUMENT AGAINST ELIMINATING ANIMAL TESTING

Those who argue against eliminating animal testing point out the shortcomings of other types of tests. The comparison of the different ways in which computational toxicology could be used by EPA under the *Federal Insecticide, Fungicide, and Rodenticide Act* (FIFRA), TSCA, and TiPED protocol for endocrine disruptors, and by European Chemicals Agency (ECHA) under the EU’s Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulation illustrates some of the problems that might arise in EPA’s proposed use for screening pesticides for endocrine disrupting chemicals (EDCs). Potential problems include:



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- **Reduced transparency for the public.** First of all, reliance on computer models can reduce transparency in regulation. Animal testing looks for actual effects on actual animals. Computational toxicology extrapolates estimates of actual effects from study results on related chemicals or effects inferred from results on cells in *in vitro* testing. This may not be transparent to the general lay public. Only those few with training in these methods will be able to understand and comment on their use. The chemical industry has always challenged the extrapolation of toxicological testing on laboratory animals to the human population, so it is expected that EPA will be challenged by industry when it proposes to restrict, cancel, or suspend the use of a pesticide based on the results of comprehensive computational models.
- **Lack of attention to complexities.** The extreme reductionist approach, depending on computer models with an unknown range of applicability, poses a problem for dependence on computational toxicology as the sole source of toxicity information. Particularly concerning is EPA's view that it could "eliminate currently used uncertainty factors." In fact, dependence on computational toxicology can increase uncertainty. Whenever relying on computer models, caution is essential to avoid the phenomenon of "garbage in, garbage out" (GIGO). Computer models must be based on sound science and have solid data as inputs. The creators of TiPED point out that, although computational methods have a place, reliance on them alone would create many false negatives. The committee found, "The complex biology of endocrine disruption means that **no single assay nor single approach** [emphasis in original] can be used to identify chemicals with EDC characteristics. Instead, a combination of approaches is necessary, including computational methods as well as both *in vitro* and *in vivo* testing... Today's *in vitro* and

computer models do not incorporate the complexity that this involves. For this reason, *in vivo* assays will also be necessary."⁸

- **Sacrificing precaution for a simpler testing scheme.** Under REACH, chemical manufacturers are required to both avoid animal testing and justify the need for the chemical based on the availability of safer alternatives. This adds an additional layer of protection that is not present in EPA's proposed methodology.

Much of the emphasis in proposals for using computational toxicology is focused on evaluating new chemicals—probably because taking existing chemicals off the market is such a daunting task. However, the current situation allows humans and all other organisms to be exposed daily to many chemicals that should not be present in the environment. Any methods of evaluating chemicals that are used must be embedded in a regulatory system that allows for the removal of EDCs and other problematic chemicals.

A SOLUTION

Certainly, environmentalists and animal rights activists should be able to find common ground. Use of *in vitro* and *in silico* methods will endanger many animals—wild and domesticated—if they lead to allowing the release of dangerous chemicals into the environment. But neither has animal testing protocol prevented the use and dispersal into the environment of dangerous chemicals. In fact, in arguing the need for animal testing, Drs. Vandenberg and Zoeller give evidence that current animal-based testing is inadequate:

First, chronic diseases are at a record high in the U.S. and elsewhere. Today, nearly 20 percent (one in six) of America's children are diagnosed with a developmental disorder including ADHD, autism, and other learning disabilities. ...

Second, many experimental studies show that chemicals approved as safe have harmful effects in human and animal studies. A failure to recognize the fact that chemical exposures are contributing to chronic diseases, with an accompanying increase in health care expenditures, is a failure to recognize the role that EPA must play in today's society.⁹

In addition to the need to evaluate and eliminate hazardous chemicals, the framework in which chemicals are evaluated must change. The *Organic Foods Production Act* (OFPA) provides us with a good model, since the law creates a default bias against synthetic chemical use—natural materials are acceptable unless shown to be hazardous, and synthetic materials are unacceptable unless it is determined that there is an absence of harm (in chemical life cycle analysis)—and the material is essential to and compatible with an organic management system, as defined by law and certified by a third party. As in the TiPED protocol, harm is evaluated regardless of exposure. Synthetic chemicals should not be allowed to be used unless they are essential, and unless their use is sustainable. The law incentivizes investment in nonsynthetic materials for agricultural and processing aids through a petition process that forces the synthetics they are replacing off the allowed list of substances.

We could both reduce the number of animals harmed in testing and protect the environment, including *all* animals, if we reverse the priorities in our policies. Instead of a default allowance of toxic chemicals (unless we have overwhelming proof of harm), we should insist on a default prohibition of the dispersal of synthetic chemicals unless they can meet a high standard of essentiality and absence of harm.

If such a standard seems impossible, consider the fact that the \$52-plus billion (and still growing) organic industry is regulated by a law that requires such a standard—and more. The standard in OFPA is applied by a board of stakeholders—including farmers, environmentalists, consumers, retailers, scientists, and organic certifiers—who must find (by a two-thirds majority) that the manufacture, use, misuse, and disposal of the chemical is necessary for organic production because of the unavailability of wholly natural substitute products, is not harmful to human health or the environment, and is consistent with organic farming and handling. In addition, those decisions are required to be revisited every five years under a sunset provision. While the vested economic interests of industrial agriculture and major food processors are trying to chip away at these rigorous standards, which have served as the foundation of organic market growth, federal organic law provides a framework for assessing whether there is harm and justification for toxic chemical use in light of alternative practices and materials.



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Despite the constant barrage of petitions by manufacturers of inputs used in nonorganic production, the list of synthetic materials allowed in organic production remains small.¹⁰ And organic production is growing faster than any other form of agriculture. Current retail sales in the U.S. in 2018 is up 6.3% from 2017.¹¹

Jay Feldman is a contributor to this piece.

ENDNOTES

- 1 <https://www.epa.gov/newsreleases/administrator-wheeler-signs-memo-reduce-animal-testing-awards-425-million-advance>.
- 2 https://www.huffpost.com/entry/epa-to-reduce-animal-testing_n_5d78e5e4e4b0432f81759073?gucounter=1.
- 3 <https://www.ehn.org/epa-lab-animals-chemical-testing-2640450647.html>.
- 4 <https://www.cnn.com/2019/09/10/reuters-america-update-1-u-s-epa-chief-to-reduce-agency-funded-animal-testing.html>.
- 5 Tom Regan, an American philosopher who specialized in animal rights theory, quoted in <http://www.lonestar.edu/stoanimaltesting.htm>.
- 6 See "Pesticides That Disrupt Endocrine System Still Unregulated by EPA," Spring 2008, "While France Bans a Common Endocrine Disrupting Pesticide, EPA Goes Silent," Spring 2019, *Pesticides and You*.
- 7 For more information, see the article "The Promise and Challenges of 21st Century Toxicology," *Pesticides and You*, 36:1, Spring 2016.
- 8 T. T. Schug, R. Abagyan, B. Blumberg, T. J. Collins, D. Crews, P. L. DeFur, S.M. Dickerson, T. M. Edwards, A. C. Gore, L. J. Guillette, T. Hayes, J. J. Heindel, A. Moores, H. B. Patisaul, T. L. Tal, K. A. Thayer, L. N. Vandenberg, J. C. Warner, C. S. Watson, F. S. vom Saal, R. T. Zoeller, K. P. O'Brien and J. P. Myers, 2013. Designing endocrine disruption out of the next generation of chemicals. *Green Chem.*, 2013, 15, 181–198.
- 9 <https://www.ehn.org/epa-lab-animals-chemical-testing-2640450647.html?rebellitem=1#rebellitem1>.
- 10 <https://ota.com/advocacy/organic-standards/national-list-allowed-and-prohibited-substances>.
- 11 <https://ota.com/news/press-releases/20699>.

A photograph of a white helicopter with blue accents flying over a dense forest, spraying a white mist of pesticides. The helicopter is positioned in the upper right quadrant of the image. The background is a lush green forest with tall trees. The overall scene is captured from an elevated perspective.

Court Strikes Down Local Authority to Restrict Pesticides

OREGON JUDGE CITES STATE PREEMPTION OF LOCAL DEMOCRATIC DECISION MAKING

A Circuit Court judge in Lincoln County, Oregon has overturned a hard-won local ban on aerial spraying of pesticides, citing state preemption of any local ordinance in the state. In her late-September decision, Judge Sheryl Bachart wrote that Oregon's *Pesticide Control Act* "expressly and conclusively displaces any local ordinance regarding pesticide use. The intention of the legislature is apparent and unambiguous." She noted in her opinion that the Oregon Revised Statutes (the codified laws of the state of Oregon), Chapter 634.057 "prohibits local governments from making any ordinance, rule or regulation governing pesticide sale or use."

Local elected officials and residents are often surprised to learn that their authority, generally reserved for local political subdivisions under their local police powers, has been quietly taken away after extensive lobbying by the chemical industry. As the judge in this case points out, state legislatures exercise authority over their municipalities. They have, in most cases, acquiesced to the economic interests and powerful lobbying of the chemical industry.¹ Increasingly, as communities become aware of this attack on the local democratic process to adopt more stringent protections than that afforded by state law, they escalate the call to repeal state preemption. In stark contrast to the Oregon judge's decision is the Maryland Court of Special Appeals ruling in May (upheld on appeal) that Montgomery County, Maryland has the right to restrict pesticides more stringently than the state, and can now begin implementing its 2015 landmark law banning the cosmetic use of pesticides on all privately owned lawns and landscaped property in its jurisdiction.² It will not surprise those who follow this issue that the chemical industry, producers, and users (most prominently the chemical lawn care industry), are back in the Maryland statehouse seeking to overturn the

court decision with a law to preempt, which they have been trying to do for decades.

EXERCISING THE LOCAL RIGHT TO PROTECT HEALTH

Voters in Lincoln County, through a ballot initiative, approved the ban on the aerial spraying of pesticides (Measure 21-177) in 2017, the initiative having been spurred by the work of Lincoln County Community Rights (LCCR), a grassroots organization that "seeks to educate and empower people to exercise their right of local community self-government in matters that pertain to their fundamental rights, their natural environment, their quality of life, their health and their safety." In its advocacy for the initiative, the group cited both the harm done by aerial pesticide spraying to people and ecosystems, and the injustice of the laws—often drafted by corporations for approval by legislatures—that make it illegal for the people to protect their health and safety more stringently than state regulations.

Immediately after the 2017 vote—a "win" for the local community—commercial fisherman and timberland owner Rex Capri and Wakefield Farms, LLC, both of whom used aerial spraying on their properties (prior to the ban), filed a legal challenge to the ban ordinance, which has been largely in effect during the two years since the ordinance passed.

SQUELCHING LOCAL AUTHORITY

The basis of the lawsuit lay in their claims that Lincoln County (or any political subdivision of the state) lacks the authority to create such an ordinance, that local statutes cannot override state law, and that the ban is barred by state regulations governing the use of pesticides, forestry practices, and the "right to farm." The group that formed back in 2017 to oppose the

ban initiative, the Coalition to Defeat Measure 21-177, is pleased with the news. In response to the judge's ruling, the coalition's director, Alan Fujishin, said, "Pesticide use by Lincoln County's farmers, foresters, fishermen, vegetation managers and pest control professionals is already carefully regulated by the Oregon Department of Agriculture and supporting agencies—as it should be."

LCCR joined in the case of *Rex Capri and Wakefield Farms, LLC vs. Dana W. Jenkins and Lincoln County* as an intervenor-defendant. Rio Davidson, a member of LCCR, called the judge's ruling "heartbreaking." He noted that during the two-years-plus when the ban was in effect, most large companies shifted to ground application of pesticides; he now expects that most will revert to aerial spraying.

LCCR PLANS TO APPEAL THE RULING

LCCR asserts that Judge Bachart failed to consider the right of local self-government, and that this right must prevail against state preemption when exercised to protect health, safety, and welfare. LCCR also stated, "It is widely recognized that, under the Ninth Amendment to the U.S. Constitution, states have the authority to recognize and secure 'unenumerated' rights (rights not expressly stated in the Constitution), and thereby to establish greater rights at the state level than the protections provided under federal law.

In covering the Lincoln County case in 2017, Beyond Pesticides noted, "The case points to the legal conundrum that localities face in trying to protect their residents, lands, and resources from the assaults of pesticides, GMOs (genetically modified organisms), factory farms, fracking sites, or a host of other ills that communities may find objectionable because of health, safety, and/or environmental concerns. The tension between states' preemptive authority, and the emerging insistence on greater local control to protect its residents, goes to the very heart of not only how governments at state and local levels derive their authority in a democratic system, but also, how that authority is shared—or not."

THE U.S. SUPREME COURT DECISION

In 1991, the U.S. Supreme Court ruled, in *Wisconsin Public Intervenor v. Mortier*, that the federal pesticide law, FIFRA—the *Federal Insecticide, Fungicide and Rodenticide Act*—which regulates pesticide distribution, sale, and use, does not preempt local jurisdictions from creating more stringent pesticide regulation. Thus, it was ruled that FIFRA nowhere expressly supersedes local regulation. However, and critically, the court left intact the ability of states to preempt such regulations. The essential argument of localities, and of Beyond Pesticides, is that state preemption laws effectively deny local residents and decision makers their democratic right to better protection when a community decides that minimum standards set by state and federal law are insufficient

This tussle between "higher" and "lower" levels of government over the authority to regulate factors in public health and safety—that has played out across communities in the U.S.—goes to some of the fundamental principles on which the American democratic experiment is based. In 2012, Beyond Pesticides executive director Jay Feldman wrote, "This is a very interesting story in American democracy. How did we get to this point in the history of the [U.S.] that we have taken away the local police powers of our local jurisdictions to protect the local public health of our people? This challenges a basic tenet that this country is based on—local governance."

SUPPORTING AND TRACKING LOCAL ACTION

Beyond Pesticides has participated in many of the numerous efforts of localities to establish more stringent controls over pesticide use. Among them: In 2013, the Takoma Park, Maryland City Council passed a law that restricted use of cosmetic lawn pesticides on public and private property within the city; the Town of Ogunquit, Maine banned the use of synthetic pesticides and fertilizers on private property in 2014; Montgomery County, Maryland adopted a law that restricts to a permitted list the use of pesticides on public and private property in 2015; South Portland, Maine, followed by Portland, Maine have adopted ordinances that stop the use of lawn and landscape pesticides, except those that are compatible with organic land management. With state preemption looming, many jurisdictions have turned to the adoption of ordinances that limit the use of pesticides—either broadly or pesticide-specific—on public lands within their jurisdiction. There are 155 local ordinances that regulate the use of toxic chemicals in parks and playgrounds at this writing.³

All of these efforts represent the interest of the public in reducing the health and environmental threats from the use of toxic chemicals in their local communities. A study, "Anti-community state pesticide preemption laws prevent local governments from protecting people from harm" in the *International Journal of Agricultural Sustainability* (2019), finds that, "By eliminating the ability of local governments to enact ordinances to safeguard inhabitants from health risks posed by pesticides, state preemption laws denigrate public health protections."

END NOTES

- 1 Beyond Pesticides has written extensively on preemption of local authority. See *Groups Take on Crisis in Democracy*, 32(1):17, 2012; See also *State Preemption Law: The battle for local control of lawn/activist/documents/StatePreemption.pdf*.
- 2 See *Montgomery County v. Complete Lawn Care, Inc.*, No. 427200V, 2019 WL 1950756 (Md. Ct. Spec. App.), May 2, 2019; upheld on appeal, July 12, 2019.
- 3 See U.S. Map of U.S. Pesticide Reform, <https://www.beyondpesticides.org/programs/lawns-and-landscapes/tools-for-change>.

FIGHTING FOR THE ENVIRONMENTAL RIGHTS OF LAKE ERIE

A community rallies to protect its lake, corporate polluters overrule city in Ohio legislature

DEBRA SIMES

The city of Toledo, Ohio approved a ballot measure in February, 2019 granting legal rights to Lake Erie in the fight to protect it from chemical-intensive agricultural pollution and contamination. Establishing a bill of rights for a body of water is a novel concept that speaks to the need to protect nature and ecological balance in the face of increasing threats to its existence. As a living entity that supports a vast array of living organisms, this approach ascribes legal rights under federal environmental protection law to natural, living systems that support life.

Lake Erie, the fourth largest of the five Great Lakes and the eleventh largest freshwater lake in the world, is once again plagued with pollution, but in this decade it is due primarily to agricultural runoff—as opposed to the raw sewage and industrial effluents that afflicted it in the mid-20th century. Concerned and weary Toledo residents sought remedies through the ballot initiative, “Lake Erie Bill of Rights,” which asked: Should Lake Erie, as an entity, have a legal right “to exist, flourish, and naturally evolve?” The ballot question asked whether the lake ought to be granted rights more typically ascribed to people. Under the measure, people are able to sue polluters on behalf of the lake, using the argument that Lake Erie’s rights have been violated.

However, before the law took effect, the Ohio legislature stepped in and passed an amendment to an unrelated budget bill to preempt the city law. According to *The Intercept* and emails obtained through a public records request, the Chamber of Commerce, working with key Republican lawmakers “slipped the amendment in an appropriations bill at the eleventh hour.” Bill Lyons, a board member of Ohio Community Rights Network is quoted in the media as saying, “This shows the influence of the Chamber of Commerce writing our laws and undermining the democracy of the people of Toledo.”

FIGHTING A HISTORY OF POLLUTION

Fifty years ago, prior to the passage of the 1972 Clean Water Act, U.S. water bodies, including the Great Lakes and their tributaries, were in big trouble. One of Lake Erie’s tributaries—the Cuyahoga River—became infamous for literally catching fire due to the sewage and industrial waste that were freely dumped into it. The early 20th century saw a rise in industrialization around the Great Lakes in which the lakes and its tributaries were used as sewers and waste disposal lagoons. According to *When Our Rivers Caught Fire*, by John Hartig, “Industry was king, and dirty rivers were considered a sign of prosperity.” That is no longer the barometer of success, but the agro-chemical sector continues to be a mighty contributor to pollution of the Great Lakes, through its production, marketing, and sales of synthetic, petrochemically derived fertilizers and pesticides.

Lake Erie has endured, in recent years, summertime algal blooms spurred by terrestrial runoff containing animal manure and synthetic fertilizers, as well as introductions of non-native fish species. The lake is also at risk of impacts from oil spills, from both vessels traversing the lake and pipelines that operate nearby. Fouling of public resources, despite real and significant progress from the 1970s through the first decade-plus of the 21st century, continues to threaten public health and the integrity of terrestrial and marine ecosystems, as well as the environmental services they provide. Currently, pollution of waterways tends to include agricultural runoff (nutrient pollution, especially phosphorous and nitrogen); pesticide contamination; and the occasional industrial (petroleum, chemical, or mining) accident or malfeasance.

Given the current administration in Washington, DC, and its goal for federal agencies of “reducing regulation,” these issues again are rising to the forefront of concern. A 2017 Gallup poll found that, across the nation, people are more concerned about water pollution than they have been in nearly two decades: In the poll, 63% of people “worry a great deal about pollution of drinking water,” and 57% “worry a great deal about pollution of rivers, lakes, and reservoirs.” (In U.S., Water Pollution Worries Highest Since 2001, Gallup, 2017)

BOX 1

Responding to a Supreme Court Decision

The Toledo effort, and a number of others around the country, owe some of their grounding to a 1972 Supreme Court ruling in *Sierra Club v. Morton*. (Roger Morton was then U.S. Secretary of the Interior.) In that case, the Sierra Club sought—and failed—to prevent development of a portion of the Sequoia National Forest; the court found, 4–3 that the Sierra Club did not have standing in the suit because it failed to show that any of its members had suffered or would suffer injury as a result of the defendant’s actions. But Justices William O. Douglas, Harry A. Blackmun, and William J. Brennan, Jr. wrote critical dissenting opinions, respectively, opining that “standing doctrine should allow environmental organizations such as the Sierra Club to sue on behalf of inanimate objects such as land;” that “when faced with new issues of potentially enormous and permanent consequences, such as environmental issues, the Court should not be quite so rigid about its legal requirements;” and that the Court should have considered the case on its merits. Justice William O. Douglas additionally wrote that “contemporary public concern for protecting nature’s ecological equilibrium should lead to the conferral of standing upon environmental objects to sue for their own preservation.”

The advocacy group Toledoans for Safe Water gathered 11,000 signatures in an effort to advance the ballot initiative, which was drafted with the assistance of CELDF, the Community Environmental Legal Defense Fund. The health of Lake Erie is no small thing to Toledo-area residents, who depend on the lake for their drinking water. In 2014, the city all but closed down when the lake became so polluted with the slimy algal mats—from phosphorus runoff from upstream farms—that hospitals and stores and restaurants shuttered, and half a million people had to depend on bottled water in that year’s very hot August.

The text of the initiative begins, “Establishing a bill of rights for Lake Erie, which prohibits activities and projects that would violate the bill of rights: We the people of the City of Toledo declare that Lake Erie and the Lake Erie watershed comprise an ecosystem upon which millions of people and countless species depend for health, drinking water and survival. We further declare that this ecosystem, which has suffered for more than a century under continuous assault and ruin due to industrialization, is in imminent danger of irreversible devastation due to continued abuse by people and corporations enabled by reckless government policies, permitting and licensing of activities that unremittingly create cumulative harm, and lack of protective intervention. Continued abuse consisting of direct dumping of industrial wastes, runoff of noxious substances from large scale agricultural practices, including factory hog and chicken farms, combined with the effects of global climate change, constitute an immediate emergency.”

RIGHTS OF NATURE—THE HISTORY

This effort, like a number of similar initiatives that have taken place in various municipalities in recent years, rests on a “Rights of Nature” argument, which says that features of the natural world have an inherent right to exist with fundamental integrity intact. With “standing”—the legal right to bring suit against an entity by virtue of enduring harm—being a critical concept to the legal and judicial system, such efforts look to establish legal status for an aspect, or aspects, of the local natural world, such as a water body, forest, fauna, flora, etc. Legal arguments in litigation brought on this basis often seek to demonstrate that current laws are inadequate to protect nature against environmental harm.

Other, similar initiatives include:

- Tamaqua Borough, Pennsylvania, approved in 2006 a Rights of Nature ordinance after it banned industry from dumping dredged minerals and sewage sludge into open pit mines. The law says that corporations “could not ‘interfere with the existence and flourishing of natural communities or ecosystems, or to cause damage’ to them within the township.”

The health of Lake Erie is no small thing to Toledo-area residents, who depend on the lake for their drinking water. In 2014, the city all but closed down when the lake became so polluted with the slimy algal mats that half a million people had to depend on bottled water in that year's very hot August.

- In 2013, Santa Monica, California passed a law requiring the city to “recognize the rights of people, natural communities and ecosystems to exist, regenerate and flourish.”
- In Minnesota, the White Earth Band of Ojibwe recently passed a tribal law establishing the natural rights of a plant central to their culture—wild rice (*Zizania aquatica*), or manoomin, the Ojibwe term. It is the first time that a plant has been granted “personhood” in the U.S., and is understood to be establishing a foundation on which to mount opposition to an Enbridge Energy oil pipeline that would threaten waters in which local tribes have treaty rights to harvest rice, hunt, and fish.

- A similar law was adopted by a Chippewa tribal group, the 1855 Treaty Authority, that represents the beneficiaries of an 1855 land pact between the Chippewa tribes and the U.S. government.

Of course, there are opponents to Rights of Nature initiatives. In the Toledo case, opposition came primarily from large agricultural operations in the area, which shed the fertilizer runoff (which often include pesticide residues, which can cause fish kills) that feeds the toxic algae in Lake Erie, causing lethal-to-other-life algal blooms that deprive the water of oxygen. Farmers claimed that with passage of the measure thousands of farms could be sued for damages for polluting the lake and be driven out of business.

During the past decade-plus, other attempts to establish nature-based rights have been supported and guided by CELDF. The organization describes its work as “a paradigm shift, a move away from unsustainable practices that harm communities, and a move towards local self-government.” It helps communities with establishment of legal community rights, including environmental rights, worker rights, rights of nature, and democratic rights. Typically, establishment of such rights happens through the creation of local laws that seek to set out one or more of those rights as a basis for preventing activities that a community finds unacceptable—



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most often, activities such as fracking, water pollution, unhealthy working conditions, pesticide use, or the environmental and/or labor ravages of particular industries, such as mining.

Of the Toledo ballot initiative, CELDF executive director Thomas Linzey said that the “intent of the initiative is twofold—to send a warning that the community is fed up with a lack of state and federal action to protect Lake Erie, and to force the courts to recognize that ecosystems like the lake possess independent rights to survive and be healthy. In other words, that rivers

have a right to flow, forests have a right to thrive, and lakes have a right to be clean.” CELDF says such efforts demonstrate the resolve of communities to fight environmental degradation, and send the message that some companies might better look elsewhere to do business. Supporters of Rights of Nature initiatives are, some environmentalists say, inviting a rethinking of nature and the place of humans in it. According to Mr. Linzey, “There’s no precedent for any of this. It is almost a new consciousness—that a community is not just *Homo sapiens*.”

BOX 2

Lake Erie Bill of Rights*

ESTABLISHING A BILL OF RIGHTS FOR LAKE ERIE, WHICH PROHIBITS ACTIVITIES AND PROJECTS THAT WOULD VIOLATE THE BILL OF RIGHTS

We the people of the City of Toledo declare that Lake Erie and the Lake Erie watershed comprise an ecosystem upon which millions of people and countless species depend for health, drinking water and survival. We further declare that this ecosystem, which has suffered for more than a century under continuous assault and ruin due to industrialization, is in imminent danger of irreversible devastation due to continued abuse by people and corporations enabled by reckless government policies, permitting and licensing of activities that unremittably create cumulative harm, and lack of protective intervention. Continued abuse consisting of direct dumping of industrial wastes, runoff of noxious substances from large scale agricultural practices, including factory hog and chicken farms, combined with the effects of global climate change, constitute an immediate emergency.

We the people of the City of Toledo find that this emergency requires shifting public governance from policies that urge voluntary action, or that merely regulate the amount of harm allowed by law over a given period of time, to adopting laws which prohibit activities that violate fundamental rights which, to date, have gone unprotected by government and suffered the indifference of state-chartered for-profit corporations.

We the people of the City of Toledo find that laws ostensibly enacted to protect us, and to foster our health, prosperity, and fundamental rights do neither; and that the very air, land, and water—on which our lives and happiness depend—are threatened. Thus it has become necessary that we reclaim, reaffirm, and assert our inherent and

inalienable rights, and to extend legal rights to our natural environment in order to ensure that the natural world, along with our values, our interests, and our rights, are no longer subordinated to the accumulation of surplus wealth and unaccountable political power.

We the people of the City of Toledo affirm Article 1, Section 1, of the Ohio State Constitution, which states: “All men are, by nature, free and independent, and have certain inalienable rights, among which are those of enjoying and defending life and liberty, acquiring, possessing, and protecting property, and seeking and obtaining happiness and safety.”

We the people of the City of Toledo affirm Article 1, Section 2, of the Ohio State Constitution, which states: “All political power is inherent in the people. Government is instituted for their equal protection and benefit, and they have the right to alter, reform, or abolish the same, whenever they may deem it necessary; and no special privileges or immunities shall ever be granted, that may not be altered, revoked, or repealed by the general assembly.”

And since all power of governance is inherent in the people, we, the people of the City of Toledo, declare and enact this Lake Erie Bill of Rights, which establishes irrevocable rights for the Lake Erie Ecosystem to exist, flourish and naturally evolve, a right to a healthy environment for the residents of Toledo, and which elevates the rights of the community and its natural environment over powers claimed by certain corporations.

* See complete Lake Erie Bill of Rights at <https://beyondpesticides.org/assets/media/documents/LakeErieBillOfRights.pdf>.



Keeping Organic Strong

Why should organic consumers be concerned about chemical-intensive production of oranges? See page 21.

The importance of public participation in maintaining the integrity of organic standards and labeling

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The gatekeeper of organic standards, the National Organic Standards Board (NOSB), held its fall 2019 meeting in Pittsburgh, Pennsylvania amid ongoing controversy about the integrity of the USDA organic seal. Despite the threats to organic integrity, organic overall continues to achieve a remarkable elimination of toxic pesticides in commercial food production with practices that support local ecosystems.

CONTROVERSIES NEED RESOLUTION

There are blemishes on the industry that risk undercutting public trust in the organic market that has been built by years of investment. At an NOSB meeting in 2017, the board failed to prohibit organic certification of hydroponically grown food with permitted inputs, sometimes referred to as soil-less production. The controversy pertains to the foundational importance of soil and the natural cycling of nutrients in organic agriculture. (See Box 1, p. 20.) The National Organic Program (NOP) in USDA has disrupted some critical board functions, including the decade-old process for sunseting allowed synthetics in organic production and processing on a five-year cycle. NOP has turned the process for relisting allowed substances from requiring a 2/3's (super-majority) vote of the NOSB to retain a synthetic material on the allowed list to a review process that requires a super-majority vote of the board to delist a material. This effectively changed the default assumption that unless a near consensus of the board could be reached, synthetics should not be allowed in organic. Ongoing questions of industrial scale livestock operations deny animals access to pasture. And, certification standards by some third-party organic certifiers are allowing practices and enforcement violations that sully an otherwise rigorous oversight and inspection system that is found nowhere else in U.S. agriculture.

THE NOSB AGENDA

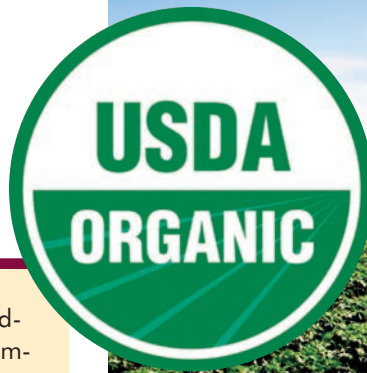
The fall meeting did not delve into the controversies that threaten to disrupt the organic market. In large part, that is because USDA has stripped away the NOSB's authority to set its own agenda and workplan. The body no longer has the power to focus on important issues like macro violations of the law and critiquing NOP enforcement efforts. In this context, the responsibility to protect and reinforce the integrity of the organic standard setting process, practices, and allowed materials falls to organic consumers and producers, through independent programs like the Real Organic Project and Beyond Pesticides' OrganicEye project.

The controversies that did emerge at the fall 2019 NOSB meeting go to the core values and standards of the law governing the production, processing, and labeling of organic food. To those who do not follow the process, the debate on allowed substances may seem technical and esoteric, but, in fact, they go to the heart of the food production system and whether organic will continue to strive to meet the challenges of a clean food production system that protects the environment, farmers, farmworkers, biodiversity, and people. While the meeting focused on allowed substances, the larger issue looming over these decisions is the protection of hard fought organic integrity and public trust in all aspects of the organic system.

NITRITES IN ORGANIC?

While almost all votes at the NOSB meeting were unanimous—relating mostly to either adding or maintaining synthetic/non-organic materials on the list of allowed substances—the debate on the continued allowance of nitrates and nitrites in curing meat raises questions that go to the heart of organic integrity. Nonorganic celery concentrates nitrates, which it

OFPA and Hydroponics



The *Organic Foods Production Act* (OFPA) embodies a vision of ecosystem complexity that is incompatible with using bags of nutrients as a basis for organic fertility. In particular, hydroponic and container systems are inconsistent with the following sections of OFPA:

- **OFPA §6503(c)** In developing the program under subsection (a), and the National List under section 6517 of this title, the Secretary shall consult with the National Organic Standards Board established under section 6518 of this title. [The NOSB recommended against allowing hydroponics in organic production in 2010.]
- **OFPA §6513(b)** An organic plan shall contain provisions designed to foster soil fertility, primarily through the management of the organic content of the soil through proper tillage, crop rotation, and manuring. [Fertility in hydroponic and container systems comes from added nutrients, not soil fertility.]
- **§6517 (b) Content of list.** The [National List] shall contain an itemization, by specific use or application, of each synthetic substance permitted under subsection (c)(1) or each natural substance prohibited under subsection (c)(2). [No material on the National List is specified for use in hydroponics or containers.]
- **§6517(c)(1)** Exemption for prohibited substances in organic production and handling operations. The National List may provide for the use of substances in an organic farming or handling operation that are otherwise prohibited under this chapter only if—
 - (A) the Secretary determines, in consultation with the Secretary of Health and Human Services and the Administrator of the Environmental Protection Agency, that the use of such substances—
 - (i) would not be harmful to human health or the environment;
 - (ii) is necessary to the production or handling of the agricultural product because of the unavailability of wholly natural substitute products; and
 - (iii) is consistent with organic farming and handling;

[Materials used to deliver fertility to hydroponic and container systems have not been evaluated and found necessary and consistent with organic practices.]



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absorbs from the soil that may be treated with synthetic fertilizers, and those nitrates are then applied in the curing process in the form of nitrites in fermented celery powder. This situation raises for the NOSB the question of whether there are alternative processing methods—or, if not, whether the treated meats (e.g., bacon) should qualify for the organic label. It is often the processing of agricultural products that introduces questionable inputs or substances. In this regard, the NOSB does not challenge whether a product should be available in market, it simply determines whether the end product qualifies for the organic label.

Beyond Pesticides had commented in previous sunset rounds in favor of removing non-organic celery powder, but the issue received much more attention going into this meeting as a result of a petition that Consumer Reports (CR) and the Center for Science in the Public Interest (CSPI) has filed with the Food and Drug Administration. The petition applies to processed meat in general, not only organic meat. It highlights the fact that meat that is processed using celery powder instead of chemical nitrates and nitrites is allowed—in fact, required—to be labeled “uncured.” Such products are generally labeled “does not contain nitrates or nitrites.”* The asterisk leads to a footnote in tiny print saying, “except that contained in celery powder or sea salt.”

CR and CSPI supply research showing that the nitrites in fermented celery powder (which is the form used in “uncured” processed meat) has identical properties—including reacting with meat protein to form carcinogenic nitrosamines—to the chemical form found in “cured” meats. This is an important issue for organic processing because the *Organic Foods Production Act* (OFPA) states, “For a handling operation to be certified under this chapter, each person on such handling

operation shall not, with respect to any agricultural product covered by this chapter— . . . (3) add any sulfites, except in the production of wine, nitrates, or nitrites.” Additionally, it should be noted, a clear legal requirement for the allowance of a synthetic or non-organic agricultural ingredient on the National List is that it is safe for human consumption. In spite of this clear instruction in OFPA, the findings related to serious health concerns, and labeling misrepresentations raised by CR and CSPI, none of which were disputed by NOSB members, the board voted 12-1, with one abstention, to retain celery powder as an allowed ingredient in organic meat.

ORANGE PULP

One issue that did not appear to be controversial going into the meeting resulted in the most board disagreement. Orange pulp produced by chemical-intensive agriculture came into the meeting with a 4-1 vote in the Handling Subcommittee in favor of removal, but was kept on the National List by a vote of 7-5 in favor of removal, with one abstention. Under current sunset rules, a two thirds majority is required to remove a material from the National List.

After NOP reversed the sunset process, which later was muddled by a provision in the Farm Bill advanced by agribusiness-friendly Senators, materials like non-organic orange pulp

typically do not sunset. In the past, this 7-5 vote by the NOSB would have resulted in the prohibition of orange pulp, with its potential agrichemical residues, from organic product formulations.

GENETIC ENGINEERING

The NOSB received thousands of comments emphasizing that genetic engineering is not acceptable in organic production. There was no controversy concerning the proposals on further clarification of the definition of excluded methods or genetic transparency of seed grown on organic land. Those comments were intended to send a message to USDA’s Undersecretary for Marketing and Regulatory Programs, Greg Ibach, who had indicated in Congressional testimony in July that gene editing might be acceptable in organic production.

CONCLUSION

Public engagement with the NOSB process is critical to the future of and public trust in the organic market. Through its *Keeping Organic Strong* campaign and webpage, Beyond Pesticides tracks the issues before the NOSB and provides the public with draft comments on all the issues before the board. It is only with public involvement in the NOSB process that we will ensure accountability to consumer and farmer expectations of organic practices.

BOX 2

The Launching of OrganicEye

To elevate our voice, Beyond Pesticides announced the formation of a new investigative arm, OrganicEye. This watchdog agency will focus on defending the “time-honored philosophy and legal definition of organic farming and food production.”

With Beyond Pesticides’ executive director having served on the National Organic Standards Board, we believe that certified organic production must continue to offer a healthier marketplace alternative and critical environmental protection.

As organic agriculture and food marketing has grown into an over \$50 billion industry, corporate agribusiness has influenced USDA to shift primary organic production from family-scale farms to large livestock factories, and allow massive hydro-

ponic/soilless greenhouses and fraudulent imports—all devastating to ethical farmers, businesses, and consumers. OrganicEye is being led by Mark Kastel, one of the founders of The Cornucopia Institute, a venerable organic farm policy research group. He brings over 30 years of diverse involvement in the organic industry. Mark has worked as a certified agricultural producer, business development consultant, and registered lobbyist, and is one of the most experienced independent fraud investigators in the organic industry.

With OrganicEye, we will amplify the voices of committed organic stakeholders who share our strong belief that continued growth of trusted organic practices is essential to solving escalating environmental and health problems, from the climate crisis to the insect apocalypse.



OrganicEye has established a toll-free hotline, 1-844-EYE-TIPS (844-393-8477), to gather confidential tips from the public on threats to organic integrity.

FUNGI—UNDERAPPRECIATED AS FRIENDS, OVERRATED AS FOES

TERRY SHISTAR, PHD

Fungi are all around us—mostly invisible to our eyes—but we rarely take notice of them, aside from the occasional attack of athlete's foot or a couple of edible species available in the grocery store. They are often viewed as mostly harmful—poisonous toadstools, molds spoiling food, and pathogens attacking our skin. However, fungi perform essential ecosystem functions. As decomposers, they not only perform the essential housekeeping function of breaking down dead organic matter, but their disassembling of complex organic molecules also releases simple compounds that feed plants.

Once classified as plants, fungi now have their own biological kingdom, considered to be more closely related to animals than plants. Mushrooms are the fruiting bodies of fungi. The vegetative body of the fungus is a mycelial mat, made up of threads known as **hyphae**. You can see **mycelium** in a pile of rotting leaves or wood chips, or spreading through a rotting log. Knotted hyphae form fruiting bodies (mushrooms) capable of producing spores.

CATEGORIES OF FUNGI

Fungi are placed into four categories, according to how they acquire nutrition. **Saprophytes** are decomposers, feeding on dead organic matter. Most of the familiar edible mushrooms—the ones that can be easily cultivated—are saprophytes. These include the field mushroom—and most common mushroom in grocery stores (*Agaricus bisporus*), which grows on composted manure, as well as shiitake (*Lentinula edodes*), oyster (*Pleurotus ostreatus*), and maitake (*Grifola frondosa*), all of which decompose wood. Shiitake, oysters, and maitake are **primary decomposers** because they are the first to consume the dead plant, while the common field mushroom is a **secondary** decomposer because it consumes resources left after manure has been composted.

Parasitic fungi consume living tissue. A spectacular example is the honey mushroom *Armillaria ostoyae*, which may be the largest organism in the world. One 2,400 acre site in Oregon had a contiguous mat of mycelium, estimated to be 2,200 years old, before logging roads dissected it. Some saprophytic mushrooms may start their meals on dying trees, thus appearing to be parasites. Others, including maitake, may consume dead parts of living trees.

Mycorrhizal fungi form symbiotic relationships with trees and other plants. Mycorrhizal fungi may form external sheaths

around plant roots (*ectomycorrhizal fungi*) or penetrate root cells (*endomycorrhizal fungi*). Either way, the mycelium vastly increases the surface area available for absorbing nutrients and moisture, transporting them to the plant. In return, the plant supplies the fungus with secretions of sugars. Most plant species participate in mycorrhizae. (The term applies to the association, not the fungus.) They grow faster and resist disease better than plants that do not have mycorrhizal partners. Mycorrhizae communicate among trees of different species, help to combat pests, and transport needed nutrients from one to another.

Mycorrhizal species include truffles (*Tuber spp.* and others), chanterelles (*Cantharellus spp.*), and morels (*Morchella spp.*)—although some speculate that morels may also be saprophytes. Many of the highly toxic Amanitas are also mycorrhizal. Mycorrhizal species are not easily cultivated because of the necessity of maintaining the association with the plant partner, so they are generally harvested from the wild.

Endophytic fungi are similar to mycorrhizal fungi in that they form associations with plants. However, endophytes never perforate cell walls of plants. Their mycelia thread among plant cells, enhancing plant growth and nutrient uptake, while producing mycotoxins that protect the plant from herbivores. Most endophytes do not produce mushrooms, though some wood conks once classified as parasites—such as the tinder polypore (*Fomes fomentarius*) are now considered to be endophytes. Endophytes are of special interest because plants inoculated with them—for example, turf grasses such as perennial ryegrass, tall fescue, and fine fescue—are protected from insects, drought, and disease. On the other hand, when those grasses are used for pasture, they may poison horses or cattle.

MYCOMEDICINALS

The first question most beginning mycologists usually ask about a mushroom is, “Can I eat it?” Mushrooms are great to eat, but they are also potent medicine. Like plants, mushrooms are subject to attack by other organisms, including bacteria and other microorganisms. Just as humans can take advantage of compounds produced by herbs, humans can also take advantage of compounds produced by mushrooms. Paul Stamets, author of *Mycelium Running* and founder of the company Fungi Perfecti, has created a table that categorizes the medicinal effects of 18 mushrooms. In addition to fighting infections, medicinal fungi may fight cancer, normalize blood pressure and blood sugar, and act as tonics to the immune,

cardiovascular, respiratory, nervous, and reproductive systems, and aid in detoxification by supporting the kidneys and liver. Reishi (*Ganoderma lucidum*) is an example of a mushroom that performs almost all of these functions. Other medicinal mushrooms include *Cordyceps sinensis*, maitake, shiitake, and turkey tails (*Trametes versicolor*). Many of the medicinal mushrooms are not edible because they are too tough, but their medicine can be consumed in the form of teas or extracts.

MYCORESTORATION

Terrestrial life comes from the soil. When that soil is damaged—by clearcutting forests, use of poisons in industrial agriculture, or bulldozing for development—the introduction of fungi is an important step in rebuilding it. Rebuilding soil means rebuilding the capacity of the soil to feed plants, hold water, and sequester carbon. Mycorestoration includes the use of fungi to filter water, rebuild forest communities, and remediate environmental contamination.

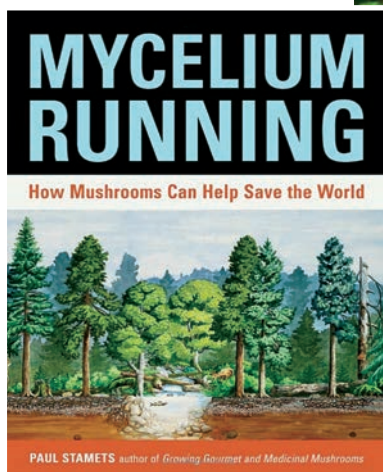
Mycofiltration can be used to prevent pollutants from entering streams and other waterbodies. Bunkers of organic substrate—such as woodchips in burlap sacks—are inoculated with spawn, and placed in such a way that they intercept the flow of water. This technique can be used to prevent excess bacteria and nutrients from flowing off feedlots and into streams.

Mycoforestry helps to preserve and enhance forest ecosystems by incorporating fungi into forest practices. For example, selective harvesting of trees in a way that minimizes disturbance to mycorrhizal fungi and inoculating new trees with mycorrhizal fungi help trees to regrow. Introduction of saprophytes that help plant communities, feed insects, and compete with parasitic fungi can help build biodiversity. Leaving some dead wood in contact with the soil helps to conserve native fungi and feed insects, birds, and mammals.

Mycoremediation is a particularly exciting use of fungi. Fungi are voracious consumers of organic (carbon-containing) chemicals and can be used to break down toxic chemicals, such as those found in oil spills. For example, the Washington State Department of Transportation tested the decomposition of diesel-contaminated soil, layered with wood chips inoculated with oyster mushrooms (*Pleurotus ostreatus*). After eight weeks, total petroleum hydrocarbons went from the original 20,000 parts per million (ppm) to less than 200 ppm.

For information about fungi and how to use them, see *Mycelium Running* by Paul Stamets.

www.BeyondPesticides.org



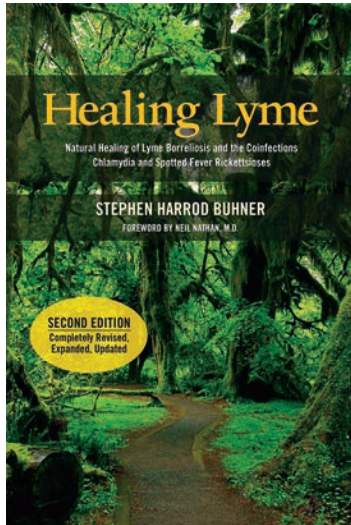
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Understanding Lyme Disease from an Herbalist's Perspective



Healing Lyme: Natural Healing of Lyme Borreliosis and the Coinfections Chlamydia and Spotted Fever Rickettsiosis, Second Edition; Stephen Buhner; Raven Press; Revised, Expanded, Updated edition (December 7, 2015)

Unless you have Lyme disease, are a doctor treating patients with the disease, have friends or family with the disease, or have an interest in the ecology of disease, you are likely to find *Healing Lyme* to be way more

than you ever wanted to know about Lyme disease. However, those four categories cover a lot of people. Not all will be interested in the whole book, and the author encourages readers to choose sections according to their interests—for example, “If all you want is to know is how to treat your Lyme infection effectively, please . . . just skip ahead to Chapter Eight.”

Pesticides and You is not a medical journal, and although this review will not cover in depth the medical aspects of the book, I will say a few words here and there to put in context the aspects more directly relevant to *Beyond Pesticides*.

This review addresses the second edition of *Healing Lyme*, published in 2015, ten years after the first edition. The book almost doubled in size, as a result of the author’s interactions with over 25,000 people with Lyme disease, and review of over 10,000 peer-reviewed journal articles. Stephen Buhner is a well-known herbalist, and like others in his field, is well-versed in plants—not just their medically-useful constituents, but also their ecology. He has a healthy respect for the wisdom of “lower organisms,” a label that many might apply to bacteria and plants.

The book addresses first misconceptions about Lyme disease. This topic is of importance to *Beyond Pesticides* because mistaken ideas lead to the use of toxic chemicals to avoid Lyme. A great deal of controversy exists concerning the rate of infection with Lyme disease (and related diseases), the vectors of the bacteria that cause the disease, the geographic distribution of the disease, and the effectiveness of the standard antibiotic treatment. The author concludes that rates of infection are much higher than generally accepted; that *Borrelia* spirochetes are present in and transmitted by a number of biting arthropods (including mosquitoes, mites,

fleas, and flies) and use many animals as hosts (not just mice, deer, and humans); that the disease is endemic to most states in the U.S.; and that although the standard antibiotic treatment works for many patients, it does not work for all.

The book examines the ecology of Lyme disease on two levels—macroecology and microecology. Both are necessary for understanding and avoiding the disease. On the macro level, it is important to understand that the ticks that serve as the primary (though not only) vectors for the disease organisms *Borrelia* spp. attach themselves to, and infect, many large and small animals from mice to deer to dogs to lizards to birds, to name a few. Birds, especially, carry the ticks and *Borrelia* spirochetes over long distances—including stops (and distribution) in urban areas. It is practically impossible to avoid Lyme disease by limiting your movements geographically. Lyme disease is also part of an evolving landscape, in which populations of some host species have been decimated or eradicated, provoking *Borrelia* to seek new hosts. The landscape has also changed in that some animals who remove the tick vectors during grooming—for instance, possums—have become less common.

On the micro level, *Borrelia* adapts to each new host it encounters. Every individual is different, and *Borrelia* is an obligatory parasite—meaning that it can only persist with resources from its host—so it must adapt. The presence of pharmaceuticals or phytochemicals from herbs in the bloodstream are factors to which the bacteria must adapt. Collagen is the source of the nutrients needed by *Borrelia*, so the author highlights this message, “The most important thing to understand about Lyme disease is that the bacteria have an affinity for collagenous tissues. This is at the root of every symptom they cause.”

Herbal Prevention and Treatment

Among the most useful herbs for treating Lyme disease is *Polygonum cuspidatum* (Japanese knotweed), which, although widely considered to be an “invasive” (and hence undesirable) plant, “tends to move into new regions about six months before Lyme disease becomes endemic there.” The fact that Lyme disease can be encountered just about anywhere may present a scary picture.

However, I will close with a couple of recommendations for avoiding the disease. First, the best defense against *Borrelia* is a healthy immune system, and the herb astragalus (*Astragalus propinquus*) is recommended as a good herb for protecting the immune system. The next best defense is avoidance of the disease vectors, and although it is not possible to avoid all possible arthropod carriers, a recipe for a natural tick repellent can be found on page 237.



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Fall 2019 ■ Vol. 39, No. 3



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