Beyond Pesticides: Protecting Health and the Environment with Science, Policy, and Action

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Pesticides *and* You

FEATURES

The Intersection of Pesticides and the New Normal under Coronavirus

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The Black Institute calls for New York City to ban pesticides in parks in the face of disproportionate hazards to people of color, failed federal protections

Striving for a Livable Society and Planet

Nurturing and sustaining life is at the core of the environmental work going on in communities across the country. However, as the events of the past months have illustrated, if we are to ensure that our society and planet are sustainable, it will require the protection of those facing the greatest hazards and attention to the underlying disparities behind them.

Disproportionate Harm from Coronavirus

As the coronavirus hit, we quickly saw disparities in who is at highest risk of infection, not just in age groups, but along racial lines. In every state, we see that people of color suffer higher rates of infection, illness, and death than their percentage of the population. The reporting recognized that this is occurring because they are disproportionately "essential workers," delivering essential services with daily exposure to the virus. They are among the lowest income workers in society and, as a result, have medical comorbidities that elevate risk factors, and are most likely to have limited, if any, health insurance. For millions of people outside the black and brown community, this has raised a heightened awareness of societal inequities along racial lines.

Black Lives Matter

Then, we all saw the horrific murder of George Floyd by the police, which sparked societal outrage, an outpouring of public support for Black Lives Matter, and calls for systemic change to combat systemic racism. That has brought our society to a transformational moment, building on a history of struggle to fight racial injustice, inequality, and environmental racism that is ingrained into our social and economic structure. History shows that there is opportunity in crisis. But defining the meaningful steps that are needed to address the foundational problems requires changes that take on vested economic interests, distribution of wealth, and remakes our social structure, reflected in a living wage, a stellar educational system, universal health care, and a rejection of attitudes that are embedded in our culture.

Call for Park Pesticide Ban Cites Environmental Racism

We started the year with a press conference in front of City Hall in New York City, calling for the passage of legislation to ban toxic pesticides in the city's parks—part of a nationwide campaign we are spearheading. At that press conference in January, The Black Institute, flanked by the bill sponsors, Council Members Ben Kallos and Carlina Rivera, Beyond Pesticides, and others, spoke to the disproportionate harm from pesticide exposure to people of color using the New York City parks. As we report in this issue, *Poison Parks*, The Black Institute's report released in January, finds, "In Manhattan, Harlem was disproportionately sprayed in comparison with the rest of Manhattan." The report points out that government regulation "has failed to address large-scale environmental practices, funded by big business, [that] disproportionately affect communities of color"— from fenceline communities near chemical production plants, farmworkers facing hazardous and inhumane working conditions in agricultural fields, landscape workers handling hazardous pesticides, to black and brown people, who suffer elevated risk factors that exacerbate pesticide hazards.

Eliminating Toxic Pesticides with Organic Transformation

This is not a time to tinker with reforms that don't address foundational problems. The fact that racial disparities are integral to the way we regulate the production, transportation, use, and disposal of toxic pesticides and other chemicals means the toxic pesticide industry is unsustainable. The standards in the governing laws are fundamentally flawed, resulting in unnecessary use and unacceptable disease outcomes that are high generally, but even greater for people of color. Systemic change does not occur with improved "mitigation measures" that EPA manipulates unscientifically or the banning of some chemicals or some uses. Systemic change will come when we eliminate the chemicals and adopt organic management practices that offer safe jobs and truly sustainable practices.

Two recent examples. As a federal court decision banning three weed killer (dicamba) products was being announced last month, new formulations of dicamba and new genetically engineered herbicide-tolerant crops were being brought on to the market. As Bayer-Monsanto announced a $10.9 billion settlement with victims of non-Hodgkin lymphoma to prevent further multi-multimillion dollar jury verdicts, it announced the continued sale of Roundup/glyphosate and declared the chemical's safety while exclaiming their commitment to "sustainable agriculture."

The next generation of hazardous pesticides are being developed for no other reason than the profits captured by multinational corporations and their shareholders. We have proven that we don't need them. Meanwhile, the hazards associated with the toxic chemicals inflict disproportionate pain on people of color, with a constellation of more complex pesticidal effects every year, from multi-generational diseases like Diabetes, asthma and respiratory illness, and learning disabilities.

As we wrote in our statement of support for Black Lives Matter (see page 4), we strive for a sustainable world that, in a true sense, can only be achieved with foundational change to our social, economic, and environmental norms.

Jay Feldman, executive director of Beyond Pesticides

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Staying Busy and Eating Healthy while Social Distancing

Let me cut to the chase: I'm trying to stay sane while self-isolating. Can Beyond Pesticides provide some ideas for projects I can work on that conform with social distancing?

Lynn, Arlington, VA

These are incredibly trying times for people across the country, and the staff and Board of Beyond Pesticides' hearts go out to all whose health has been affected by the coronavirus. While some areas are starting to re-open, Beyond Pesticides urges extreme caution by social distancing, wearing a mask, and utilizing safe disinfecting and sanitizing practices. (See p12, *The Intersection of Pesticides and the New Normal under Coronavirus*.) As we isolate from family and friends, the good news is that there is still plenty we can do to forward the goal of a safer, healthier, pesticide-free world. Here are some actions you can still take:

Grow a Victory Over the Virus Garden: Eating healthy food is an important part of feeling and staying well during self-isolation. And pollinators and other imperiled wildlife are still in need of our protection. Whether you decide to grow vegetables to eat or flowers for pollinators, you'll want to make sure that your seeds and plants are free from harmful pesticides. Beyond Pesticides maintains a directory of online retailers where you can find high quality organic seeds for your garden, so you won't need to break quarantine (*www.bp-dc.org/lorganicseeds*).

Support Your Local, Organic Farmers: Many farmers are struggling economically from the coronavirus outbreak. These farms are likely to face significant disruptions when they or one of their employees get sick. Connect online with local farmers and see if they have moved to curbside pickup or other direct-to-consumer "no touch" distribution channels that minimize interaction.

Write to Your Elected Officials: Remember that letter you started to your elected officials, but never sent? Now you have time to finish and send it. Take your time in conducting background research; make use of Beyond Pesticides' databases on peer-reviewed studies such as the *Pesticide-Induced Diseases Database* (*www.bp-dc.org/pesticide-induceddiseases*) or *What the Science Shows* on pollinator declines (*www.bp-dc.org/pollinators*).

Organize Virtually: Pesticide-free and organic practices remain a critically important part of our future, as they help create more resilient people, communities, and ecosystems. You can still connect with your neighbors through social media on sites like Facebook and Nextdoor. Virtual tools like Zoom let you continue face-to-face organizing. You can work with like-minded advocates to map out a post-pandemic game plan for action.

Stay Up-to-Date with Beyond Pesticides: Our email (*info@beyondpesticides.org*) and phone line is open (202-543-5450), and we'll continue working remotely to engage with members and supporters on actions and online events.

Toxic Chemicals Aren't Necessary to Control Coronavirus

I have underlying health conditions and am looking for advice on least-toxic measures I can take around my home to stop coronavirus. I read that the U.S. Environmental Protection Agency is recommending some highly toxic products—is that the only thing that will work?

Paula, Silver Spring, MD

While people are seeking answers, EPA has indeed published a list of products that are highly toxic, containing toxic chemicals such as chlorine bleach, peroxyacetic acid, alkyl dimethyl benzyl ammonium chlorides, didecyl dimethyl ammonium chloride and other "quats," sodium dichloro-s-triazinetrione, and hydrochloric acid. Some of these can trigger breathing problems and other respiratory symptoms, as well as attack the nervous and immune systems.

On the other hand, CDC's website makes it clear that such toxic chemicals are unnecessary. The common sense, nontoxic advice should be heeded:

- Avoid close contact with people who are not isolating with you.
- Avoid touching your eyes, nose, and mouth.

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.

- Stay home when you are sick.
- Cover your cough or sneeze with a tissue, then throw the tissue in the trash.
- Clean and disinfect frequently touched objects and surfaces using a soap-based household cleaning spray or disinfectant wipes.*
- Wash your hands often with soap and water for at least 20 seconds. If soap and water are not readily available, use an alcohol-based hand sanitizer with at least 60% alcohol.*
- For cleaning hard surfaces, 70% alcohol (common rubbing alcohol) is sufficient.*

* See *www.bp-dc.org/disinfectants* for safer products. Stay safe during this crisis.

Addressing Invasives while Protecting Health and Ecosystems

I'm working on a pesticide policy in my community and am interested in how you might suggest we deal with "invasive" species. Can you point us in the right direction?

Martin, Boston, MA

It's Beyond Pesticides position that invasives, or opportunistic species, should be dealt with on a case-by-case basis, with established priorities and a plan. With any unwanted species, there needs to be an understanding of the ecological context. We need to be asking the right questions: What role is the plant currently playing in a landscape—what niche is it currently filling? If we remove this plant, what will fill that niche? Will we be replanting the right native species to fill that niche? What are the detrimental impacts of letting it spread? Is there a way we can isolate it to stop its spread? Can we ever remove this plant altogether, or will we be working at control indefinitely? These are important questions that we need to be asking before we even consider management methods.

Regarding policy, requiring an individualized invasive species management plan seems to be the right answer, though unfortunately many pesticide reform policies sidestep the issue and simply exempt invasives to avoid opposition. Just like all organic approaches, we'll want to place a focus on prevention and working with ecological systems, rather than against them, making even least-toxic pesticide use a last resort.

There is a strong potential to undermine the stability of an ecosystem if we simply go in and immediately break out the strongest tools in the toolbox without a plant replacement strategy. On a turf system with common weeds a simple answer is grass plants. But, in forested areas already subject to intrusion (from construction/logging, etc.), rights-of-way, and urban areas, the focus is on alternative vegetation or ground cover. Sometimes, little should be done except simple mechanical cutting to keep these species in balance.

This is an interesting and, at times, contentious issue that environmentalists grapple with, so there is certainly room for fresh ideas on how to approach opportunistic species without the use of toxic pesticides.

For more information, we encourage you to watch the talk given at Beyond Pesticides 37th National Pesticide Forum in New York City by Peter Del Tredici, PhD, senior research scientist at Harvard's Arnold Arboretum (*www.bp-dc.org/invasives*).

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, or "Follow" us on Twitter! *www.facebook.org/beyondpesiticides*, *twitter.com/bpncamp*.

Excerpt from Beyond Pesticides Action of the Week (1/27/2020): Insist that the Veterans Administration Cover Conditions Caused by Agent Orange. United States military veterans suffering from bladder cancer, hypothyroidism, hypertension, and Parkinson's-like symptoms after their exposure to Agent Orange will remain unprotected and uncompensated until at least late 2020, according to a letter sent by Veterans Affairs (VA) Secretary Robert Wilkie to U.S. Senator Jon Tester (D-MT).
Michael comments: Why so long with a decision when the VA promised a few years ago that they would announce their decision? It used to be that the VA had 90 days after the National Academy of Science findings to make a decision. Prolonging this is not the right way to treat our veterans.

Excerpt from Beyond Pesticides Action of the Week (1/21/2020): Send a Message to EPA: Do Your Job to Protect Health and the Environment. As news reports come in demonstrating the threats to major groups of organisms, such as insects and birds, and the stability of Earth's ecosystems, and scientists appeal for major policy changes, recent actions by the U.S. Environmental Protection Agency's Science Advisory Board highlight the need for public insistence that EPA do its job.
Alice comments: EPA Administrator Wheeler must do his job and work as supported by the best scientific evidence available.
C.E. comments: EPA continues to fail to do their only job, which is to protect people and the environment. My life has been ruined by that failure and many people are suffering terribly (not to mention the increased suffering if we don't fix this right now). Everyone has a right to be safe and protected. Humans, animals, plants, water, and the environment should be protected with the utmost care. We demand that EPA protect the environment instead of the pesticide and chemical industries. If not, resign and have someone that is capable do the job!

Primary Manufacturer of Chlorpyrifos Drops Out of Market, EPA Continues to Allow Use

Corteva, a spin-off from DowDupont chemical company, will stop producing the highly neurotoxic insecticide chlorpyrifos by the end of this year as a result of declining sales, the company says. Despite the move being viewed widely as potentially good for public health, the company is earning little praise from health advocates for what amounts to a shrewd financial decision that may allow use levels of the brain-damaging pesticide to continue unabated. "Other people are going to continue to profit from harming children," said Marisa Ordonia, an attorney with the group EarthJustice to Canada's *National Observer*. "But we're going to continue to keep fighting to make sure children and farmworkers are protected," she said.

At odds is the difference between halting production of chlorpyrifos and cancelling its EPA registration. While Corteva has the ability to voluntarily stop producing its own product, EPA registration permits other generic manufacturers to continue producing the product. And, over the years, there would be nothing to stop Corteva from reintroducing "new" chlorpyrifos products back on to the market.

Chlorpyrifos is an organophosphate insecticide. Chemicals in this class are known to inhibit proper nerve functioning by inactivating the enzyme acetylcholine esterase. Acute exposure to chlorpyrifos can result in numbness, tingling sensation, incoordination, dizziness, vomiting, sweating, nausea, stomach cramps, headache, vision disturbances, muscle twitching, drowsiness, anxiety, slurred speech, depression, confusion, and, in extreme cases, respiratory arrest, unconsciousness, convulsions, and death. The chemical's use in agriculture means that the general public is regularly exposed to smaller doses of the chemical in food. The most concerning impacts of chlorpyrifos are seen in low-income, fenceline (near chemical production plants), people of color, and farmworker communities, where working in or living near chlorpyrifos-sprayed fields can mean high rates of chronic exposure.

Studies by the Columbia Children's Center for Environmental Health (CCCEH) at Columbia University link chlorpyrifos to developmental delays, attention-deficit/hyperactivity disorder problems, and changes to the brain (Rauh et al., 2006 and 2012).

In 2016, EPA, under the Trump administration, reversed a scheduled ban of the chemical after records revealed then-EPA administrator Scott Pruitt met privately with Dow Chemical's CEO. Since that time, EPA and environmental groups have battled the chemical's use in the courts and four states have moved to phase out many of its uses, either by statute (HI) or administrative action (CA, NY, MD).

Association of Farmworkers Opportunity Programs

STATEMENT

Beyond Pesticides Stands with Black Lives Matter

In demanding a future that transforms society to ensure equality of opportunity and respect for life, we support the leadership of Black Lives Matter in advancing systemic and institutional change in how we value each other. As an environmental and public health organization, Beyond Pesticides seeks to ensure that we put a stop to disproportionate harm to people of color because of racism and inequality. We strive for a sustainable world that, in a true sense, can only be achieved with foundational change to our social, economic, and environmental norms. In this context, we stand with those demanding an end to systemic racism, white supremacy, and violence in society, and call for a social structure and law enforcement system that honors this goal.

Call for Pesticide Bans as EPA Backslides

Atrazine Ban Urged

The weed killer atrazine causes developmental abnormalities in frogs and research indicates that it affects the endocrine system and reproductive biology of humans. In addition to its agricultural uses in corn, sorghum, and sugar cane production, atrazine is also used on home lawns, school grounds, parks, and golf courses, where exposure to children is common. Nontoxic alternatives are available for all of these uses. Despite the risks identified by EPA—effects to the neuroendocrine system, reproductive and developmental alterations, and impacts on aquatic plant communities—the agency is proposing to increase the allowable levels of atrazine in waterways. Beyond Pesticides, in May, sent a petition to EPA with over 4,000 signatories objecting to its proposal.

. . . and Paraquat

Joining with 15 farm, farmworker, environmental justice, and conservative organizations, Beyond Pesticides, in December, submitted comments on EPA's risk assessment of the herbicide paraquat that used questionable science to justify continued use of this deadly chemical that is linked to Parkinson's disease. Paraquat is applied annually in the U.S. to more than 100 crops, including cotton, corn, and soybeans. It is quick-acting, non-selective, and restricted use (can be applied by certified applicators and those under their supervision). It is used to control weeds and grasses on agricultural and nonagricultural sites or as a crop desiccant. Paraquat has been linked to numerous adverse health and environmental effects, including increased risk of Parkinson's disease, which has motivated numerous public interest campaigns and proposed legislation to ban its uses in the U.S. The failure of EPA to meet its regulatory responsibility to ban pesticides that do not meet even the weakest of safety standards reflects the failure of the agency's overall regulatory review process and the urgent need to shift the market to organic practices that create a default prohibition of synthetic pesticides.

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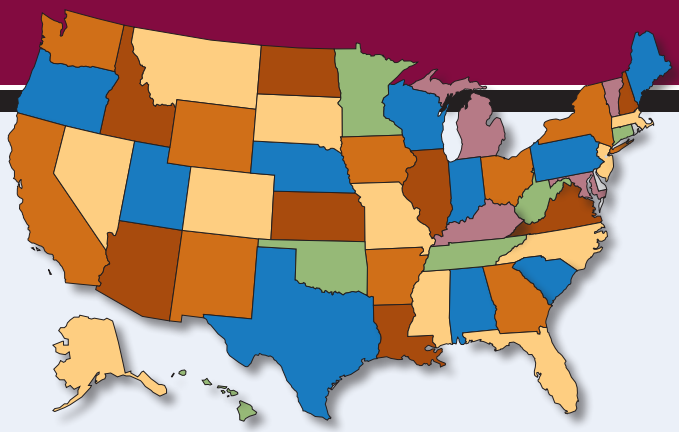
. . . and Dicamba

First, Missouri's largest peach farm, Bader Farms, won a lawsuit in February—$265 million from two multinational agrichemical companies—after the companies' dicamba-based weed killers caused widespread damage to the farm's fruit trees. Bayer's Monsanto and BASF were found to be responsible for negligence in the design of their dicamba herbicides, and failure to warn farmers about the dangers of their products.

Then, in June, the federal Ninth Circuit Court of Appeals, in response to litigation filed by a coalition of farm and environmental groups, led by Center for Food Safety, vacated EPA's 2018 conditional registration of three dicamba weed killer products for use on an estimated 60 million acres of DT (dicamba-tolerant through genetic modification/engineering) soybeans and cotton. Syngenta's new dicamba product, Tavium, was not cited in the lawsuit and may require further litigation. These cases, similar to the inadequate EPA reviews on atrazine and paraquat, underscore the need for transforming agriculture to adopt organic systems that effectively eliminate the need for toxic pesticides and fertilizers.

"Emergency" Use of Bee-Toxic Neonicotinoid in 10th Year?

Following up on comments that Beyond Pesticides submitted in May with 15 farm, farmworker, and environmental groups objecting to the issuance of a proposed interim decision on bee-toxic neonicotinoid (neonic) insecticides, thousands challenged EPA's potential allowance of an "emergency" use of a neonic for the tenth year in a row. As part of registration review, EPA has not shown that continued neonicotinoid use will meet the legal safety standard under the *Federal Insecticide, Fungicide and Rodenticide Act* (FIFRA). In addition, the repeated use of an emergency provision in FIFRA for bee-toxic pesticide use for nine years makes a mockery of EPA's responsibility, according to Beyond Pesticides and over 3,000 signatories, submitted in June. The groups commented on a request from Maryland, Pennsylvania, and Virginia to use the neonic dinotefuran for yet another year, the tenth, for control of brown marmorated stinkbugs. EPA approved 125 emergency exemptions in eight states from 2011 through 2019 to kill stinkbugs in pome and stone fruits. Dinotefuran presents an alarming hazard to bees and other pollinators. Like other neonics, it is systemic and can indiscriminately poison any insects feeding on nectar, pollen, or exudates. It is also highly toxic to aquatic invertebrates and soil organisms, as well as being highly persistent. Stated in the comments, "In addition to the serious ecological impacts, dinotefuran is toxic to the immune system. This is, of course, is an effect that should be avoided during the coronavirus pandemic—when the immune system is under attack." According to the statement: "EPA must stop approving emergency exemptions in routine cases" and require full registration.



Signals of Environmental Decline, Edging Toward the Insect Apocalypse

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Monarchs Decline by Half in One Year

The number of monarch butterflies overwintering (2019-2020) in Mexico is down 53% from last year, according to a count conducted by World Wildlife Fund (WWF) Mexico. While WWF (March 2020) indicates the decline was expected due to unfavorable weather conditions during the species southward migration, other environmental groups are raising red flags. WWF's count found that monarchs occupied seven acres this winter, down from 15 acres last year. Reports indicate that 15 acres is a minimum threshold needed to prevent a collapse of the butterfly's migration and possible extinction.

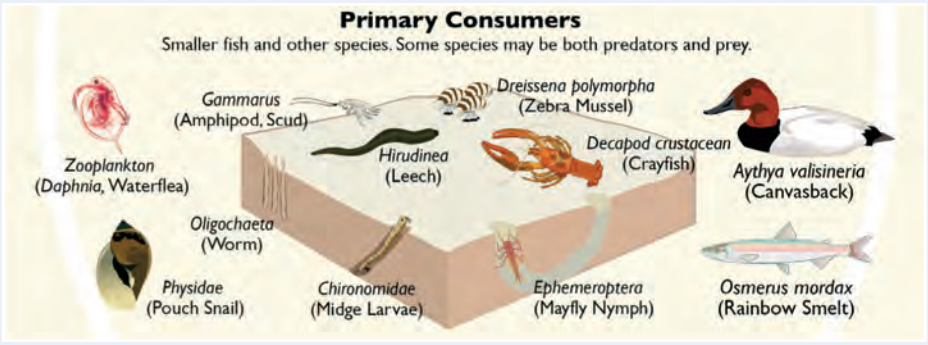
Research published in *Frontiers in Ecology and Evolution*, "Pesticide Contamination of Milkweeds Across the Agricultural, Urban, and Open Spaces of Low-Elevation Northern California" (June 2020), finds that western monarch milkweed habitat contains a "ubiquity of pesticides" that are likely contributing to the decline of the iconic species. The research provides a grim snapshot of a world awash in pesticides and raises new questions about the U.S. regulatory process that continues to allow these toxic chemicals on to the market without adequate review and oversight. "We expected to find some pesticides in these plants, but we were rather surprised by the depth and extent of the contamination," said Matt Forister, PhD, biology professor at the University of Nevada, Reno and co-author of the paper. "From roadsides, from yards, from wildlife refuges, even from plants bought at stores—doesn't matter from where—it's all loaded with chemicals. [T]he ubiquity and diversity of pesticides we found in these milkweeds was a surprise," Dr. Forister said.

Pesticides Identified as Threat to Fireflies

Research in *BioScience*, "A Global Perspective on Firefly Extinction Threats" (February 2020), sounds the alarm over declines in fireflies, principally attributed to habitat loss, light pollution, and indiscriminate pesticide use. "Our goal is to make this knowledge available for land managers, policy makers and firefly fans everywhere," said study coauthor Sonny Wong, PhD, of the Malaysian Nature Society to *USA Today*. Although there is scant monitoring data on firefly populations, studies conducted over the last decade, alongside anecdotal reports and expert opinion, have led to international concern. This research grew out of a 2010 international meeting in Malaysia, which produced *The Selangor Declaration on the Conservation of Fireflies*, and is part of the Firefly Specialist Group of the International Union for the Conservation of Nature (IUCN), established in 2018 to prevent the extinction of fireflies. Also contributing to the decline is water pollution, tourism, invasive species, and climate change.

Decline in Mayflies Threatens Ecosystems

Research published in the *Proceedings of the National Academy of Sciences*, "Declines in an abundant aquatic insect, the burrowing mayfly, across major North American waterways" (February 2020), reveals a precipitous decline in numbers of mayflies where they have been historically abundant. The research finds that in the Northern Mississippi River Basin, seasonal emergence of burrowing mayfly (*Hexagenia*) adults declined by 52% from 2012 to 2019; in the Western Lake Erie Basin, from 2015 to 2019, the reduction was a shocking 84%. Neonicotinoid insecticides are a significant factor in this decline because mayflies are extremely vulnerable to their impacts, even at very low exposure levels during the larval stage (as nymphs or naiads) in waterways widely contaminated with the chemicals. *Ephemeroptera*, or mayflies, is an insect order that contains keystone species, on which other species are wholly dependent and without which the ecosystem would undergo drastic change. Given this, a plummeting mayfly "count" is especially alarming because mayflies provide a critical, primary food source in aquatic and terrestrial ecosystems and an important ecosystem service. As the research study notes, "Seasonal animal movement among disparate habitats is a fundamental mechanism by which energy, nutrients, and biomass are transported across ecotones. A dramatic example of such exchange is the annual emergence of mayfly swarms from freshwater benthic [lake or river bottom] habitats. . . Annual . . . emergences represent the exchange of hundreds of tons of elemental nutrients, thousands of tons of biomass, billions of organisms, and trillions of calories worth of energy to the surrounding terrestrial habitat. . . A single emergence event can produce 87.9 billion mayflies, releasing 3,078.6 tons of biomass into the airspace over several hours." According to Purdue



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University ecologist Jason Hoverman, PhD, "Mayflies serve critical functions in both aquatic and terrestrial ecosystems. Because of their important role as prey, reductions in their abundance can have cascading effects on consumers throughout the food web."

Croplands' Toxicity to Pollinators Skyrockets

A study published in *Scientific Reports*, "County-level analysis reveals a rapidly shifting landscape of insecticide hazard to honey bees (*Apis mellifera*) on US farmland" (January 2020), finds that even as overall volume of insecticide use has decreased, the total "bee toxic load" has increased markedly, due in large part to the use of hazardous seed coatings with insecticides. Findings indicate that, from 1997–2012, the area treated with pesticides saw "a 16-fold increase in oral potency [chemical toxicity] far surpass[ing] a 64% decline in application rate." The shift to neonicotinoid-treated seed and other application modes of the pesticide follows a pattern by the petrochemical and chemical-intensive agriculture industry to find the next best chemical after facing controversy resulting from the use of highly toxic organophosphate insecticides—linked to hazardous residues, hazards to farmers and farmworkers, chemical drift concerns and liability, and insect resistance. Before organophosphates, the controversy focused on organochlorines, like DDT. However, with the substitution approach to chemical-intensive agriculture, widespread neonicotinoid use has resulted in contaminated pollen, nectar, and guttation droplets, and brought with it devastating indiscriminate harm to ecosystems, from pollinators to aquatic life, while raising human health concerns. "Several studies have shown that these seed treatments have negligible benefits for most crops in most regions," said coauthor Christina Grozinger, PhD at Pennsylvania State University. "Unfortunately, growers often don't have the option to purchase seeds without these treatments; they don't have choices in how to manage their crops," she said.

Baby Bees' Brain Growth Adversely Affected by Neonicotinoid Insecticides

Research out of the Imperial College of London, "Insecticide exposure during brood or early-adult development reduces brain growth and impairs adult learning in bumblebees" (March 2020), finds that bumblebee (*Bombus terrestris audax*) exposure to the neonicotinoid insecticide imidacloprid, through consumption of contaminated nectar and pollen during the larval stage, causes abnormal brain growth in some parts of the bees' brains, and significantly impairs learning ability. This research expands the body of scientific knowledge on behavioral impacts of neonics on the larval stage of bees, adding to existing research on adult bees.

Glyphosate-Roundup Causes Biodiversity Loss in Freshwater Ecosystems

A study of the weed killer glyphosate (Roundup) use finds that that algae can develop resistance to contamination, but surviving phytoplankton communities are much less diverse. The study, "Community rescue in experimental phytoplankton communities facing severe herbicide pollution" (March 2020), conducted by McGill University researchers and published in *Nature Ecology & Evolution*, raises concerns about biodiversity loss, especially in light of potential stressors, such as pollution and climate change. Phytoplankton matter because their disruption can cause a trophic cascade and impact other organisms. "These tiny species at the bottom of the food chain play an important role in the balance of a lake's ecosystem and are a key source of food for microscopic animals," said coauthor Vincent Fugère, PhD.

The adverse environmental and human health effects of glyphosate are now known worldwide, while EPA continues to give the pesticide a green light. Bayer-Monsanto, glyphosate's primary manufacturer, recently announced a $10.9 billion settlement with plaintiffs. Its pervasive use and biocidal effects also link the chemical to broader environmental and health issues, such as adverse impacts on soil microbiota and the gut microbiome, as a result of its antibiotic properties.

Fighting Institutional Racism: Safety and Fair Wages Demanded by Washington Farmworkers

Farmworkers walked out of an orchard in Sunnyside, Washington in March to demand improved working conditions. Over a dozen farmworkers cited unacceptable toxic pesticide

exposure, unfair wages, and lack of paid breaks. Their employer, Evans Fruit, owns and farms over 8,000 acres in the state. The workers represent the ongoing struggle for safe working conditions and a living wage when working in the chemical-intensive agriculture industry. Evans Fruit workers said the company provides insufficient protective gear and training before requiring workers to spray pesticides for most of their 12- to 15-hour workdays. Jorge de los Santos, who has worked for Evans Fruit for five years, told the *Yakima Herald*, "My eyes (were) constantly irritating me." Evans Fruit declined to comment,

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but worker representatives said the company has been unwilling to negotiate."

Physicians annually diagnose up to 20,000 reported pesticide poisonings of agricultural workers. Working mothers' unborn children are exposed. A farmworker's life expectancy is 49 years, compared to 78 for the general population. Author and organizer Randy Shaw said in the 2017 documentary on the United Farm Workers, *Dolores*, "The environmental justice movement said that certain environmental hazards are disproportionately impacting on people of color. It wasn't simply stopping DDT, but it was also making the larger point [that] you're only allowing this because of who the workers are, and their race and class background."

Organic Protects Biodiversity

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Organic agriculture provides refuge for biodiversity in an increasingly toxic landscape and is more profitable than chemical-intensive agriculture, according to "Landscape context affects the sustainability of organic farming systems" (February 2020), published in the *Proceedings of the National Academy of Sciences*. Organic farms are more profitable than chemical-intensive agriculture, despite slightly lower average crop yields (depending on crop). The value of organic agriculture to biodiversity increases when surrounded by large chemical-intensive fields, but profitability slightly decreases. Small organic farms near urban centers, for example, can be more profitable than large organic farms in remote areas.

Researchers conducted a global meta-analysis of the relationship between landscape context and biotic abundance, biotic richness, crop yield, and profitability. They used landscape metrics that "reflected composition (amount of land cover types), compositional heterogeneity (diversity of land cover types), and configurational heterogeneity (spatial arrangement of land cover types)." Data sets for the study were collected from 148 different studies that span 60 crops on six continents across a range of farming practices and landscape types.

Organic sites have 34% higher biodiversity than chemical-intensive crops. This should come as no surprise, as monocultural croplands have become increasingly large and toxic to organisms such as pollinators and birds in the last few decades. Organic agriculture uses a precautionary approach to toxic substances, thereby allowing biodiversity to thrive. For example, a recent study from Finland illustrates how organic animal farms can, in fact, improve wild bird abundance. "A landscape with large field sizes might be an indicator of agricultural intensification in general, with many fields with only one crop and heavier pesticide and herbicide use," said Olivia Smith, PhD, lead author of the study. "That's a place where there's not a lot of natural habitat animals can use. An organic farm on that kind of landscape becomes a refuge for species."

Profits from organic agricullture are on average 50% higher than conventional agriculture. Consumers who care about avoiding toxicity, especially families with young children, are driving a surge in organic agriculture. In the U.S., demand far outpaces the supply. While the number of farms in the U.S. is generally declining, the number of organic farms increased 27% between 2012 and 2017, according to data from the USDA National Agricultural Statistics Service.

Stopping Systemic Environmental Racism in New York City Parks

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The Black Institute calls for New York City to ban pesticides in parks in the face of disproportionate hazards to people of color, failed federal protections

JAY FELDMAN

Those fighting for environmental justice understand that the harms inflicted by toxic chemical production and use cause disproportionate adverse effects on people of color—from fenceline communities near chemical production plants, to farmworkers facing hazardous and inhumane working conditions in agricultural fields, landscapers handling toxic pesticides, to black and brown people who suffer elevated risk factors that exacerbate pesticide hazards. In its report, *Poison Parks* (January 2020), The Black Institute documents New York City public spaces in low-income people of color neighborhoods being sprayed with the weed killer glyphosate (Roundup) at significantly higher rates than other parts of the city. The report notes, "Minority and low-income communities suffer from the use of this chemical [glyphosate] and have become victims of environmental racism."

In this context, The Black Institute, working with a coalition of organizations including Beyond Pesticides, is calling for the urgent passage of Intro 1524 —a "A Local Law to amend the administrative code of the City of New York, in relation to the use of pesticides by City agencies." The legislation only allows on public New York City (NYC) land (owned and leased) the use of substances that are permitted under federal organic law or meet EPA's standard for exempt as nontoxic and disclose all ingredients on the product label. The bill sponsors have secured cosponsorship from a majority of members of the New York City Council, but it is being held up by the Speaker's office, at this writing.

LEGISLATION TO BAN TOXIC PESTICIDES

Toxic pesticide use in NYC parks would be prohibited if the legislation passes. The bill "would ban all city agencies from spraying highly toxic pesticides, such as glyphosate (Roundup), and be the most far-reaching legislation to implement pesticide-free land practices in New York City parks," according to a press release from its sponsors, NYC Council Members Ben Kallos and Carlina Rivera. The bill was heard and passed out of the Committee on Health on January 29. Council Members Kallos and Rivera point out in their joint press release that Roundup is the pesticide most intensively used by city agencies, and that, "The use of this pesticide poses a health risk for anyone who frequents city parks and playgrounds, as well as city workers, including city parks employees who come into contact with glyphosate-containing chemicals while spraying." Council Member Rivera said: "Our parks and open spaces are critical to our health when our communities have so few of them, so we have to make sure our city is pushing toward making them safer, greener, and more resilient. But no New Yorker should ever have to be exposed to toxic pesticides and it is long past time that our city ban these dangerous chemicals." Council Member Kallos added, "Parks should be for playing, not

pesticides. All families should be able to enjoy our city parks without having to worry that they are being exposed to toxic pesticides that could give them and their families cancer."

CALLING FOR AN END TO ENVIRONMENTAL RACISM IN MANAGING CITY PARKS

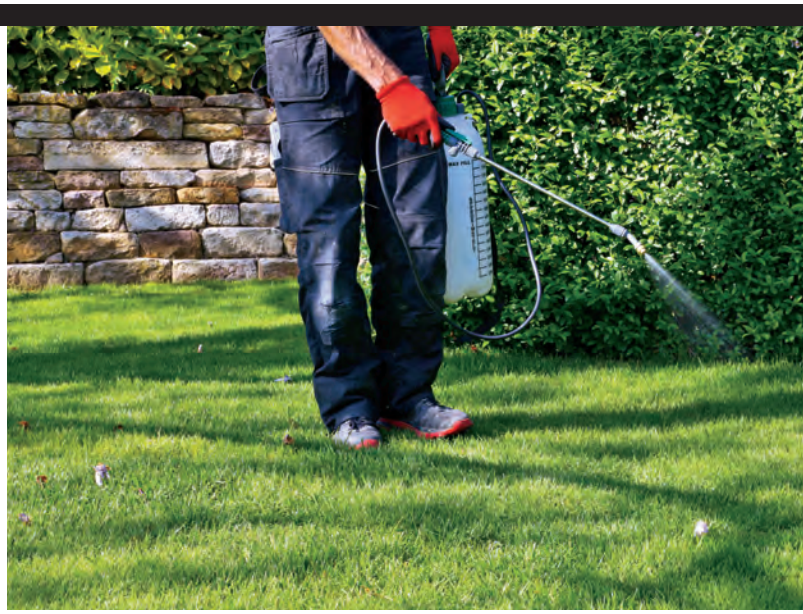
Poison Parks gives national and international context to the struggle for environment justice—the definition emerged from protests by North Carolina residents of a majority African American county, who had formed Warren County Citizens Concerned (WCCC) in the late 1970s to fight the toxic waste landfill siting for polychlorinated biphenyls (PCBs). The Rev. Dr. Benjamin F. Chavis Jr., a founder of the United Church of Christ Commission on Racial Justice, called the landfill siting environmental racism. *Poison Parks* notes at the beginning of the report Rev. Dr. Chavis' definition: "Environmental racism is racial discrimination in environmental policy-making. It is racial discrimination in the enforcement of regulation and laws, in the deliberate targeting of communities of color for toxic waste disposal and the siting of polluting industries. It is racial discrimination in the official sanctioning of the life-threatening presence of poisons and pollutants in communities of color; and, it is racial discrimination in the history of excluding people of color from mainstream environmental groups, decision-making boards, commission, and regulatory bodies."

The report delves into this in more detail:

> Environmental racism or eco-racism has become an issue that disproportionately affects all communities of color and is defined as "practices that place African Americans, Latinos, and Native Americans at greater health and environmental risk than the rest of society." (Bullard, 1993) Environmental racism describes the subjection of racially marginalized groups to disproportionate exposure to pollutants from industry, natural resource extraction, toxic waste, poor land management, and sometimes lack of access to clean water. This term also describes the disadvantaged ecological relationships between the industrialized West and developing nations which threaten the health, overall well-being, and safety of these populations. Communities of color also have higher exposure rates to air pollution compared to their white, non-Hispanic counterparts. There is an extensive and severe history of environmental racism in the United States dating back to the pre-Jim Crow Era. Marginalized groups in America suffered before these facts were labeled as such and environmentalism became a topic of discussion among academics. It was and continues to be through the efforts of community-based coalitions, alliances with national recognized organizations, and legal action that minorities have been able to confront individual industries' racist tendencies.

DISPROPORTIONATE USE, EXPOSURE, AND HARM

With that as background, *Poison Parks* documents the use patterns of glyphosate (Roundup). The report states: "It is a terrifying reality that more than 500 gallons of this chemical were sprayed throughout New York City in 2016. Minority and low-income communities suffer from the use of this chemical and have become victims of environmental racism.



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A Freedom of Information Law (FOIL) request disclosed that from 2017–2018, "[I]dlewild Park in Queens had higher application rates in 2017 and 2018 compared to surrounding locations. . . . According to census data, the communities surrounding Idlewild Park are approximately 90% African American. People of color that use this park are being hit with extraordinarily high amounts of glyphosate concentrate. Not to mention the impact this high concentration would have on pesticide applicators who are mostly men of color."

The report continues, "The same FOIL document shows that in Manhattan, Harlem was disproportionately sprayed in comparison with the rest of Manhattan. When analyzing this data, only locations that included parks, playgrounds, or recreation centers on park land were considered."

WORKERS IN HARM'S WAY

In reference to worker exposure to glyphosate (Roundup) use, the report states, "This exposure uniquely affects people of color working for NYC. The NYC Parks Department is 64% people of color, including all positions in the department. However, when broken down further, building services employees are 96% people of color, laborers are 56% people of color, farmers are 78% people of color, and transportation service workers are 77% people of color. Combined, an average of 77% of these employees are people of color."

LOCAL LAWS ARE REQUIRED TO ADDRESS ENVIRONMENTAL RACISM

After making the case that EPA is not adequately protective, *Poison Parks* calls for:

- Stop the routine use of dangerous toxic pesticides,
- Only allow safe products. . . with. . . ingredients approved by the National Organics Standards Board,

- Immediately adopt an official Integrated Pest Management (IPM) measure that requires public monitoring, record-keeping, and use of non-chemical methods and safer pesticides before using other treatments. [Note that Beyond Pesticides defines this as Organic Land Management.]

BEYOND PESTICIDES CALLS FOR ACTION

In offering testimony in support of the ban bill, Beyond Pesticides executive director Jay Feldman said: "By restricting pesticide use on its own property, the City will provide critical protections for community health, particularly for children, the elderly, and vulnerable population groups that suffer from compromised immune and neurological systems, cancer, reproductive problems, respiratory illness and asthma, Parkinson's, Alzheimer's, diabetes, or learning disabilities and autism. We urge this Committee and the New York City Council to adopt Intro 1524, a measure that meets the urgent need for hazard reduction at a time of increasing awareness of the dangers that pesticides pose to human health and the environment, while the federal regulatory system is undergoing a severe reduction in programmatic work, adequate scientific assessment, and, in many cases, a reversal of safety decisions that had been made by the EPA previously."

THERE IS AN URGENT NEED FOR NYC TO ACT

The issue is made more urgent for New York City and for many municipalities and states because most envi-ronmental regulation below the federal level in the U.S relies heavily on the determinations of EPA that support environ-mental racism. Under the Trump administration, federal environmental regulation generally, and regulation of pesticides in particular, have been dramatically weakened, which elevates the health threat. The failure of EPA requires localities to step up and protect local and regional residents and environments.

The bill was first proposed in 2015 after Council Member Kallos heard concerns from elementary students at NYC Public School 290 about the danger and health impacts of pesticides on people and animals.

Mr. Feldman's comments at the Committee on Health hearing included: "With glyphosate being the poster child for unacceptable, hazardous pesticide use around our children and families, this legislation is critically needed to protect the residents and the environment of New York City, and advance the adoption of organic land management practices in parks and playing fields.... The approach to land care specified by this legislation identifies an allowed substance list to ensure that the products and practices used are compatible with the organic systems that protect people and local ecology. It is this approach to pesticide reform that will effectively stop the unnecessary use of hazardous pesticides applied in parks and public spaces throughout the city. While addressing urgent local concerns related to public and worker health and the environment, passage of this law in New York City will make an important contribution to reversing the escalating crises in biodiversity, including pollinator declines, and the climate crisis—which are exacerbated by petroleum-based, synthetic pesticides, the release of carbon into the environment, and the lost opportunity to sequester carbon in organic soil systems."

CONCLUSION

The increased general awareness of the need to address disproportionate risk in people of color communities extends to toxic chemical use and the adverse effects that pesticides have caused among people with preexisting or underlying conditions of respiratory illness, like asthma, and immune system diseases. Given that these health conditions are elevated in people of color communities, a failure to remove toxic pesticides from NYC parks is a failure to address systemic racism. Adding to this is the fact that there are clear disparities of risk from the Covid-19 virus, which have been documented as disproportionately affecting people of color with effects that cause the same adverse health outcomes as pesticides—breathing problems and immune system effects.

The reality of disproportionate impact of Covid-19 among people of color, coupled with elevated exposure to pesticides, which exacerbate the very same adverse health conditions as the virus, is alarming, systemically racist, and requires immediate action. The good news is that we have an opportunity to take action now and eliminate an exposure pattern to hazardous pesticides that disproportionately affects people of color. Beyond Pesticides, with communities across the country, has demonstrated that we can have beautiful parks and playing fields with organic land management practices and without the use of toxic pesticides, so why wouldn't we eliminate this disparity immediately. The time is now.

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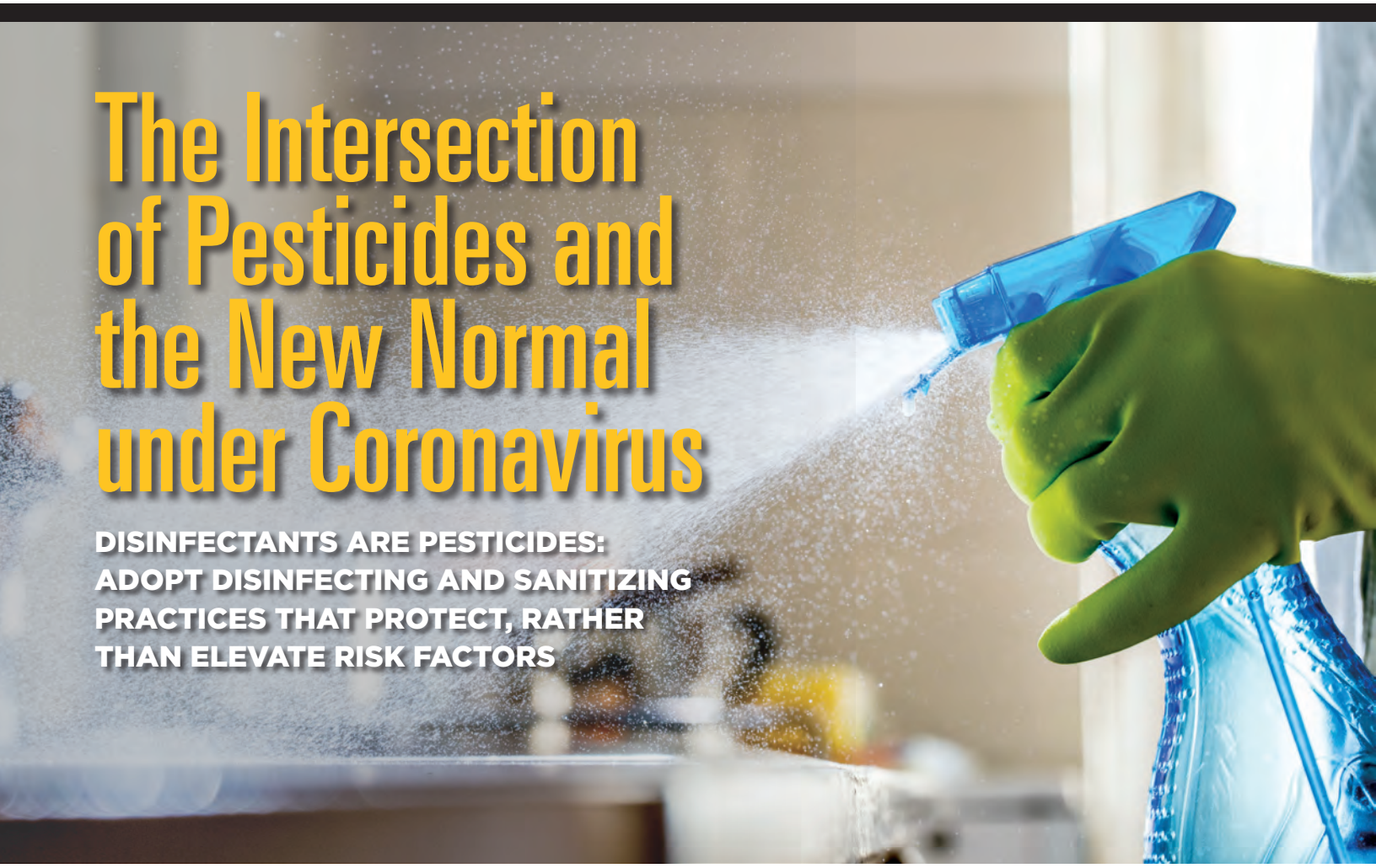
The Intersection of Pesticides and the New Normal under Coronavirus



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DISINFECTANTS ARE PESTICIDES: ADOPT DISINFECTING AND SANITIZING PRACTICES THAT PROTECT, RATHER THAN ELEVATE RISK FACTORS

TERRY SHISTAR, PH.D. AND JAY FELDMAN

As the Novel Coronavirus Disease 2019 (Covid-19) kills and infects—over 11 million infected (nearly three million in the U.S.) and over 500,000 dead (over 132,000 in the U.S., at this writing and rising exponentially—people are looking for sound safety advice for themselves and their families. Disinfectants are registered by the U.S. Environmental Protection Agency (EPA) as toxic pesticides. Can safety from the virus be achieved without them?

While the Centers for Disease Control and Prevention (CDC) has offered preventive steps for washing hands, cleaning, sanitizing, and disinfecting with soap and water, EPA has allowed the market to be flooded with toxic products that public health officials cite as unnecessary to kill the coronavirus. Soap breaks down the membrane surrounding the virus, which then falls apart. The various toxic materials that are being promoted as sanitizers, as described below, increase people's vulnerability to the virus among those who have underlying health conditions, such as illnesses of the respiratory and immune system. Cleaning and disinfecting can reduce risk from pathogens, like coronavirus, but toxic chemical exposure can actually increase risk.

DEFINITIONS

CDC advises, "Cleaning is the necessary first step of any disinfection process. Cleaning removes organic matter, salts, and visible soils, all of which interfere with microbial inactivation. The physical action of scrubbing with detergents and surfactants and rinsing with water removes substantial numbers of microorganisms. If a surface is not cleaned first, the success of the disinfection process can be compromised. Removal of all visible blood and inorganic and organic matter can be as critical as the germicidal activity of the disinfecting agent."[1] [Emphasis added.]

In terms of materials, sanitizers, which are designed to be used on humans, are distinguished from disinfectants, which are used on inanimate surfaces. Sanitizers are regulated by the Food and Drug Administration (FDA), while disinfectants are regulated as pesticides by EPA.

In 2016, FDA banned 19 antimicrobial ingredients in hand soap, including triclosan,[2] finding them no more effective than plain soap and water.

DISINFECTANTS AND SANITIZERS IN PUBLIC HEALTH EMERGENCIES

It is important during public health emergencies involving infectious diseases to scrutinize practices and products very

carefully so that hazards presented by the crisis are not elevated because of the unnecessary threat introduced with toxic chemical use. Beyond Pesticides is compiling and updating resources for safer decisions, which are updated on the organization's website, *www.bp-dc.org/disinfectants*.

PROTECTION FROM COVID-19 (CORONAVIRUS) WITHOUT TOXIC SANITIZERS AND DISINFECTANTS

The coronavirus can be fought with common sense prevention and safer disinfection products. In the management of viral and bacterial infections, it is always important that we do not exacerbate the risk to individuals in the process of avoiding or controlling the threat. It is important to avoid products that increase vulnerability to respiratory problems or weaken the immune system. In the case of Covid-19, there are protective measures—both practices and products—that can protect us without using toxic products that increase risk factors.

WHY THE CONCERN ABOUT TOXIC SANITIZERS AND DISINFECTION PRODUCTS?

CDC reports an increase in calls to poison control centers regarding illnesses resulting from use or misuse of toxic disinfectants during the pandemic.[3] In May, the World Health Organization (WHO) released an updated advisory that warns, "Spraying disinfectants can result in risks to the eyes, respiratory or skin irritation and the resulting health effects."[4] "Spraying or fogging of certain chemicals, such as formaldehyde, chlorine-based agents or quaternary ammonium compounds, is not recommended due to adverse health effects on workers in facilities where these methods have been utilized," WHO reports.

Disinfectants are designed to be used on hard surfaces, while sanitizers are made to be used on skin. Neither type is meant to be ingested. FDA warns that disinfectant sprays or wipes should not be used on skin because they may cause skin and eye irritation.[5]

Furthermore, the Covid-19 crisis has elevated public understanding that there are people who are more vulnerable to the effects of the virus. These are generally people who have a preexisting condition or are of advanced age, who may have a weakened immune or respiratory system. With the management of viral and bacterial infections, it is always important that risk to individuals is not exacerbated in the process of avoiding or controlling the threat. Many of the products approved as sanitizers and disinfectants by FDA or EPA may have negative impacts on the respiratory or immune system, thus reducing resistance to the disease.

In the case of Covid-19, there are protective measures—both practices and products—that offer protection without using toxic products that increase risk factors.

PREVENTION

The good news is that toxic chemicals are not necessary to prevent exposure to Covid-19 and eliminate the virus. CDC urges simple measures to prevent exposure:

- Avoid close contact with people who are sick.
- Avoid touching your eyes, nose, and mouth.
- Cover your cough or sneeze with a tissue, then throw the tissue in the trash.
- Stay home.
- Practice social distancing: stay at least six feet from other people.
- Wear a mask in public.
- Wash hands frequently with soap and water or use an alcohol-based hand sanitizer.

How it works: The best way to prevent any infectious disease transmission is to stay out of contact with those who have already contracted the disease.

HAND CLEANING AND SANITIZING

Eliminating the Virus on Hands

- Wash hands often with soap and water for at least 20 seconds. Antibacterial soap is not necessary. If soap and water are not readily available, use an alcohol-based hand sanitizer with at least 60% ethanol or 70% isopropanol. Always wash hands with soap and water if hands are visibly dirty or, if washing is not feasible, rub off visible dirt before using a hand sanitizer.

How it works: Soap breaks down the virus's fat membrane—and the infectious material falls apart—as long as you rub the soap on your hands for at least 20 seconds. Alcohol sanitizers with 60% ethanol or 70% isopropanol do the same thing. These chemicals break down the virus by a similar process, by breaking down the lipid covering of the virus.[6]

FDA regulates hand sanitizers. Only products with active ingredients ethanol, isopropanol, or benzalkonium chloride can qualify as "hand sanitizers" according to FDA. However,

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Massachusetts Farmers Market public safety signage.

CDC says evidence shows that benzalkonium chloride is less reliably effective against the coronavirus than alcohol.[7] An alcohol-based hand sanitizer should contain at least 60% ethanol or 70% isopropanol in order to be effective.[8]

In 2016, FDA banned 19 antimicrobial ingredients in hand soap, including triclosan,[9] finding them no more effective than plain soap and water.

The Good: Soap or Alcohol

The most effective way to remove the coronavirus from hands is to wash with soap and water, for at least 20 seconds.

If soap and water are not readily available, use an alcohol-based hand sanitizer with at least 60% ethanol or 70% isopropanol. Glycerol or aloe as part of the remainder can help counter the drying effects of alcohol on the skin.

The Bad: Toxic Sanitizers

Avoid hand sanitizers containing benzalkonium chloride (BAC), which is a quaternary ammonium compound (or "quat"). It is an irritant that can cause asthmatic reactions and adversely affect the respiratory system.[10,11] BAC is also associated with changes in neurodevelopment,[12] selection for antibiotic resistance,[13] and irritation and/or contact dermatitis.[14] In addition, CDC reports that BAC is less reliable than the alcohols.[15]

DISINFECTING SURFACES

Eliminating the Virus on Surfaces

- Clean and disinfect frequently touched objects and surfaces using regular household cleaning sprays, soap or safer disinfectants. Disinfectants are ineffective if used on dirty surfaces because their disinfectant power is wasted attacking dirt.[16] Ordinary soap, detergent, and water can be used for cleaning.

How it works: Like handwashing with soap or using alcohol hand sanitizer, the virus on surfaces can be detached and broken down with soap and alcohol.[17]

EPA's "List N" contains products approved for use against the coronavirus. In response to the question, "How does EPA know that the products on List N work on SARS-CoV-2?" EPA says:

> While surface disinfectant products on List N[18] have not been tested specifically against SARS-CoV-2, the cause of COVID-19, EPA expects them to kill the virus because they:
> - Demonstrate efficacy (e.g., effectiveness) against a harder-to-kill virus; or
> - Demonstrate efficacy against another type of human coronavirus similar to SARS-CoV-2.
>
> All surface disinfectants on List N can be used to kill viruses on surfaces, such as counters and doorknobs.
>
> Because SARS-CoV-2 is a new virus, this pathogen is not readily available for use in commercial laboratory testing to see if a certain disinfectant product is effective at killing the virus.

While all of these disinfectants eliminate the virus, some are safer to use than others. Some may actually increase risk from coronavirus through their effects on respiratory and immune systems.

The Better-Good: Natural-based substances tend to be safer, while still effective at eliminating the virus on surfaces. Look for products with the following active ingredients (* indicates listed by EPA's Design for the Environment Program (DfE) or Safer Choice Program). This category is subdivided because active ingredients are found in products with other, or "inert," ingredients, which regularly make up the majority of a product's formulation, are toxic, and not disclosed on the product label. Because DfE is a voluntary program, its list is limited to manufacturers that choose to participate with individual product reviews.

Better. Below, the full formulation of product ingredients, including "inerts," has been evaluated and listed by DfE/Safer Choice, but "inerts" are not disclosed to the public:

- *CleanCide* (EPA Reg No. 34810-35; active citric acid)
- *Contec Citric Acid Disinfectant* (EPA Reg No. 34810-35-71670; active citric acid)
- *Lysol® Cleaner with Hydrogen Peroxide:* Citrus Sparkle Zest (EPA Reg No. 777-126; active hydrogen peroxide)
- Purell Products (EPA Reg No. 84368-1-84150; active ethanol) (See *www.bp-dc.org/disinfectants for complete list of Purell products*.)
- Wexford Disinfectant Wipes (EPA Reg No. 34810-37; active citric acid)
- ACCEL 5 RTU (EPA Reg No. 74559-8; active hydrogen peroxide)

Good. While the active ingredients with an asterisk below are DfE listed, the "inert" ingredients in most products containing these active ingredients have not received the DfE/Safer Choice listing (except those in the "better" category above).

- Citric acid*
- Ethanol*
- Isopropanol*
- L-lactic acid*
- Hydrogen peroxide*
- Sodium bisulfate*
- Thymol
- Dodecylbenzenesulfonic acid*[20]

The Bad: EPA has approved a long list of products[21] that will eliminate the Covid-19 virus on surfaces. The list includes products containing toxic chemicals, such as chlorine bleach, peroxyacetic acid, quaternary ammonium compounds or "quats," sodium dichloro-s-triazinetrione, and hydrochloric acid. Exposure to these chemicals are associated with a long list of adverse effects, from asthma to cancer.[22,23] Avoid products containing:

- Peroxyacetic acid (peracetic acid)[24]
- Chlorine compounds (sodium hypochlorite, hypochlorous acid, sodium chlorite, sodium chloride[25])
- Sodium Dichloro-S-Triazinetrione
- Quaternary Ammonium compounds (quats)
- Iodine[26]
- Phenolic compounds
- Glycolic acid
- Octanoic acid[27]
- Potassium peroxymonosulfate[28]
- Ammonium carbonate[29]
- Ammonium bicarbonate18
- Silver[30]
- Glutaraldehyde[31]

PRODUCTS: WHAT TO USE AND WHAT TO AVOID

The Beyond Pesticides website offers a guide[32] to buying disinfectants and sanitizers, regularly updated as EPA adds more products to List N.[33] (See *www.bp-dc.org/disinfectants*.)

Claims that characterize disinfectant properties are not made unless backed up by FDA or EPA. Even though these agencies have not provided complete and adequate regulatory oversight, based on a history of criticism by review agencies[34] and scientific critiques, their judgment on the issue of efficacy is used until/unless there is a better, more authoritative source. However, the agencies list toxic sanitizers and disinfectants that pose hazards in their use, especially to those with existing respiratory or immune conditions. For that reason, the review of sanitizers and disinfectants focuses on the threats to the respiratory and immune systems.

CHECK THE PRODUCT LABEL!

It is important to examine all chemical ingredients on the disinfectant and sanitizer product labels. Also, look at the use instructions to ensure that the method of use is compatible with your need. Some products require a longer contact time with the surface than others. Some may be applied as a spray, while others may be wiped onto the surface.

Alamy/Jim McDowall

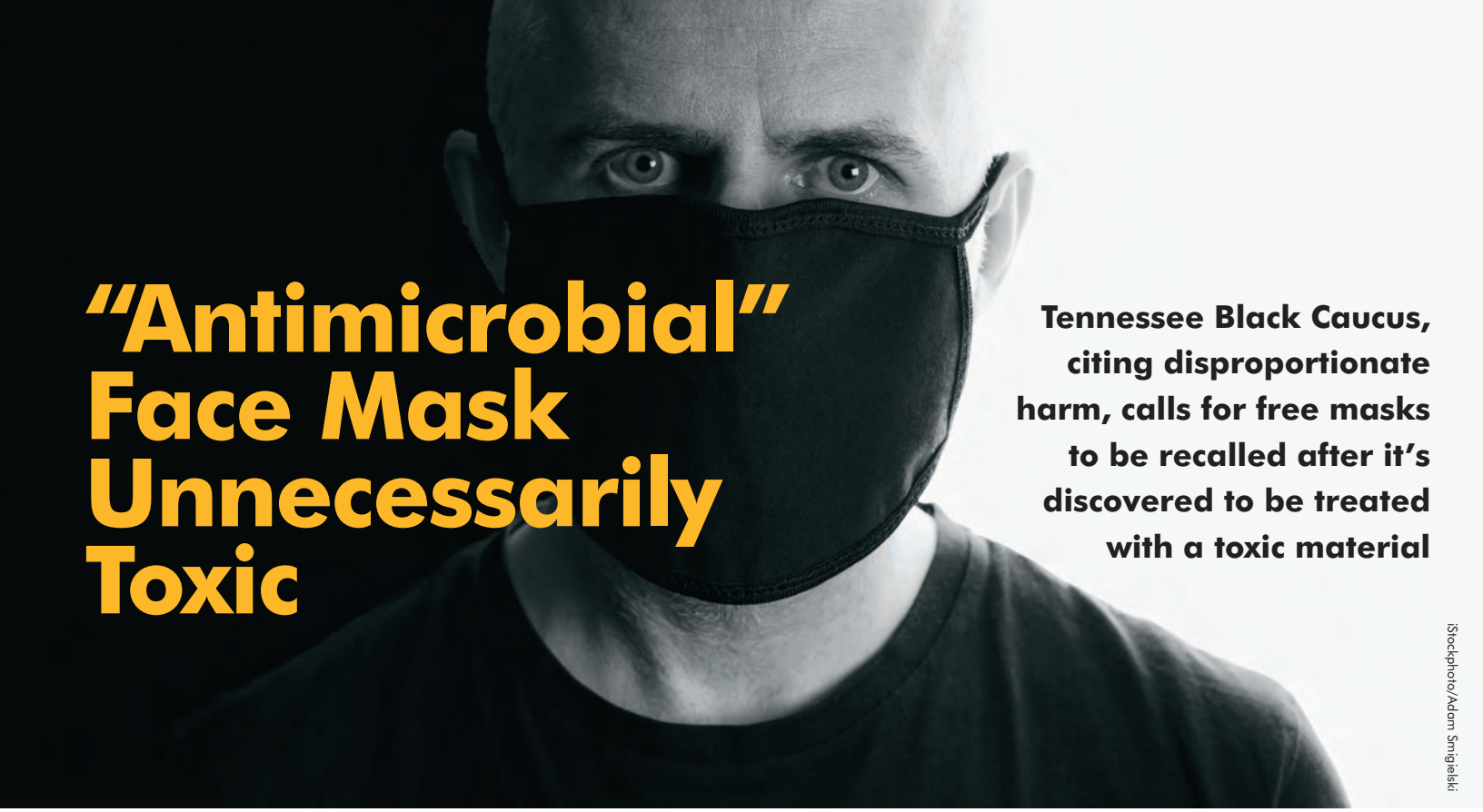
The first chemical ingredient is not the only chemical ingredient to consider when looking for a nontoxic sanitizer and disinfectant. Even if the first chemical ingredient is nontoxic, the following chemical ingredients are not always nontoxic (e.g., hydrogen peroxide is a nontoxic sanitizer, while hydrogen peroxide with peracetic acid is a highly toxic disinfectant).

Fight the coronavirus with common sense prevention and safer disinfection products. Avoid products that increase vulnerability to respiratory problems. All ingredients listed as "bad" are associated with harm to the respiratory system.[35,36,37,38,39,40] In addition, some quats have been shown to cause mutations, lower fertility, and increase antibiotic resistance.[41] Phenolic compounds include a wide range of toxic chemicals, including cresols, hexachlorobenzene, and chlorophenols. Health effects from breathing or exposure to the skin include headaches, burning eyes, muscle tremors, skin burns, irregular heartbeat, severe injury to heart, liver, kidneys, and lungs, cancer, and death.[42,43]

STAY SAFE

It is important during public health emergencies involving infectious diseases to scrutinize practices and products very carefully so that hazards presented by the crisis are not elevated because of the unnecessary threat introduced with toxic chemical use.

The endnotes indicated in the text of this piece can be found at www.bp-dc.org/disinfectantscited.



"Antimicrobial" Face Mask Unnecessarily Toxic

Tennessee Black Caucus, citing disproportionate harm, calls for free masks to be recalled after it's discovered to be treated with a toxic material

iStockphoto/Adam Smigielski

While wearing a mask is an important practice to help reduce the spread of Covid-19 infection,* a mask produced with pesticide-laden material for Tennessee residents and others, sold throughout the U.S, has been identified as possibly elevating the virus's health risks and/or introducing toxic chemical exposures. The state of Tennessee began at the end of May providing residents with free face masks made from sock fabric incorporated with antimicrobial silver pesticide and then stopped after an investigative report by NewsChannel 5 in Nashville. After EPA issued a statement that misled the public on the completeness of its review, the state continued with its distribution of the free masks.

The investigative unit of NewsChannel 5 Nashville discovered that the masks contain a toxic antimicrobial pesticide. Because of the U.S. Environmental Protection Agency's (EPA) interpretation of federal pesticide law, textiles and other materials infused with toxic antimicrobial substances are not evaluated by the agency for the wide range of exposure patterns associated with the use of these toxic products. In addition, the silver product in the sock material, Silvadur 930 Flex, states on its label that over 99% of product ingredients are "other ingredients," providing no disclosure of what they are or their potential hazards.

Beyond Pesticides' board member Warren Porter, PhD, environmental toxicology professor at University of Wisconsin at Madison, in an interview with NewsChannel 5, assessed the situation bluntly. Dr. Porter told reporters over a Zoom interview, "I wouldn't wear one," after explaining the potential impacts on the respiratory system.

TENNESSEE BLACK CAUCUS RAISES ALARM, PEOPLE OF COLOR DISPROPORTIONATELY AFFECTED

Following news reports, support from Beyond Pesticides, and at the urging of the Tennessee Black Caucus of State Legislators, Governor Bill Lee (R) recalled the chemically treated masks. "We know that many people in some of our more disadvantaged communities took advantage of the giveaway and now we need to protect them from the protection they believed we were providing for them," Representative G.A. Hardaway (D-Memphis) told Channel 5. "We are concerned that many of those people may have health issues that may have become aggravated by the masks."

FABRIC TREATED WITH A PESTICIDE

The masks, dubbed "sock masks" because the state contracted with a sock production company to fabricate them, are impregnated with the pesticide product Silvadur 930 Flex Antimicrobial. Containing silver as an active ingredient, Silvadur (manufactured by DowDupont) and other similar products are registered for use in consumer goods like carpet, footwear, wall and floor coverings, and other industrial and household fabrics. When incorporated into consumer products, including clothing, its use is intended to inhibit the growth of microbes that may cause "deterioration of the treated product."

EXPOSURE RAISES SAFETY CONCERNS

It should be emphasized that the treated sock fabric was not intended to be used as a face covering. This use can result in exposure to silver that may be dislodged from the fabric.

* Chu, Derek, Akl, Elie, et al. *Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. Lancet, June 1, 2020; 395: 1973–87.*

Asked about the risk of having Silvadur products so close to one's nose and mouth, Dr. Porter responded, "That would definitely be more vulnerable because you've got all your respiratory surfaces and a lot of things that can get through those respiratory surfaces."

"You start messing around with DNA, which is the genetic material controlling your cell operations, you interfere with the messaging and bugger up the communication that goes on in cells, like I say, you've got a molecular bull in a china shop," Dr. Porter told NewsChannel 5. "There are all kinds of ways that it can disrupt cellular activity."

PEOPLE AT RISK OF VIRUS THREAT PUT AT GREATER RISK WITH PESTICIDE EXPOSURE

Although Governor Lee's efforts to protect residents from Covid-19 by encouraging the use of face masks may have been well-intentioned, Dr. Porter states that it is critical to avoid the use of toxic pesticides that may further undermine respiratory or immune system health. This applies to a range of pesticide uses: the use of disinfectants; toxic spray programs for mosquitoes that can be effectively managed with larval control and the reduction of breeding sites; land management of parks, playgrounds and playing fields that can be managed organically, and; other community pesticide use programs.

Shortly after the NewsChannel5 piece ran, officials in Nashville's Metro Public Health Department announced it would postpone distribution of the silver-tainted masks "out of an abundance of caution" and to "allow Metro Health officials to learn more about the masks from state officials."

Impregnating any consumer fabric with potentially hazardous antimicrobials is an unnecessary measure that has no proven public health benefit. However, the pesticide industry has long played on consumers fears of bacteria in order to find new markets for these toxic products. The U.S. Centers for Disease Control and Prevention (CDC) recommends simple cloth face coverings to protect against coronavirus. The agency suggests the following on its website: "CDC recommends wearing cloth face coverings in public settings where other social distancing measures are difficult to maintain (e.g., grocery stores and pharmacies), especially in areas of significant community-based transmission." Beyond Pesticides warns people to avoid any fabric or clothing that markets "extra protection" in the form of a patented antimicrobial.

POLICY CREATES LOOPHOLE IN PROTECTION AND MISLEADING LABELING

Underlying a serious public health threat associated with inhaling antimicrobial silver, there is a serious policy issue behind this story. The sock and mask manufacturer, Renfro (headquartered in Mount Airy, NC with a manufacturing facility in Cleveland, TN), responded to the TV piece by distinguishing its use of Silvadur 930 Flex silver antimicrobial pesticide from another silver antimicrobial, Silvadur, claiming that its product is "safe." The only difference on the labels of these products is the percentage of silver. Both products work by releasing silver ions (see Factsheet, p.18). The label indicates that over 99 percent of the ingredients are "other ingredients" not disclosed to the public. While claiming that its sock fabric "has been determined to be safe in consumer products," it has been reported that the manufacturer says the pesticide washes out of the fabric after numerous washings. Pesticides are not registered as "safe" by EPA, but are subject to risk assessments and allowable levels of harm.

EPA EXEMPTS PESTICIDE-TREATED MASKS FROM REVIEW AS LONG AS NO SAFETY CLAIM IS MADE

Under what is known as the "treated articles exemption" (40 CFR 152.25(a)), all products treated with antimicrobials are not regulated by EPA unless the manufacturer makes a public health claim. Renfro, in claiming the safety of the sock, material, does not disclose the exemption from exposure reviews that its socks (as do other antimicrobial-impregnated products) enjoy. Renfro notes that the toxic antimicrobials are "used for inhibiting microbial growth in order to reduce odor on textiles and garments." EPA does not look at exposure patterns associated with the treated textiles. Beyond Pesticides has long told EPA that it is an outrage not to evaluate the exposure patterns associated with textiles impregnated with pesticides. (See EPA's explanation of the treated article exemption in Box 1.) Beyond Pesticides maintains that this EPA failure allows manufacturers to mislead the public on product safety and efficacy.

For more information on the hazards associated with many antimicrobials registered as pesticides, as well as proper safety measures to clean surfaces of coronavirus, see Beyond Pesticides' program page on Disinfectants, Antimicrobials, and Sanitizers (www.bp-dc.org/disinfectants).

BOX 1

EPA Policy Statement on Pesticide-Treated Fabrics, Plastics, Paints, Etc.

PRN 2000-1: Applicability of the Treated Articles Exemption to Antimicrobial Pesticides

This notice clarifies EPA policy with respect to the scope of the "treated articles exemption" in 40 CFR 152.25(a). This exemption covers qualifying treated articles and substances bearing claims to protect the article or substance itself. EPA does not regard this exemption as including articles or substances bearing implied or explicit public health claims against human pathogens.

This notice addresses the types of claims that are not permitted for antimicrobial pesticide products exempt from registration under this provision and gathers together in one place guidance the Agency has offered on labeling statements it believes would or would not be covered under this provision. This notice also explains the requirement that the pesticide in a treated article be "registered for such use."

This notice provides guidance to producers and distributors of pesticide treated articles and substances, and to producers and distributors of pesticides used as preservatives to protect treated articles from microbial deterioration.

Source: EPA, Pesticide Registration website, and Factsheet: Consumer Products Treated with Pesticides.

Face Masks Treated with Silver Pesticides Elevate Risk Factors

Both ionic silver and nanosilver have virtually the same adverse effects from exposure to silver ions, although nanosilver may have additional risks attributable to particle size. According to the science, silver ions kill bacterial cells at the same rate as they harm human cells. Both ionic silver and nanosilver are toxic not only to microbes, but to other species as well. Although intact skin may pose an effective barrier against the absorption of silver, mucosal surfaces (respiratory tract, gastrointestinal tract, urinary tract, and reproductive tract) are observed to be less effective barriers and compromised skin is often a poor barrier.

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Silver is deposited in many or all organs, and there is evidence that it may persist in the body for weeks to months. The accumulation of silver in soft tissues is responsible for the most widely known effect, argyria, which lends a grayish hue to the skin—but silver is also deposited in the liver, spleen, adrenal glands, muscle tissue, and brain. High doses can be lethal. Other health effects that have been documented include weight loss, hypoactivity, altered neurotransmitter levels, altered liver enzymes, altered blood values, enlarged heart, and immunological effects. Since silver accumulates in the body, it is dangerous to discount these effects as being associated with higher doses than would be predicted by exposure to silver through a face mask.

EPA has not evaluated the exposure pattern associated with exposure to fabrics fabricated for face masks and inhaling air through the pesticide-treated material. On its Technical Data Sheet for the chemical applied by Renfro—Silvadur 930 Antimicrobial (Flex is an additive combined with Silvadur 930)—DowDupont states, "Avoid prolonged inhalation of SILVADUR™ 930 Antimicrobial vapors." The antimicrobial in the sock fabric works by releasing silver ions. It has been reported that the antimicrobial properties diminish over time as the pesticide washes out, again releasing silver ions.

EPA HAS NOT REVIEWED USE OF PESTICIDE-TREATED FABRIC AS A FACE MASK

Products treated with antimicrobials, like the sock fabric, are not regulated by EPA unless the manufacturer is making a public health claim—under what is known as the "treated articles exemption" in federal pesticide regulation.

BACTERIAL RESISTANCE— A PUBLIC HEALTH THREAT

The spread of antimicrobial resistance is a health care crisis of major proportions. The Centers for Disease Control and Prevention (CDC) calls it "one of the world's most pressing public health problems." Many bacterial infections are becoming resistant to the most commonly prescribed antibiotics, resulting in longer-lasting infections, higher medical expenses, and the need for more expensive or hazardous medications. The development and spread of antimicrobial resistance is the inevitable effect of the widespread use of antimicrobials. Microbes evolve quickly, and antimicrobials provide strong selection pressure for those strains with genes for resistance to antibiotics, as well.

Silver is used on surgical sites—commonly in dressings—and surgical sites are a common entry point for dangerous antibiotic-resistant infections (including methicillin resistant *Staphylococcus aureus* (MRSA)). It is important that we maintain options—including ionic silver—for preventing and treating MRSA and other opportunistic infections in surgery. A recent review article found, "The declining efficacy of existing antibiotics potentially jeopardizes outcomes in patients undergoing medical procedures." In particular, the study found:

> We estimate that between 38.7% and 50.9% of pathogens causing surgical site infections and 26.8% of pathogens causing infections after chemotherapy are resistant to standard prophylactic antibiotics in the USA. A 30% reduction in the efficacy of antibiotic prophylaxis for these procedures would result in 120,000 additional surgical site infections and infections after chemotherapy per year in the USA (ranging from 40,000 for a 10% reduction in efficacy to 280,000 for a 70% reduction in efficacy), and 6,300 infection-related deaths (range: 2,100 for a 10% reduction in efficacy, to 15,000 for a 70% reduction).

Silver is an antimicrobial with medical uses, so it is important to avoid unnecessary consumer non-medical use that could lead to resistance. Sütterlin et al. found, "Despite a restricted consumption of silver-based products in Swedish health care, silver resistance genes are widely represented in clinical isolates of *Enterobacter* and *Klebsiella* species. To avoid further selection and spread of silver-resistant bacteria with a high potential for healthcare-associated infections, the use of silver-based products needs to be controlled and the silver resistance monitored."

TWO LAWSUITS

Challenge Deceptive Environmental Practices by Major Corporations

Beyond Pesticides Sues ExxonMobil and TruGreen for making fraudulent claims about their practices to protect people and the environment

Corporations, fighting the facts, desperately try to align their messaging with environmental issues that the public increasingly understands are critical to their health and the sustainability of the planet. TruGreen, a nationwide chemical-intensive lawn treatment company, has long characterized its practices as good for the environment and healthy for those who purchase their toxic pesticide service. ExxonMobil, as a oil and gas producer of petrochemicals that are the basis for pesticides, has invested significant advertising dollars to tell the public that they are a green company, heavily invested in addressing and solving the climate crisis. In both cases, the companies are engaging in fraudulent and misleading practices that misstate the truth and the facts, leading the public to believe that they are offering solutions that people want to support with their purchasing power, according to separate lawsuits filed by Beyond Pesticides in Washington, DC. Beyond Pesticides is represented by the Richman Law Group, headquartered in New York City.

Alamy/Dennis MacDonald

THE CASE AGAINST EXXONMOBIL

On May 15, 2020, Beyond Pesticides sued ExxonMobil Corporation (Exxon) for "false and deceptive marketing," misrepresenting to consumers that it "has invested significantly in the production and use of "clean" energy and environmentally beneficial technology." The truth, according to the complaint (*Beyond Pesticides v. Exxon Mobil Corporation*) filed in DC Superior Court in May, is that the vast majority of Exxon's business continues to be in the production and use of petroleum, natural gas, and petrochemicals, including pesticides. These activities are significant contributors to the climate crisis and the decline of pollinators and biodiversity, threatening the viability of biological systems that sustain life.

Real solutions to the climate crisis and biodiversity destruction are within our reach if not slowed by deceptive practices of Exxon and other powerful corporations.

"ExxonMobil's advertising and marketing mislead the public by presenting ExxonMobil's clean energy activities as a significant proportion of its overall business," according the lawsuit. In an age where consumers are looking to support responsible companies that are supporting and transitioning away from fossil fuel-based energy and chemical products, "ExxonMobil is able to capture the growing market of consumers," according to the complaint.

Surveys have found that consumers are more likely to buy products and services based on corporate image. For example, a 2015 Nielsen survey finds that the majority of consumers are more likely to buy products and services from companies "known for" being environmentally friendly or committed to social value.

"We cannot afford to be misled by corporations that are tinkering with solutions to the environmental crises of climate change and biodiversity devastation, which threaten our future over an ever-shortening time horizon," said Jay Feldman, executive director of Beyond Pesticides. "Overselling half-hearted attempts to solve these environmental crises head-on is doing dramatic damage to the large scale and meaningful changes that must take place now," Mr. Feldman continued.

Beyond Pesticides is working with consumers, farmers, landscapers, and communities across the country and worldwide to expedite a transition to organic land management practices (defined under the *Organic Foods Production Act*), eliminating petrochemical pesticides and fertilizers, which release human-caused carbon into the atmosphere and are destructive of soil biology and organic matter, nutrient cycling, and carbon sequestration. Drawing down carbon from the atmosphere on a massive scale is critical to a holistic strategy for reversing the climate crisis—which is feasible with regenerative organic systems that could, if universally adopted, capture more than 100 percent of carbon dioxide (CO_2) emissions.

Exxon espouses a "commitment to develop new resources to ensure the world has the energy it needs while also minimizing the environmental impacts, including the risks associated with greenhouse gas emissions and climate change."

Exxon has invested heavily in its image as a "clean" and "green" company with advertising on its leadership on carbon capture and storage technology to the tune of 1.8 billion advertising impressions for this one campaign. Yet, according to the complaint, "Since 2000, ExxonMobil's capital expenditures total well over $465 billion. Thus, the $9 billion in environmentally beneficial investments touted by ExxonMobil demonstrate that no more than 2% of ExxonMobil's capital expenditures in the past 20 years was invested in lower-emission solutions, carbon capture and storage technology, biofuels, cogeneration, and more efficient manufacturing processes, combined."

"Deceiving the public into believing that one of the largest petroleum companies in the world is committed to solving the climate crisis, while it continues to devastate the planet, is dangerous and inexcusable, especially given what's at stake," said Mr. Feldman. "This is especially problematic, given that real solutions to the climate crisis and biodiversity destruction are within our reach if not slowed by deceptive practices of Exxon and other powerful corporations," Mr. Feldman continued.

"The coronavirus pandemic challenges us to think differently and act urgently to prioritize the importance of science in government and corporate decision making, take the necessary steps to avert looming crises that affect public health and the environment, and hold companies accountable to practices that protect life," said Mr. Feldman. Beyond Pesticides advocates for the adoption of organic land management, a systems approach that eliminates toxic petrochemical pesticides and fertilizers and builds organic matter and soil biology as a means of cycling nutrients for plant health, sequestering carbon on a massive scale, and protecting biodiversity. Organic methods are successfully and economically used in managing agriculture, lawns, parks, and playing fields across the country.

Exxon's false and misleading representations and omissions violate the District of Columbia *Consumer Protection Procedures Act* ("DC CPPA"), D.C. Code§§ 28-3901, et seq., according to the complaint.

THE CASE AGAINST TRUGREEN

Beyond Pesticides sued TruGreen for misrepresenting the safety of the toxic chemicals that it uses to treat lawns. The case, *Beyond Pesticides v. TruGreen* (DC Superior Court, Case No. 2020CA001973B, was filed in March 2020. At the same time, Beyond Pesticides urged all states to prohibit toxic chemical spraying in neighborhoods as nonessential and hazardous, especially during the coronavirus pandemic. Widespread

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exposure to lawn pesticides, which are immune system and respiratory toxicants, can elevate serious risk factors associated with Covid-19 (coronavirus).

As part of its marketing, TruGreen tells consumers that it offers environmentally friendly, sustainable lawn care services without chemicals that cause cancer, allergic reactions, or other health or environmental harms. These claims, according to Beyond Pesticides' complaint, are false and deceptive and illegal under the laws of the District of Columbia.

Advocates suggest that during the Covid-19 crisis the cessation of pesticide applications in neighborhoods across the U.S. will reduce involuntary exposure to chemicals that exacerbate respiratory and immune system illness and risk factors associated with coronavirus. Lawn care services have been determined by some states to be nonessential services and are prohibited from applying chemicals and delivering other lawn services during phase I of the pandemic. However, TruGreen has notified customers that it will continue to deliver services where permitted. Some companies are reporting cancellations. The litigation is intended to curtail use of hazardous pesticides long-term.

TruGreen makes several claims to consumers that, according to the lawsuit, the company knows to be false. As stated in the complaint, "TruGreen purports to offer environmentally friendly, sustainable lawn care services that use no chemicals that may cause cancer, allergic reactions, or other health or environmental harms." Beyond Pesticides shows that these claims are false and deceptive.

Quoting from TruGreen's information to consumers, identified as false and deceptive in the litigation:

> "We will not approve products containing known or probable human carcinogens as defined by the U.S. EPA, the National Toxicology Program, or the International Agency for Research in Cancer [IARC]."
>
> "We do not approve products that are known skin sensitizers or that may produce allergic reactions."
>
> "We do not approve products known or thought likely to leach to groundwater when applied to lawns."

In fact, TruGreen uses the weed killer glyphosate (Roundup), which is identified by IARC of the World Health Organization as probably carcinogenic. It uses a chlorophenoxy (Tri-Power), another weed killer whose label warns of "irreversible eye damage" and "allergic reactions." Another hazardous pesticide identified in the lawsuit is triclorfon (Dylox), a neurotoxic organophosphate insecticide. As stated in the complaint, TruGreen's representations are intended to, and do, portray to consumers that its lawn care services are environmentally responsible and free from harmful chemicals.

"It's time that chemical lawn care companies stop deceiving the public and their customers with deceptive, misleading, and false information on the real hazards of the pesticide they use," said Jay Feldman, executive director of Beyond Pesticides. "These practices are particularly abhorrent, given the availability of organic compatible products that do not cause harm," said Mr. Feldman.

Beyond Pesticides advocates for the adoption of organic land management, a systems approach that eliminates toxic chemical pesticides and fertilizers and builds organic matter and soil biology as a means of cycling nutrients for plant health. This approach is successfully and economically used in managing lawns, parks, and playing fields across the country.

TruGreen's false and misleading representations and omissions violate the District of Columbia *Consumer Protection Procedures Act* ("DC CPPA"), D.C. Code§§ 28-3901, et seq.

For more information on organic land management of lawns, parks, and playing fields, see Beyond Pesticides Lawns and Landscapes page at *www.bp-dc.org/lawns*.

TRACKING BIODIVERSITY

MOSSES

TERRY SHISTAR, PH.D.

From the vantage point of the standing human, mosses can all look the same—a carpet of green in a moist, shady place. But get down on your knees and take out a magnifying glass, and you will find that moss comes in various colors (shades of green, mostly) in some unexpected places. Mosses are a fascinating and beautiful part of local ecosystems, filling an important niche, and serving as habitat for literally thousands of microscopic organisms that work in concert with nature. And they are evergreen, providing green cover all winter!

MOSSES ARE BRYOPHYTES

Mosses belong to the phylum Bryophyta, which is often combined with the phyla Marchantiophyta (liverworts) and Anthocerotophyta (hornworts) under the term bryophytes *sensu lato (s.l.)*. Bryophytes s.l. are non-vascular plants—they lack specialized tissues to take up and transport water and nutrients—and are therefore small, since cells must acquire water and nutrients directly from the environment and are dependent on diffusion to transport them within the plant. In the narrow sense (*sensu stricto* or *s.s.*), bryophytes, or mosses, are distinguished from liverworts and hornworts by their form, having multicellular rhizoids (root-like hairs) that anchor them to substrates, and by various characteristics of their reproduction and development.

Some small plants with "moss" in their names are not mosses. Irish moss is a seaweed. Scottish moss is in the carnation family. Reindeer moss and others are lichens. Spanish moss is an air plant related to pineapples. Club mosses are related to ferns.

LIFE CYCLE

As in many other plants, moss reproduction may be asexual (vegetative) or sexual. Vegetative reproduction is very common. A piece that breaks off may land in a suitable habitat and grow there.

In changing habitats, the genetic recombination of sexual reproduction can help the plant adapt. The sexual reproductive cycle of mosses and other bryophytes differs somewhat from reproduction in "higher" plants. The moss plant that we see is a gametophyte (bearing sperm or eggs), which is haploid, having half the chromosome complement of the diploid cell, which contains the chromosomes from both parents. Male gametophytes release sperm into water, which can carry them to female gametophytes. After fertilization, the zygote grows into a sporophyte—a diploid embryo that grows from the female gametophyte. The diploid mother cells within the sporophyte undergo meiosis, producing haploid spores, which disperse and, if they find favorable conditions, germinate into a thin filament called a protonema, from which buds develop into new moss plants.

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ECOLOGY

Mosses contain chlorophyll and use sunlight to produce food, so they require some sunlight. They absorb minerals and water through the surface of the plant. Because of their dependence on water for growth and reproduction, mosses grow most luxuriously in moist environments, with different species preferring different substrates. Mosses are poikilohydric—they have no mechanism to prevent drying out, but can survive periods of desiccation, reviving when favorable conditions return. The moss in the top photo on page 23 is growing in the space between warm season grasses and forbs in a sunny hayfield.

Because mosses do not require soil for nutrients, they are among the first plants to colonize bare ground. In doing so, they help to build soil and prevent erosion. Mosses lack roots to take up nutrients but do have rhizoids that help anchor them to the soil, stone, tree, or other substrate on which they live. Because they do not take up nutrients from the soil, they do not compete for nutrients with their vascular plant neighbors. Because they are small, they do not compete for sunlight.

Who eats moss? Moss has little nutrition to offer, but moose and musk oxen will scrape away snow to get it in the winter. Pikas are small rabbit-like animals living mostly at high elevations, but those living at lower elevations consume large quantities of moss. Small invertebrates make moss their

home as well as a food source. Moss provides shelter, water, food, and insulation. Like moss itself, microscopic invertebrates (such as nematodes, tardigrades, and bdelloid rotifers) require free water for active life, but are all capable of cryptobiosis (a dormant dehydrated state) to tolerate periodic drought. Some of these invertebrates eat moss, while some nematodes and tardigrades prey upon bacteria, insects, and other tiny invertebrates. Fungi and bacteria are decomposers in the moss ecosystem, releasing nutrients for mosses and other primary producers in the food web.

HUMAN VALUE

In addition to their value in building soil and preventing erosion, moss has been used for other human purposes. The absorptive properties of dried moss were once valued as a predecessor to toilet paper and diapers. Currently, dried sphagnum moss is used as packing material for plants and perishable foods. Peat, the partly decayed remains of sphagnum moss, has been used so much as a soil conditioner that the ecosystems it supports are threatened by peat mining. The currently favored substitute for this use is coconut coir.

ENJOY MOSS. GROW MOSS. READ ABOUT MOSS.

The diversity of mosses becomes more apparent up close. The currently known moss flora of North America north of Mexico is comprised of 1,402 species in 333 genera classified in 81 families. Seventeen (5%) of the genera and 273 (19.5%) of the species are endemic to the area. Of these, 36 (2.6%) are considered to be of conservation concern. A major division is between pleurocarpous mosses, which attach to hard surfaces, grow quickly, and creep along the ground, and acrocarpous mosses, which grow in mounds.

Areas that are too shady and damp to grow a healthy grass lawn may be perfect for a moss garden. Mosses like thin, compacted soil of low fertility, as well as rock or logs. When grown in such a location, they require almost no work to maintain. Many kinds of moss do not tolerate heavy traffic, but sheet moss (moss in the genus *Hypnum*) stands up better than most, so it is often used on paths. Mosses make a beautiful groundcover in a shady garden. By providing a variety of substrates (logs, rocks, and soil), a diversity of species may be established. Moss may also be used as a mulch around other plants to hold in moisture and nutrients.

GROWING MOSS

Moss is easy to grow by transplanting a patch from a similar environment. The patch may be broken up into smaller pieces, which will spread to fill in the spaces. To plant, moisten the bottom and press into the new substrate. Pieces may be held in place temporarily with nails or sticks until rhizomorphs grow. Another way of planting moss is to put pieces in a blender with a small amount of water and blend for two minutes. Spread this slurry onto the substrate. Buttermilk is often suggested as an additive to help the slurry stick to rocks or clay pottery. In either case, water frequently until the moss is established.

To learn more about mosses, read *Gathering Moss* by Robin Wall Kimmerer, which explores the biology of mosses in their ecological and human contexts.

Moss in hayfield Terry Shistar

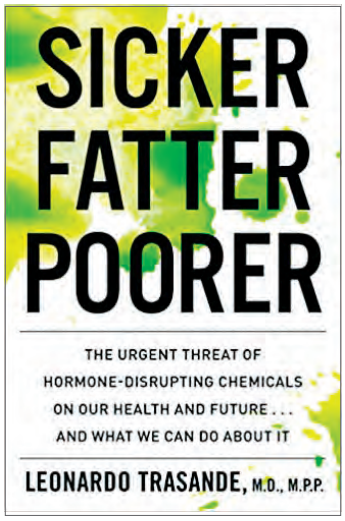
Moss in hayfield with chigger. Terry Shistar

Moss with sporophytes. Terry Shistar

iStockphoto/dpinn

Reviewed by Terry Shistar, PhD

The Time to Eliminate Endocrine-Disrupting Chemicals Is Now



Sicker, Fatter, Poorer
Leonardo Trasande, MD, MPP
Houghton Mifflin Harcourt.
240pp. 2019

The full title of Dr. Trasande's book is *Sicker, Fatter, Poorer: The urgent threat of hormone-disrupting chemicals to our health and future. . . and what we can do about it.* He dedicates the book to the "memory of Rachel Carson, Theo Colborn, and Lou Guillette. Your legacies inspire us all to carry on your work to protect human health and the environment from endocrine-disrupting chemicals." Indeed, this book carries on the spirit of these dedicated scientists and a growing number of others who conduct important research in the field of endocrine disruption, and urge us to action.

While Rachel Carson awakened society to indiscriminate use of "poisons," not "endocrine disruptors," the DDT she wrote about in *Silent Spring* is an endocrine disrupting chemical (EDC), and the reproductive failure of birds that she brought to our attention is an endocrine-disrupting effect. Theo Colborn, PhD brought EDCs into public view by publicizing the work of scientists working on wildlife deformities in the Great Lakes, through her landmark book, *Our Stolen Future,* and through the founding of The Endocrine Disruption Exchange (TEDX). Lou Guillette, PhD connected the dots for many of us with his work on the reproductive biology of alligators in Lake Apopka, Florida. These scientists, as well as others in the field, have expanded on past findings, clarifying the broad impacts of chemicals that interfere with the hormones that regulate every system in our bodies. Both Drs. Colborn and Guillette were awarded Beyond Pesticides' Dragonfly Award in 2006 and 2015, respectively, for their extraordinary efforts, and presented their research at numerous Beyond Pesticides' Forums.

EDCs disrupt hormones that regulate every system in our bodies, causing a host of diseases. These diseases include autism, attention deficit and hyperactivity disorder, food allergies, diabetes, high blood cholesterol, high blood pressure, low sperm counts in men, infertility in women, and cancer, among others. As Dr. Trasande says, "There is also substantial irony in that chemical exposures appear to induce conditions that then require other chemical exposures (pharmaceuticals) to cure them."

Most recently added to the growing list of endocrine effects caused by chemical exposure are metabolic diseases, including obesity and diabetes. The chemicals causing these effects have been termed "obesogens." Dr. Trasande explains that studies by Bruce Blumberg, PhD and colleagues show how exposure to EDCs triggers epigenetic changes in gene expression, "predisposing the body to produce more fat cells that lead to stubborn weight gain over time." He says, "Carefully designed, peer-reviewed studies have drawn an increasingly convincing link between obesity and type 2 diabetes and prenatal and early childhood exposure to pesticides, bisphenols (such as BPA), and plasticizers, such as phthalates. Other studies have suggested that adults may gain weight or develop diabetes in response to their exposure later in life."

The effects of EDCs are considered "externalities" by economists, meaning that the "free market" does not account for the costs of treating these diseases. Companies that make the chemicals get richer, while those exposed to them get poorer.

After explaining how EDCs are making us "sicker, fatter, and poorer," Dr. Trasande urges action—ranging from making personal choices to limit exposure to EDCs (such as eating organic food and avoiding plastics), leveraging economic power, to effecting policy changes. He says, "[E]very person you discuss EDC's with will have a family member with a chronic disease that may be due to these preventable exposures." *Sicker, Fatter, Poorer* is an important and very readable addition to the literature on EDCs.

(Editor's Note) Faced with the health threats of coronavirus, now is the time to eliminate compounding challenges to our bodies that increase our vulnerabilities to a range of illnesses. The documentation in this book supports us moving forward as a society to transform our approach to toxic chemical dependency in the face of available sustainable practices and products.

Buying Online These Days?

To be safe, many have turned to online shopping to get necessities delivered. If you happen to be using Amazon, you can put your purchases to work for Beyond Pesticides. AmazonSmile will donate 0.5% of your eligible purchases to Beyond Pesticides when you designate us as your charitable organization.

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IN THE AGE OF CORONA VIRUS, THE NEW NORMAL,

WE CAN END TOXIC PESTICIDE USE

It is important during this infectious disease pandemic to scrutinize chemical practices, products, and policies very carefully so that hazards presented by the crisis are not exacerbated by unnecessary toxic pesticide use.

Let's join together to protect all, especially those at greatest risk.

Use Safer Disinfectants and Sanitizers

Fight the virus with common sense prevention and safer disinfection products. Avoid products that increase vulnerability to respiratory and immune system illness. Go to www.bp-dc.org/disinfectants.

Stop Your Community's Pesticide Use in Parks, Playing Fields, and Playgrounds

Widespread exposure to lawn and landscape pesticides, which are immune system and respiratory toxicants, elevate serious risk factors associated with Covid-19. And they are not necessary for beautiful turf and landscapes. Now is the time to transition to organic. See www.bp-dc.org/lawns.

BEYOND PESTICIDES

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