

Twist upon twist in glyphosate battle: Next generation safer biopesticides on the way thanks in part to anti-chemical activists?—who may yet oppose them

As biotech firm Bayer battles more than 13,000 lawsuits alleging its popular weed killer Roundup (glyphosate) can cause cancer in farmers, there are widespread concerns that the legal battle could fuel additional restrictions on the herbicide and other pesticides. The organic industry-funded anti-GMO advocacy group US Right to Know (USRTK), which has [worked closely](#) with the plaintiffs' lawyers, has been clear that it's not just going after a single weed killer; the group wants to [handcuff conventional pesticide manufacturers](#) with endless lawsuits, spur regulations and force growers to adopt organic farming practices, which they claim would lead to the use of fewer 'toxic' chemicals.

Many scientists and farmers fear that restrictions on glyphosate and other pesticides that have been declared safe by regulators and used for decades could force growers to turn to [more expensive, less effective and more harmful solutions](#) (including in some cases [organic alternatives that are more toxic](#).) But not all the chaos created by myopic activists is necessarily bad. In an ironic twist, USRTK and its allies along the fringes of the environmental movement are speeding the development of new biologically based pesticides that prove both safe and almost as effective as synthetic counterparts.

Though designed primarily to help farmers, many of these next-generation products are also engineered to counter objections from activists. They're "natural," environmentally benign and less likely to encourage insect and weed resistance. In yet another twist, though, many anti-chemical campaigners are wary of these new innovations, fearing they are Big Ag's next Trojan Horse designed to maintain "corporate control" over modern farming.

Not-so-secret plot to ban pesticides

Implying that the Environmental Protection Agency is asleep at the wheel, USRTK co-founder Gary Ruskin made it clear here and other anti-glyphosate campaigners are targeting all synthetic pesticides:

"if what has been touted as perhaps our 'safest' widely used pesticide [[#glyphosate](#)] actually causes [#cancer](#), what assurance do we have about the hundreds of other [#pesticides](#) that the [@EPA](#) has assured us are safe?" [@guardian](#) [@Nathan_Donley](#) [@careygitlam](#)
<https://t.co/Ae3pzcJYfW>

— Gary Ruskin (@garyruskin) [May 7, 2019](#)

Other groups seem to share Ruskin's concern and have been even more forthcoming about their intention to fatally injure the crop protection industry. The Pesticide Action Network says it wants to tackle "the global pesticide problem" by eliminating more than [300 chemicals from agriculture](#):

Here in the U.S., PAN's work often focuses on mobilizing action around specific pesticides to

strengthen regulations, win phaseouts, and spur investment in safer alternatives. Recent examples include our work on chlorpyrifos, which is harmful to the health of children and farmworkers; dicamba, which is wreaking havoc on the crops and livelihoods of farmers across the country; and glyphosate, a probable carcinogen and key ingredient in the most widely used herbicide in the world.

What's not often visible is that these U.S.-based efforts are part of a broader campaign through our global PAN International network to phase out the use of Highly Hazardous Pesticides, or HHPs, around the world.

Next-generation biopesticides

These anti-pesticide campaigns generate massive attention. Always itching for a headline, the press amplifies claims by PAN and other groups even as the science community pushes back against over-the-top hysteria, debunking the misleading and even downright false assertions about pesticide safety. Far less attention has been paid to the fact that the crusade against synthetic pesticides has quietly energized ongoing efforts to develop more sustainable pest management tools.

Synthesizing and registering conventional pesticide ingredients is a tedious and expensive process—[requiring a decade and costing upwards of \\$180 million](#). But since nature is an [abundant source](#) of toxic chemicals, pesticide manufacturers have gotten good at deriving alternatives called “biologicals” or “biopesticides” from microorganisms and plants, developing products for as little as [\\$5 million in about three years](#), according to the biopesticide company BioWorks.



mushroom-based biopesticides could cut environmental damage from synthetic chemicals

These naturally derived pesticides offer a number of benefits that make them appealing to farmers. They

target specific insects, harmful microorganisms and weeds through multiple, unique [modes of action](#), according to the EPA, which [reduces the likelihood](#) of pesticide resistance, an ever-present threat to agriculture. Biologicals may be toxic enough to kill targeted pests without harming humans or beneficial insects, as the [well-known Bt \(Bacillus thuringiensis\) proteins](#) are, or they may simply cause mating disruptions or discourage insects from munching on crops.

Given these benefits, it's no wonder these products are growing in popularity. According to a [2015 study](#), "globally, the use of biopesticides is increasing steadily by 10% every year More than 200 products are sold in the US market" The University of California Division of Agriculture and Natural Resources [noted in January](#):

Overall, more than 225 microbial biopesticides are presently manufactured within 30 countries According to Berkshire Hathaway, the global biopesticides market is projected to reach a value of \$8.8 billion by 2022, representing annual average growth of 17% from 2016

Most of this growth is driven by the global success of [genetically engineered insect-resistant Bt crops](#), which drastically cut insecticide use around the world and spare millions of farmers the ill health effects that can go with it. There are a variety of biopesticide products in the pipeline or already on the market that achieve similar goals. Researchers have turned [spider venom](#) peptides into insecticides, which can be engineered into transgenic crops, as Bt toxins were, or used as standalone treatments. Biotech firm [Vestaron](#), for instance, manufactures a bioinsecticide derived from the venom of the [Australian Blue Mountains funnel-web spider](#). Approved for greenhouse use, it targets aphids, spider mites, thrips and whiteflies. The EU-funded [EcoStack Project](#) is also working on venom-based pesticides.

To briefly recall your high-school biology class, Ribonucleic acid (RNA) plays a key role in [constructing proteins from DNA](#). New [RNA-based pesticides](#) utilize a gene silencing mechanism called "[RNA interference](#) (RNAi)" to disrupt this protein construction process in targeted pests—including nematodes, viruses, and fungi—[ultimately killing](#) them. The [EPA adds](#), "Using RNAi researchers can make a pesticide that targets a single insect pest and only that single pest This approach does not add even trace amounts of chemical pesticides to the environment or the food produced from the plant."

"Sticky" [microbial pesticides](#) are in the works as well. These products adhere to plant leaves better than their synthetic counterparts, a feature that allows farmers to protect their crops while also reducing harmful chemical runoff into soil and nearby water sources. Mushrooms also have been [turned into pesticides](#) that target thousands of annoying insects.

How activists encourage pesticide development

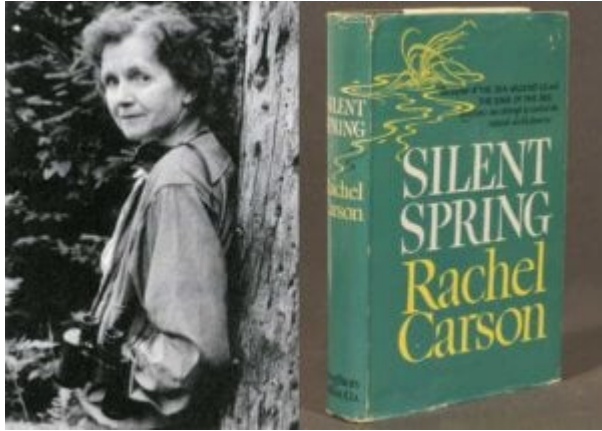


Image: Population Connection

Farmers alone aren't driving this spike in biopesticide development. Environmental activist groups and the consumers who trust them play a prominent role as well, and have for decades. While chemical companies are primarily concerned about the needs of farmers, their actual customers, manufacturers also have to consider whether a new product will "pass the scrutiny of environmental groups, child safety advocates, and other industry watchdogs," [Purdue University has pointed out](#). "Product negativity such as legal battles, bad publicity, and regulatory restrictions signal a potentially bad investment."

Famed environmental activist Rachel Carson deserves credit for this. With her 1962 book *Silent Spring*, according to the [US Fish and Wildlife Service](#), she "awakened society to the dangers of chemical pesticides" Even though Carson's allegation that the insecticide DDT causes cancer [proved to be incorrect](#), *Silent Spring*-inspired arguments still influence pesticide development 57 years later. For example, Science magazine writer Erik Stokstad in a May 2019 article [raised the prospect](#) of the glyphosate-cancer lawsuits spurring new herbicide development. Though farmers and weed scientists fear continued judgements against Bayer could restrict glyphosate availability, Stokstad noted, enterprising companies see an opportunity.

Davis, California-based Marrone Bio Innovations, for instance, has developed a weed killer known for now as MBI-014. The herbicide is derived from a bacterial species called *Burkholderia rinojensis* and interferes with the synthesis of proteins weeds require to grow. Marrone submitted the pesticide for [EPA approval](#) in August 2018 and it's now weaving its way through the required regulatory channels before it hits the market.

Unless states or countries ban glyphosate, farmers are unlikely to drop the weed killer, because it still effectively controls many weeds and preserves soil health. Rather they would integrate such products as MBI-014 into their existing pest management programs, Marrone BioInnovations founder and CEO Pam Marrone told the GLP by phone, noting that the new herbicide is effective against weeds that have developed resistance to [glyphosate](#) and another weed killer, [dicamba](#). Established in 2006, the California company already sells [eight biopesticides](#).

Why the crusade against synthetic pesticides has backfired

Although activist nonprofits like the Environmental Working Group, always eager to [whip up hysteria](#) about glyphosate-tainted breakfast cereals, have ignited public concern about pesticide safety, their crusade has run headfirst into a simple fact time after time: feeding a growing population without effective plant protection products [isn't possible](#). Either we control the pests or they destroy the crops we eat.

By complaining about so-called “toxic” chemicals under these circumstances, the activist groups have only incentivized the development of pesticides that are harder to demonize. There’s no better evidence of this than [Bayer’s recent announcement](#) that it is investing \$5.6 billion over the next decade in new herbicide development, and reducing its environmental footprint 30 percent with “more precise and more sparing application of crop chemicals,” as Reuters reported. Always under pressure from politicians elected by chemical-wary voters, the EPA has facilitated biopesticide development as well, [noting in 2014 that it](#)

is committed to encouraging the development and use of biopesticides and considers them inherently reduced-risk pesticides The Agency recognizes that these pesticides are often different in their mode of action and has employed numerous measures to facilitate the application process.

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The smaller biopesticide makers have worked the public’s concern into their business models as well. “It’s not the main reason for what we do,” Marrone added. “We’re in it to help farmers get a better return on investment while also improving sustainability. But we’re in a world where the consumer rules and then environmental groups wade [into the discussion] and things go into the courts.” Her company elaborated [on its website](#):

The general public is quite possibly a driving force behind the rise in [biopesticide] demand. The public is concerned about the potential for pollution and possible health hazards [W]hether right or wrong, [consumers perceive] these issues to be related to the use of conventional pesticides. The issues are most acute where the urban/housing segment and agriculture sector meet. The rapid growth of housing into rural areas creates clashes of interest for farmers, environmental groups and residents.

To a certain extent, consumer concern about pesticide safety is evidence that the activists have been effective. Moreover, there is some truth to their concern that using one chemical until it no longer works and moving on to the next isn’t a sustainable approach (although farmers have moved away from that strategy over the past two decades). As University of Wyoming weed scientist Andrew Kniss has [pointed out](#)

, “heavy reliance on any single pesticide (like glyphosate) is probably not a good thing.” Growers recognize this, too, Marrone said, noting that the organic and conventional farmers her company works with are “clamoring” for more holistic pest management approaches. The problem with the activist groups, she added, is that they don’t want to compromise:

They’re very strident so *they often get tuned out* There’s always those on the organic side who say you should never have any purchased inputs but sometimes you need inputs sometimes you just lose your crop and you need to use something There shouldn’t be polarization there’s room for everybody, all production systems, in this. We have to solve problems and we’re not going to solve them just one way.

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Anti-GMO activists portray Monsanto and other biotech firms as greedy corporations

But the activists are on a crusade against “corporate farming.” They see agrochemical company-developed biopesticides as an attempt by industry to maintain their “control” of food production. [Organic Consumers Association](#) (OCA), the quirky anti-vaccine group with deep ties to the organic industry, which financed USRTK’s creation, made this clear in a response to [Stokstad’s Science article](#):

The way we farm now—monocultures, GMO crops, heavy applications of synthetic fertilisers—has made conventional farmers dependent on pesticides. Yet all of these components of modern agriculture scream short-termism Even as the toxicity of glyphosate is being splashed all over the news, so-called experts and agricultural and scientific commentators are [asking](#) what herbicide can we use next [I]f the process of agroecological farming began today, Europe could feed itself, pesticide free, in 10 years.

Pesticide Action Network (PAN), though acknowledging that [microbial pesticides](#) are a step in the right direction, has likewise claimed that farmers should ultimately move to chemical-free, “natural processes to control pests” (including polycultures, mulching and cover crops), and complained that “industry strategies basically aim to conform with – rather than transform – the dominant agri-food regime.”

What do consumers think?

The public’s concern about pesticide safety only goes so far, however. Unlike OCA, PAN and other activist groups, most consumers don’t have philosophical objections to the “agri-food regime”; they just want to know that the food they buy in grocery stores is safe. Recent surveys indicating that [consumers grow less skeptical](#) of crop biotechnology the more they learn about it seem to confirm this divergence between activists and consumers. According to a [May 2019 study](#), learning “the science behind GM technology leads to more positive explicit attitudes towards GM foods, greater willingness to eat GM products, and lowered perceptions of GM foods as risky.” Marrone’s interactions with consumers suggest that they also appreciate the logic behind turning microbes into biologicals. As she told the GLP:

When I talk to consumers and I explain what I’m doing, they get it—the difference between good microbes and bad microbes. They understand e.coli and salmonella, but they understand probiotics in their yogurt. I don’t expect a negative backlash.

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