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Genetically Engineered Food – the Lie That Won't Die

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STORY AT-A-GLANCE

- Biotech industry promised genetically engineered foods would reduce pesticide use, increase the nutritional content of food, boost farmers' profits and feed the world by increasing yields
- In reality, GM crops have turned glyphosate into one of the most widely and recklessly used herbicides in history and monoculture has led to a loss of biodiversity
- GM crops have also failed to live up to expected increases in crop yields and, nutritionally, GMOs primarily provide cheap, unhealthy ingredients for ultraprocessed ready meals, prepackaged foods and fast food restaurants
- More than 40,000 people in the U.S. have filed lawsuits alleging exposure to Roundup is the cause of their cancer. Once a rare cancer, non-Hodgkin lymphoma is now the seventh most common cancer in U.S. men and women
- The agricultural biotech industry continues to advance with a new suite of genetic engineering technologies known as gene editing, which includes techniques such as CRISPR as well as synthetic biology and gene drives

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Promises, promises, promises. The toxic world of genetically modified organisms (GMOs) and industrial agriculture is built on false promises. For nearly 30 years we have been listening to the propaganda of the big biotech companies like Monsanto/Bayer,

Syngenta, DuPont/Pioneer, BASF and others about how genetic engineering will transform farming and food production.

We've heard how it will reduce the environmental impact of farming by lowering pesticide use. We've been promised that it will increase the nutritional content of food. We've been told how it will boost farmers' profits by increasing yields, and that those increased yields will help "feed the world."

As the problem of man-made climate change has moved to the top of the global agenda, new promises have emerged about how GMOs will fight climate change and how genetic engineering will make plants more resilient to drought and flooding. The huckster promises keep on coming, but what has the biotech industry actually delivered over nearly three decades?

Increasing Pesticide Use

First and foremost, GMO crops were sold as a way of reducing on-farm pesticide use. But since GM crops were introduced, there has been a dramatic increase in pesticide use on those crops worldwide.

Most GM crops fall into one of two types. Pesticide "resisters," or "Roundup Ready" crops, mostly corn and soya, are genetically engineered to withstand the spraying of Monsanto's Roundup herbicide, the active ingredient of which is glyphosate. Most recently, pesticide resisters have also been engineered to resist other highly toxic pesticides like dicamba and 2,4-D.

GM crops have turned glyphosate into one of the most widely and recklessly used herbicides in history. According to the USDA,[1] more than 90% of the soybeans harvested on U.S. farms are genetically engineered to withstand herbicides like Roundup.

Pesticide "producers," or Bt plants, which include corn and soya but also cotton, produce their own insecticides. When an agricultural pest eats the crop, in theory, it will be poisoned and die.

But weeds and insects rapidly evolve[2] to be immune to these poisons. Most agricultural weeds have become resistant to Roundup, causing farmers to spray more each year. The heavier use of herbicides creates ever more "superweeds" and even higher herbicide use.

The increase was first seen in pesticide resisters. A 2012 study[3] out of Washington State University found that planting GM crops quickly resulted in herbicide-resistant "superweeds" and, as a result, increased herbicide use.

By 2016, research from University of Virginia confirmed that glyphosate-resistant weeds have led to a 28% hike in herbicide use on GM soybeans[4] compared with non-GM. This rise has also been reported in other countries such as Canada,[5] Brazil[6] and Argentina.[7]

More recently, insects have begun to become resistant[8] to the insecticides bred into pesticide products, causing farmers to use even more and more dangerous mixtures of pesticides to try and keep them under control.

Loss of Biodiversity

Right now, more than ever, we need a healthy, biodiverse and functioning ecosystem — one that depends on a rich diversity of plants, animals and insects.

Agricultural land that is biodiverse is more productive and more able to cope with unexpected changes, for instance, in climate or cyclical levels of plant diseases or invasive species. Studies show that healthy soil can absorb and hold more CO_2[9] than damaged soil.

But today's modern industrial farming involves often-large tracts of land devoted to a single crop, known as monocultures. In monocultures diversity is discouraged by the use of pesticides which keep every living thing, except the valuable crop, off the land.

In the U.S., land converted to soy production has typically been pre-existing agricultural land[10] and so is not linked to deforestation, as it is in South America.

But, increasing demand for soy is destroying American prairies and analysis of satellite data has shown that between 2006 and 2011, farmers in the Dakotas, Minnesota, Iowa and Nebraska had converted 1.3 million acres of grassland into soybean[11] and corn production. Research by the USDA's Economic Research Service[12] echoes this finding.

No Benefit to Farmers

These monocultures are bad news for wildlife, reducing habitats for a wide range of wild creatures, from ground-nesting birds to pollinators like bees and butterflies. They also are bad for farmers.

An in-depth investigation by The New York Times[13] in 2016 revealed that, in addition to increasing pesticide use, genetic modification in the U.S. and Canada has failed to bring the expected increases in crop yields.

This resonates with the findings of a 2016 National Academy of Sciences report that found "there was little evidence"[14] that the introduction of genetically modified crops in the United States had led to yield gains beyond those seen in conventional crops.

Most recently, U.S. farmers have been suffering from a glut of soy,[15] linked to ongoing trade disputes with China, which have resulted in low prices and farm bankruptcies.

Equally important is the fact that GMOs have failed to feed the world. The main by-products of GMOs are fats and sugars. GMOs, when they're not being turned into biofuels, are being turned into corn, soya and even cottonseed oil and sugars such as high-fructose corn syrup and beet sugar.

In other words, what GMOs have most successfully done is provide cheap, unhealthy ingredients for ultraprocessed "ready" meals, prepackaged foods and fast food restaurants.

A Poisoned Plate

All those monoculture crops and all that spraying, especially with glyphosate, have consequences for the food we eat. GMO crop monocultures lead to “monodiets.”

Today just a handful of crops now dominant diets around the world.[16] This new monodiet has more calories and less nutrition. It’s a dietary disaster that is accelerating the worldwide rise in noncommunicable diseases such as obesity, heart disease and diabetes.

That global diet is also more poisoned than ever before. Glyphosate (Roundup), is sprayed liberally on GM crops. It is also regularly sprayed on non-GMO crops, such wheat, oats, maize and barley but also soya, rapeseed, sunflower seeds and chick peas, as a desiccant, to dry them out, before harvest.

There is also evidence that glyphosate and its toxic breakdown product AMPA (α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid) accumulates in foods like GM soy.[17] Laboratory tests in both the U.S.[18] and Europe[19] have found it in the popular ice cream brand Ben & Jerry's, likely due to its cookie, cake and other cereal ingredients. It is also a contaminant in honey[20] and in popular oat-based cereals and multiple other foods,[21] especially those containing soy.

A recent laboratory analysis by Moms Across America found glyphosate residues in the new recipe Impossible Burger. The **levels of glyphosate and AMPA**[22] were low (11ppb) but evidence from animal feed studies indicates that just 0.1 ppb of glyphosate can destroy gut bacteria.[23]

Hardly surprising, then, that tests show 93% of Americans tested were positive for glyphosate.[24] Worryingly high levels have been found in the breastmilk and urine[25] of American mothers, as well as in their drinking water.

Passed on to babies through breastmilk or the water used to make formula, this could impact infant health since glyphosate is a suspected hormone disrupter.

Other studies of animals fed GM foods and/or glyphosate show worrying trends including damage to vital organs[26] like the liver and kidneys, damage to gut tissues and

gut flora, immune system disruption, reproductive abnormalities and even tumors.

In March 2015, when glyphosate was classified by the World Health Organization as "probably carcinogenic to humans,"[27] not many could have been surprised.

Judgment Day

Agrichemical companies continue to claim that glyphosate is safe. But juries across the U.S. say otherwise. Currently more than 40,000 people in the U.S. have filed lawsuits[28] alleging exposure to Roundup is the cause of their cancer and in particular, lymphomas. Once a rare cancer, the most common type of lymphoma, Non-Hodgkin Lymphoma, is now the seventh most common cancer in U.S. men and women.[29,30]

The first three cases to go to trial resulted in a combined $2.424 billion in jury verdicts[31] (though this was subsequently reduced by judges). The science supports these verdicts.

A recent study showed convincing evidence[32] of a link between glyphosate-based herbicides and endocrine disruption and genetic alterations commonly associated with the development of lymphomas.

One shocking fallout from the first glyphosate case to go to trial, that of Dewayne Johnson,[33] was the unsealing of several previously classified documents.[34] The documents detailed Monsanto's efforts to collude with the U.S. Environmental Protection Agency to cover up glyphosate's cancer risks.

Out of 14 glyphosate studies reviewed by the EPA, which looked specifically at cancer in animals, eight found elevated cancer rates in at least one organ or tissue. Yet the EPA chose to dismiss these findings, and conclude that glyphosate is "unlikely to cause cancer."

Most recently another Monsanto legacy pesticide, dicamba, has hit the headlines. In 2017-18, "dicamba drift" was responsible for damage to an estimated 5 million acres of non-GM soybeans[35] in 24 states, and numerous specialty crops and wild plants.

In February 2020, in the first U.S. dicamba trial, a Missouri jury awarded $265 million in damages[36] to peach producers Bader Farms when drift from a nearby GM soybean field killed their trees. All these trials point to a health and environmental emergency and, yet, action at the federal level to curb the use of these toxic chemicals is sorely lacking.

Taking matters into their own hands, some states and local communities are beginning to ban or restrict the use of chemicals like glyphosate. In 2018, both Portland[37] and the city of Austin[38] banned it. In 2019 Miami[39] and Los Angeles County[40] approved their own bans on city property, while Seattle[41] agreed to restrict its use.

Beyond U.S. borders, more than two dozen countries[42] including Canada, Argentina, France, Germany, Italy, Portugal and the U.K. have put bans and/or restrictions in place.

Consumer Awareness Rising

Ever since the first genetically modified (GMO) foods and animal drugs, the Flavr Savr tomato[43] and recombinant Bovine Growth Hormone (rBGH), came onto the U.S. market in 1994, the biotech industry has been waging a public relations war to get the public to accept genetically engineered food.

But studies continue to show that the public doesn't buy it, and doesn't want to eat it. Most are concerned about health,[44] and rightly so. Others are worried about the damage these crops cause to the environment. These are legitimate concerns, as are those about corporate control of our food.

In fact, in the past few years some big and consequential mergers have taken place in the agri-biotech sector. With these mergers the "Big Six" (Monsanto, Bayer, BASF, Syngenta, Dow and DuPont) became the Big Four[45] (Bayer-Monsanto, DowDuPont/Corteva, ChemChina-Syngenta, BASF) further concentrating the majority of the power and profits of the seed and GM technology market into even fewer hands.

Media response to the proposed mergers has turned up a few surprises. For instance, the normally ultraconservative and financially focused Bloomberg online news channel

focused more on the dubious histories of Bayer and Monsanto,[46] than on any benefits of the deal.

A more sober article in the Wall St Journal[47] suggested this might be a good time to reconsider the path we are on, agriculturally speaking. In the face of superweeds, higher seed prices and dropping yields, it argued, the GMO crop "boom" could well be over.

But the boom isn't over yet and independent testing which reveals how much glyphosate is in our bodies and in our foods has become widespread. Likewise, the Non-GMO Verified[48] label is now as important as the organic label for consumers wanting to avoid GMOs in their foods. It's a testimony to the vehemence of public rejection, and the shameful inaction of government, that the importance of these independent backstops has grown.

The Lie That Won't Die

In spite of all this, the agricultural biotech industry continues to advance with a new suite of genetic engineering technologies known as gene editing, which includes techniques such as CRISPR as well as synthetic biology and gene drives.

What makes these GMO 2.0[49] technologies different is they can create genetically engineered organisms more cheaply and more quickly than ever before.

Fronting up to critics and the farmers who are abandoning the GMO lie,[50] proponents of synthetic biology claim we no longer need farmers to produce food.[51] By creating novel food products, including meat substitutes, from genetically engineered microbes in big vats in anonymous warehouses, we can improve the efficiency and sustainability of food production.

For anyone who believes that food should come from a living and connected ecosystem this is the grimmest of grim promises — a world without farmers and without farm animals, where the land is used for … what, exactly?

This grim vision of food production has been given the nickname, the "dark food chain,"[52] because it doesn't need sunlight. Further alarm bells are ringing as the biotech industry moves into other areas of the natural world.

A recent and alarming report[53] from the International Union for the Conservation of Nature (IUCN) suggests that gene drives and synthetic biology could be used to revive declining or even extinct species,[54] eradicate invasive species, improve soil[55] by re-engineering soil microbes and therefore improve plant health and biodiversity.

It could engineer trees to absorb more carbon[56] or to be resistant to diseases, such as the invasive fungus that plagues the American chestnut tree,[57] and re-engineer insects[58] for pest management.

Farming is part of the much larger, connected web of nature. What happens "out there" directly and indirectly affects what happens on the farm, which is why we need to challenge this troubling direction of travel for GMOs.

Regulatory Apathy

Strong regulation is there to protect us all — or it should be. But new methods and proposed uses for GMOs have brought greater complexity to the regulatory sphere.

In some cases, as with the new gene-edited Calyno soybean oil,[59] which can be sold without labeling, regulators have given in. In others, such as with proposed gene-edited farm animals, regulators really don't know what to do.[60] USDA's vague and confusing 'bioengineered' labeling scheme[61] is a yet another case in point.

Biotech companies argue there is no point in regulating GMO 2.0 anyway since its products are so close to "natural" they no longer need to be tested or labeled as GMO.[62]

This new "naturalness," they claim, makes it impossible to tell gene-edited products from conventionally produced ones anyway. This is absolutely not true.[63] When genetic engineers create new GMOs, they must also create the processes to identify them — if only to monitor and verify their work.

Anyone can use these processes. That's just what happened in a U.S. Food and Drug Administration study,[64] originally published in 2016 and republished in February 2020, which found numerous off-target effects in gene-edited "hornless" cattle, including a strand of bacterial DNA which could pass on antibiotic resistance.

It concluded "that both scientists and regulators need to be alert to the potential for such unintended alterations to take place." A frank accompanying editorial[65] explained further why regulation was important.

Following on from this, Belinda Martineau, Ph.D., developer of the Flavr Savr tomato, noted[66] that the GMO cow developers had the tools to find these mistakes for themselves, but incompetently failed to use them.

"Such big mistakes made during the development of these 'poster children' GMOs," she wrote, "make one wonder how carefully other, more run-of-the-mill GMOs have been developed over the last 25 years as well."

Marteau went on to say that the data justify, in her mind, "FDA's intention to carry out mandatory premarket review of all gene-edited livestock and thereby regulate these GE products based on the fact that they were created using genetic engineering," adding "I also think FDA should require premarket review of all GE crops as well."

Regenerative Agriculture — Action, Not Promises

If, to coin a phrase, "a promise is a debt unpaid" then the biotech companies are racking up some serious ethical, moral and environmental IOUs to society.

Out of their failure, however, has emerged the regenerative organic agriculture movement, a response to the growing awareness of the connection between agriculture and health, environmental destruction and climate change. Regenerative agriculture[67] refers to farming and grazing practices such as:

- Reduction/elimination of tillage and use of synthetic chemicals
- The use of cover crops, crop rotations, compost and animal manures

- Integrating animals with perennial and annual plants to create a biologically diverse ecosystem on the farm
- Grazing and pasturing animals on grass and, more specifically, using a planned multi-paddock rotation system
- Raising animals in conditions that mimic their natural habitat

It's what every diligent farmer should be doing anyway and, formalized into a growing movement, these practices can improve biodiversity on the farm, enhance productivity, and even help tackle climate change by rebuilding soil organic matter and improving both carbon drawdown and improved water infiltration and storage in soils.

The truth is that conventional (i.e., chemical and GMO-based) farming needs to change. The problems farmers face now — failing soils, lower yields, toxic working environments — can't be "magicked" away with genetic engineering. In fact, GMOs just drive farming deeper into a failing, exploitative, chemically-dependent, industrial model.

In contrast, many see regenerative organic farming as the next evolving stage of organic farming, free-range livestock grazing and eco-system restoration. Rather than promising future benefits, regenerative farming can be put into practice and deliver measurable benefits right now. For the future's sake, this is the path we need to take.

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