



MEETING EXISTENTIAL CHALLENGES: EMPOWERING ACTION FOR CHANGE WITH SCIENCE

By Jay Feldman

The year of scientific studies (2023), both human and environmental health, covered in this issue form the foundation of the extraordinarily compelling need for transformative action to end petrochemical pesticide and fertilizer use. To the extent that science is a dispassionate search for the truth, all levels of decision making, from personal to policy, must apply scientific findings with passion in order to protect health and the environment. If local, state, and federal policies and decisions of people, families, and government are informed by science, then this issue of *Pesticides and You* calls for dramatic and immediate changes in practices and policies to protect public health and the ecosystems critical to supporting life.

The illnesses that are the focus of scientific pesticide research compiled in this issue have touched most families with devastating consequences, including cancer, disruption of the endocrine system, neurological damage, gut-brain effects, reproductive dysfunction, learning disabilities and behavioral disorders, Parkinson's disease, and more. Similarly, the devastating impacts of pesticides on biodiversity, from pollinators to endangered species, affect the long-term survival of life on the planet. As health and the environment are in steep decline,

the interconnected adverse effects associated with the cycle of dependency on petroleum-based pesticides and fertilizers contribute to the climate emergency by releasing greenhouse gases and diminishing the ability of soil to sequester carbon.

Cycle of Petrochemical Dependency

We have [noted previously](#) that chemical-intensive land management and agricultural practices with their dependency on synthetic fertilizer deplete the microbial health of the soil and its ability to cycle nutrients through the breakdown of organic matter, thus contributing to disease and infestations in plant populations that are used to justify toxic pesticide use. As the problems increase, more toxic pesticides are used. This treadmill results in less resilient landscapes and crops that are more vulnerable to drought and swings in the weather. As we study the scientific findings on adverse effects, it becomes clear that the challenges to health and the environment can be ended with the adoption of land management practices that do not use petrochemical inputs—a system that adopts organic practices. This is no longer an unrealistic pipe dream but is based on existing productive and profitable practices in the private sector, and efficacious and cost-effective practices in the public sector—systems already in place that can be scaled up rapidly.

In focusing on the harm to human health and ecosystems, it is critical to evaluate the necessity and efficacy of the toxic products being evaluated. How is the harm wreaked on people and the environment justifiable when end-goals can be achieved without them? In this regard, the science on the resistance of target organisms identified as pests or the lack of product efficacy, discussed in this issue, illustrates a failure in the analysis (regulatory review) to assess the science on ecosystem compatible methods and materials.

When the scientific findings in this issue, which add to a history of similar findings, are evaluated under the policy governing pesticide registration in the *Federal Insecticide, Fungicide, and Rodenticide Act* (FIFRA), the legal standard of “reasonable” adverse effects is not met, given the availability of nontoxic alternatives. The pesticide hazards documented in this issue are devastating and, operationally, the viability of organic alternatives makes them unjustified. The regulatory body responsible for the harm that people and the environment suffer, the U.S. Environmental Protection Agency (EPA), applies limited science—without attention to the robust analyses in the open scientific literature—from laboratory animal studies on discrete and complex interactions and health endpoints. The limitations of the regulatory review have been [widely evaluated and discussed](#) in the scientific literature and by the Office of the Inspector General on general population effects as well as those [disproportionately harmed](#). The assumption in regulatory reviews that the chemicals are needed for agricultural productivity and profitability and to ensure quality of life is not borne out by the science. And in light of the catastrophic scientific findings when taken in the aggregate, the reasonable harm test fails. Moreover, the proof of this failure emerges over the 50 years of EPA’s existence and the underlying statutes that have guided the agency’s action, culminating today in the existential crises to which petrochemical pesticides and fertilizers have contributed significantly.

Compilation of Dramatic Scientific Findings

This hard-hitting compilation contains key scientific research and issues that Beyond Pesticides has tracked over 2023, adding to the body of evidence in support of the urgent need to move away from pesticides that contribute to escalating existential threats—health crisis, biodiversity collapse, and the climate emergency. In addition to the print edition, this issue can be found in a digital format at bp-dc.org/MeetingExistentialChallenges2023.24. As we wrote in the introduction to the previous issue of *Pesticides and You*, “Whether talking about serious health threats from chemical-induced diseases, the collapse of life-sustaining biodiversity, or the dramatic destruction caused by greenhouse gases and rising and erratic temperatures, the interconnectedness of the crises requires strategic solutions that are holistic and nurturing of nature.”

Organization of this Issue

The issue is organized to address the crises by cataloging the emerging science over the last year into five categories

of petrochemical pesticide and fertilizer effects: (i) Toxicology—Human Health Threats, (ii) Disproportionate Harm, (iii) Threatened Biodiversity and Ecosystems, (iv) Pest Resistance and Failed Efficacy, and (v) Organic and Nontoxic Practices.

In this issue, the body of science describing the specific adverse effects is dramatic—from the perspective of what science is telling us repeatedly with increasing urgency over the last 50 years. At the same time, the organic solution in study after study and operationally in the marketplace charts a clearly viable and cost-effective path forward now. In light of these facts, the delay in the transition away from petrochemical pesticides and fertilizers is truly unconscionable. “Reduction” strategies that tinker with or tweak chemical-dependent land management practices are not defensible any longer. The lack of preventive protection of people and families whose lives are disrupted or destroyed by the diseases and illnesses documented in science journals as being initiated

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or promoted by pesticide exposure—from production, transportation, use, storage, to disposal—is embedded in federal, state, and local policies. The data clearly finds that the compromises that statutes and regulations make with people’s lives and the sustainability of the ecosystems that support life serve corporations that benefit from the sale and use of these toxic substances, not society at-large.

Beyond Pesticides tracks these studies on a daily basis and publishes reviews of the scientific literature through our *Daily News*. Seeing the range of health and environmental threats collected together in this compendium is shocking and difficult to take in. For that reason, we assemble the reviews in this issue in one place and then organize all the data in our Pesticide-Induced Diseases Database, a relational database available on our website at bp-dc.org/PIDD.

The patterns of diseases and ecosystem destruction linked to a dramatic range of adverse human health and environmental effects are stark and serve as a call for systemic change without delay.

In Section 1, Toxicology—Human Health Threats, studies address breast cancer and other cancers, disruption of the endocrine system (the message system of the body leading

to cancer and other effects), reproductive effects, Parkinson's disease, liver damage, metabolic disorders, chronic kidney disease, diabetes, obesity, shingles, pregnancy and reproductive complications, developmental effects in children, nervous system disruption, neurodevelopmental problems, seizure disorders including epilepsy, gut-brain effects, behavioral effects, asthma and respiratory disorders, mast cells impact (immune system regulators), brain effects, pregnancy and fetal effects, PFAS (polyfluoroalkyl substances) contamination linked to a large range of effects including cardiovascular risks, and issues pertaining to indoor air contamination, highly destructive accidents, and regulatory weakness that questions scientific integrity conflicts of interest, and pesticide dangers at golf courses.

In Section 2—Disproportionate Harm, studies address global malnutrition linked to pollinator decline with highest threat to low-income people, governmental support of environmental justice to ameliorate disproportionate effects of pollution and climate change, history of disproportionate harm on Juneteenth, neurodevelopmental disorders, effects to farmworker pregnancy, and indigenous people's knowledge applied to protecting biodiversity.

In Section 3—Threatened Biodiversity and Ecosystems, studies on limits of mitigation measure to protect pollinators, degradation of color discrimination in pollinators, fungicide linked to adverse brain effects through oxidative stress, impacts on bee gut microbiota, adverse impacts on birds, butterfly decline, insect decline, waterway contamination, dying oceans, threatened endangered species, and bee-toxic pesticides.

In Section 4—Pest Resistance and Failed Efficacy, studies on disease transmission through pesticide-resistant mosquitoes, bed bug resistance, resistant Colorado potato beetle attacked with genetically engineered pesticides, incomplete data on RNAi, antibiotic resistance, glyphosate causing reduced crop yields and climate effects, organic compared to glyphosate on yields and

climate, EPA failure to conduct pesticide efficacy reviews, and crop failure with genetically engineered plants.

In Section 5—Organic Transition and Nontoxic Practices, studies on soil health in climate debate, perennial crops to fight biodiversity collapse, crop diversification and Intercropping, cultivating natural predators, organic pilot sites in New York City parks, NFL call for end to synthetic turf, strengthened USDA organic enforcement exceeds chemical-intensive agriculture, National Organic Standards Board issues, challenging hydroponic organic, strengthen EPA's Safer Choice with organic compatible practices and products, and California Roadmap weaknesses.

A Holistic Framework for Moving Forward

The intersectionality of the science on health threats, biodiversity collapse, and the climate emergency may not be captured by any one individual study, but, taken as a whole, what emerges from the body of science on pesticides and alternatives contained in this issue is a call to action. Threats in each category of harm are in and of themselves devastating, deadly, and unsustainable, whether the subject matter is health, biodiversity, or climate.

Scientists at Beyond Pesticides 40th National Forums, *Forging a Future with Nature: The existential challenge to end petrochemical pesticide and fertilizer use* (see recording at bp-dc.org/Forum2023), and in the scientific literature have discussed the urgent need

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for a strategic response to the climate crisis as part of a constellation of public health and biodiversity crises that intersect. Whether a health crisis borne out of chemical-induced diseases, the collapse of life-sustaining biodiversity, or the growing number of catastrophes caused by greenhouse gases and rising temperatures, the interconnectedness of the crises requires solutions that are holistic and nurturing of humans' relationship with nature—an interrelationship that has been neglected as a matter of policy and practice. In October, 2023, an editorial in the *Journal of the American Medical Association* (JAMA) captures the urgency of the climate and biodiversity crisis in *Time to Treat the Climate and Nature Crisis as One Indivisible Global Health Emergency*. The authors state: "Over 200 health journals call on the United Nations, political leaders, and health professionals to recognize that climate change and biodiversity loss are one indivisible crisis and must be tackled together to preserve health and avoid catastrophe. This overall environmental crisis is now so severe as to be a global health emergency."

Taking Collective Action

This may be obvious to those who have eschewed pesticides in their daily lives and their communities by adopting an organic diet and organic land management and still confront one or more of the diseases tied to pesticides in the scientific literature. The change needed requires collective action and a societal embrace of organic systems that put an end to the multiple toxic mixtures and involuntary exposure, from contamination of land, air, water, and food.

Although we recognize the importance of attempts to restrict individual pesticides through improved chemical regulation and effective toxic pesticide use reduction strategies, a crosscutting national grassroots collaboration is critically needed, especially now, to help reframe the public debate to be holistic. A precautionary approach, embraced by organic principles, starts with the premise that we do not need toxic chemicals to achieve food



productivity goals or beautiful landscapes.

As with previous issues, we view this issue as a tool for empowering activism and the necessary dramatic changes in practices and policies. This issue alone does not capture the entire body of the scientific literature (which we strive to accomplish with our web-based [databases and program pages](#)), but it adds significantly to the documentation that must compel decision makers to take meaningful action in eliminating petrochemical pesticides and fertilizers. At the same time, it is intended to provide a path forward with organic practices and links to our hands-on development of organic models for land management in communities across the country.

Reorienting the Focus of Change

Two representative examples in the last year illustrate the virtually insurmountable challenges under existing pesticide law. One is a case about the continued use of a brain-damaging pesticide. The other is the escalating threat of a pandemic because of antibiotic resistance, highlighting the importance of eliminating agricultural antibiotic use.

Case Study #1: After decades of campaigning, the deadly insecticide chlorpyrifos remains on the market. The news in November 2023 that a federal Appeals Court had reversed an EPA decision to ban

the brain-damaging pesticide chlorpyrifos calls into question the value of the basic structures, processes, and authorities of pesticide law that the public has been told are protective of health and the environment. After decades of review and litigation at considerable expense to government and the public interest community, this reversal, especially on a highly neurotoxic insecticide like chlorpyrifos, identifies a [fundamentally flawed system](#) that does not respect the science nor protect the health of people, in this case, children's brains.

It was EPA's finding that chlorpyrifos is destructive of the nervous system, particularly in children, and the functioning of the brain that led to an EPA-negotiated chemical company (Corteva/Dow Chemical) settlement in 1999 (took effect in 2000) that removed residential uses of chlorpyrifos from the market. The 2020 EPA decision, 21 years later, to stop agricultural uses followed another Appeals Court decision, departing from the agency's usually long, drawn-out negotiations that ultimately compromise health and the environment. EPA banned agricultural uses of chlorpyrifos in 2016 at the end of the Obama Administration, but the decision was reversed by the Trump Administration in 2017. Because EPA's decision was not negotiated, but based on scientific facts showing unreasonable harm, the industry sued, which brings us to the current situation.

While litigation against EPA under current pesticide law is needed to call out the problems with inadequate protections, the fundamental inadequacies of the law ultimately need to be addressed. Realistically, however, the power of the chemical industry and its influence in the U.S. Congress has prevented the overhaul of the law that is required to eliminate chlorpyrifos and petrochemical pesticides in favor of organic land management or agricultural practices that are as productive and profitable as chemical-intensive practices.

Background. EPA's action to cancel all agricultural uses of chlorpyrifos was a rare instance when the agency took comprehensive protective action. Required by a 9th Circuit Court of Appeals decision in [April 2021](#) to take action, [EPA issued a final rule](#) in August, 2021—in full effect February 28, 2022—after an earlier 9th Circuit decision, concluding that “EPA is unable to conclude that the risk from aggregate exposure from the use of chlorpyrifos meets the safety standard of the *Federal Food, Drug, and Cosmetic Act* (FFDCA). Accordingly, EPA is revoking all tolerances for chlorpyrifos.” On November 3, 2023, the 8th Circuit U.S. [Court of Appeals decided](#) to vacate EPA's 2021 decision to cancel all food tolerances for chlorpyrifos and sent it back to the agency.

History of Failure. In other cases, EPA has avoided such litigation by taking more limited action. When the industry challenges EPA, the agency almost invariably capitulates through a negotiation process. With the herbicide paraquat, [EPA allowed an industry umbrella group](#)—dubbed the Agricultural Handler Exposure Task Force—reduce its assessment of the risks to workers, resulting in the agency changing its position within months. With the synthetic pyrethroid class of insecticides, [EPA allowed an industry group](#) to rework its methodology for addressing pyrethroid risks to children and followed the request of another industry group to allow the pyrethroids to be sprayed with smaller buffer zones during windier conditions. With the chemical weed

killer glyphosate, despite overwhelming evidence of its [carcinogenic properties](#), the agency has refused to acknowledge this risk, [even after a federal court chastised its review process](#), and instead has acted at the behest of chemical manufacturers to stop glyphosate from being [banned in other countries](#).

The examples of this pattern are numerous, including the 2022 EPA decision to cancel, with a five-year phaseout, the deadly chlorinated hydrocarbon wood preservative [pentachlorophenol](#), with dioxin contaminants, among others ([see Gateway on Pesticide Hazards and Safe Pest Management](#)), after it watched countries around the world one-by-one ban its use under an international treaty—the Stockholm Convention, which was never ratified by the U.S. With a severely diminished market worldwide and difficulty setting up a manufacturing shop in the U.S. after a community and state uproar in [South Carolina](#), the manufacturer withdrew—after 40-plus years of fighting and unthinkable cases of cancer. EPA then announced in March of this year that it was time to cancel the chemical.

And even when EPA suspends the registration of a pesticide, [removal from use is very slow](#) because existing stocks are generally allowed to be sold. For example, EPA [suspended](#) the registration of the herbicide dimethyl tetrachloroterephthalate (DCPA) (also widely known as dacthal), effective August 22, 2023, leaving existing stocks (products containing DCPA manufactured before August 22) available on the market.

These examples and more demonstrate that a chemical-by-chemical “whack-a-mole” approach cannot adequately protect against the dangers of pesticides. This again speaks to the need for practices and policies at every level of government that adopt organic agriculture and land management practices.

Case Study #2: Inability to head off pandemic crisis due to antibiotic resistance.

Despite [successful litigation](#) on EPA’s failure to comply with regulatory

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process that stopped the unnecessary use of an antibiotic (streptomycin) in citrus production in December 2023, the court’s reasoning fails to grasp the science behind the biggest emerging threat to U.S. and global health—antibiotic resistance. What is most disturbing and challenging is that EPA, responsible for applying science in the protection of the public’s health, misled the court on the overwhelming worldwide scientific consensus on the contribution of agricultural antibiotic use to the human death and disability rate linked to antibiotic resistance.

On this subject, Beyond Pesticides has written extensively about [horizontal gene transfer](#), which explains the movement of antibiotic resistant bacteria throughout the environment, ultimately making their way to people, as medically necessary drugs become ineffective. As we have written, “The human pathogenic organisms themselves do not need to be sprayed by the antibiotic because movement of genes in bacteria is not solely “vertical,” that is from parent to progeny—but can be “horizontal” from one bacterial species to another.”

Regarding the reliance of the court on EPA’s misrepresentation of the science, the court found, “EPA emphasized that ‘there is no data that antibiotic use in agriculture leads to the presence of antibiotic resistance in bacteria of human health concern,’ and that ‘[a]t the present time, there is little evidence for or against the presence of microbes of human health concern in the plant agricultural environment.’” And yet, on May 19, 2019, *The New York Times* reported,

“The agency [EPA] approved the expanded use [of streptomycin] despite strenuous objections from the [Food and Drug Administration](#) and the [Centers for Disease Control and Prevention \[CDC\]](#), which warn that the heavy use of antimicrobial drugs in agriculture could spur germs to mutate so they become resistant to the drugs, threatening the lives of millions of people.”

The court decision requires us to focus on how the nation’s pesticide law FIFRA, and the chemical-intensive agricultural practices it effectively promotes, is contributing to what can already be considered a worldwide pandemic. Yes, antibiotic resistance is another pandemic that some call the “silent pandemic,” but the numbers belie that characterization.

It certainly is true that there is a confluence of factors that contribute to this worldwide pandemic, which will be the focus of a United Nations General Assembly (UNGA) High-Level meeting on antimicrobial (e.g. [bacterial](#) and [fungal](#)) resistance (AMR) in September, 2024 in New York. However, we cannot afford to ignore any cause of resistance, given the health implications of ineffective treatments for bacterial and fungal diseases. While there are many statistics with a range of numbers that we cite, according to the [CDC](#), “More than 2.8 million antimicrobial-resistant infections occur in the U.S. each year, and more than 35,000 people die as a result. When *Clostridioides difficile*—a bacterium that is not typically resistant but can cause deadly diarrhea associated with antibiotic use—is added to these, the U.S. toll of all the threats in the report exceeds 3 million infections and 48,000 deaths.” According to a 2021 article in *Current Research in Microbial Sciences*, “[Anti-biotic resistance in agriculture: Perspectives on upcoming strategies to overcome upsurge in resistance](#),” the leading consumers of antibiotics in developed countries are U.S. consumers. So, it would appear that the U.S. population may have the most to lose from antibiotic resistance.

A report evaluating 204 countries published by the [University of Wash-](#)

ington's Institute of Health Metrics and Evaluation, "Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis," generated the following statistics:

- **13.66 million people who died** globally had sepsis as an immediate cause of death or in the chain of events leading to their death (intermediate cause).
- **4.95 million people who died** in 2019 suffered from drug-resistant infections, such as lower respiratory, bloodstream, and intra-abdominal infections.
- **1.27 million deaths** in 2019 were directly caused by AMR [antimicrobial resistance].
- **1 in 5 people who died** from AMR was a child under five years old, often from previously treatable infections.

For those who prefer to talk about public health in economic terms, according to the [Food and Agriculture Organization of the United Nations](#), the Global Research on Antimicrobial Resistance study found, "If action is not taken, the rise of AMR cumulatively may result in over 3.4 trillion USD loss in the world's annual gross domestic product (GDP) in ten short years."

[ReAct](#), an independent worldwide network focused on antibiotic resistance, founded in 2005, has characterized the problem from [perspectives around the world](#).

ReAct Africa Director Mirfin Mpundu says:

"Addressing antibiotic resistance effectively will require big changes—to governance, financing, systems transformation and the change of behaviors and practices. But at the end of the day the end goal must be to ensure that everyone who has a resistant infection, or requires surgery, or needs cancer treatment, or is born premature can in fact access effective antibiotics in the future—this is the expectation that we should all voice to governments from now to September next year."



Ultimately, EPA must get out in front and start thinking and acting holistically in its analyses and restrictions of pesticides. The challenge of antimicrobial resistance is an example of the agency moving along with a limited focus that undermines the protection of the environment and people, as existential crises continue to emerge—whether it is the chemical-induced or exacerbated human health crises, biodiversity collapse, or the climate emergency. Even under existing law, EPA has the opportunity and responsibility to deem the adverse effects associated with petrochemical pesticide use related to these existential crises "unreasonable," given the availability of alternative practices, principally organic land management, that are viable, accessible, productive, profitable, and, most importantly, enabling of a livable future.

Transformative Change

None of the studies covered in this issue are theoretical. To operationalize a strategic vision to eliminate the use of petrochemical pesticides and fertilizers, communities with Beyond Pesticides' support are heavily engaged with hands-on work to transition parks, playing fields, and public spaces to organic land management through Beyond

Pesticides' [Parks for a Sustainable Future](#) program. These programs are models for all managers of public and private property to teach the adoption of methods that eliminate toxic pesticides and fertilizers. The programs apply the same standards that govern certified organic agricultural production under the [Organic Foods Production Act \(OFPA\)](#), which focuses on soil management practices that are applicable to all land management. While we advance this approach, we must protect underlying organic standards in OFPA against the ongoing threat to the law's stringent standards by industry groups that want easier access to the organic market. We do this through our [Keeping Organic Strong](#) campaign.

It is critical to elevate the public's voice for change, even when the target—be it EPA or a member of Congress—appears to be unreachable. While Beyond Pesticides works locally from the grassroots up to transition to organic practices, we are seeking to elevate the public's voice in all policy arenas to codify practices at the local, state, and federal level that reverse the existential health, biodiversity, and climate crises. Join with Beyond Pesticides' [Action of the Week](#) to raise your voice.