



Written by [Dr. Stephanie Seneff](#) on June 4, 2024

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## What Is Glyphosate, and Why Is It a Problem?

Glyphosate is the active ingredient in the herbicide Roundup. Legislators for the most part consider it to be a wonderful herbicide because it kills all plants except those that are engineered to resist it, yet is considered to be practically nontoxic to humans. It is pervasive in the food supply in the United States, yet the government is not interested in even determining how much is in our food, presumably because they consider it safe. However, several activist groups have conducted studies measuring glyphosate levels in common foods. Zen Honeycutt of Moms Across America recently found detectable levels of glyphosate in 100 percent of fast-food samples and 95 percent of samples from children's school lunches.



AP Images

Don't eat this: While glyphosate (as used in Roundup) has been touted as safe for decades, plenty of evidence suggests that it contributes to a host of health issues. The use of glyphosate on our food supply has many people concerned.

Glyphosate is used to control weeds, especially on the GMO (genetically modified organism) Roundup-Ready crops (corn, soy, canola, sugar beets, alfalfa, and cotton). Glyphosate kills weeds by suppressing an essential enzyme called EPSP synthase in the shikimate biological pathway. GMO crops have been endowed through genetic engineering with a microbial gene that codes for a version of EPSP synthase that is insensitive to glyphosate. These crops can be directly sprayed with glyphosate; they don't die, but they do soak it up, and it ends up on your dinner plate. It is also used on non-GMO crops, including sugar cane, wheat, oats, barley, chickpeas, garbanzo beans, lentils, and some plants for seed oils, where it is applied shortly before harvest as a desiccant or ripener. Some of the highest levels of contamination are showing up in non-GMO crops. Its usage on crops has increased dramatically since the rollout of GMO crops in the late 1990s.

We have been led to believe that glyphosate is safe for human consumption, yet it is becoming increasingly clear that this is not true. An argument that is used is that it suppresses an enzyme in the shikimate pathway, EPSP synthase, that is not present in human cells. However, our gut microbes do express this enzyme, and they use the shikimate pathway to produce the three aromatic amino acids — tryptophan, tyrosine, and phenylalanine. Human cells are unable to produce these amino acids because they lack the shikimate pathway. We depend on our food and our microbes to keep us supplied with these critical nutrients.

These three amino acids are not only three of the 20 or so coding amino acids that are assembled into proteins according to the DNA code, but they are also precursors to several very important biologically active molecules, including the neurotransmitters serotonin, dopamine, and epinephrine; melatonin and thyroid hormones; the skin pigmentation agent melanin; and the B vitamin niacin. The prevalence of sleep disorder has been increasing over time, in step with the rise in glyphosate usage on core crops. Of course, correlation does not equal causation, but glyphosate has been shown experimentally to suppress



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the synthesis of melatonin, the sleep hormone, in rats. Serotonin deficiency is linked to obesity, depression, and violent behavior. Dopamine deficiency is a feature of Parkinson's disease. Insufficient melanin in the skin will result in an increased risk of skin cancer from sun exposure.

Over the past few decades, researchers have become much more aware of the importance of the gut microbiome to human health. This awareness is likely due to the fact that so many people today are suffering from gut dysbiosis, leading to a multitude of diseases and conditions not restricted to the gut. In my opinion, glyphosate may be the most significant contributor to the rise in gut problems, including inflammatory gut, leaky gut, bowel infections, celiac disease, irritable bowel syndrome, constipation, and diarrhea.

**Ubiquitous:** Spraying crops with pesticides and herbicides is commonplace in the United States. While many crops are engineered to resist glyphosate, the chemical can still soak into the plants and end up on our dinner table. (AP Images)



Studies on the effect of glyphosate on the gut microbiome have revealed that two very important symbionts, *lactobacillus* and *bifidobacteria*, are especially sensitive to glyphosate. *Lactobacilli* are very important in the infant gut to assist in metabolizing milk. *Bifidobacteria* are especially skilled at breaking down complex carbohydrates into simpler molecules, which are then further processed into short-chain fatty acids (acetate, propionate, and butyrate) by other microbes, particularly *Firmicutes* and *Bacteroidetes*. Butyrate is the favorite food of colonocytes lining the colon, and when these are deficient, bowel diseases emerge, including colon cancer.

Many diseases and chronic conditions have been rising in prevalence over time, in step with the rise in glyphosate usage on core crops. These include diabetes, obesity, autism, ADHD, depression, inflammatory bowel disease, thyroid cancer, pancreatic cancer, Alzheimer's disease, Parkinson's disease, fatty liver disease, and kidney disease, among others. It might be hard to believe that one chemical could be causal in so many diseases, but I believe glyphosate's unique mechanism of toxicity can explain its ability to disrupt cellular metabolism in diverse ways.

I first became aware of glyphosate in September 2012, when I heard a two-hour presentation on it delivered by Professor Don Huber, an expert in plant pathology, at a workshop in Indianapolis. Before walking into that room, I did not know what glyphosate was; by the time I walked out, I was nearly certain that I had found the answer to my quest to figure out what was the primary source of the autism



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epidemic in America. I had been intensively studying autism for the previous five years and had become aware that many autistic children have complex gut issues, so I was suspecting that the cause might be found in the food supply.

Huber explained that glyphosate binds tightly to, or chelates, minerals, making them unavailable to plants, but also to the gut microbes and even our own cells. It also is harmful to microbes both in the soil and in the gut, since many of them contain the enzyme that glyphosate suppresses. Glyphosate also suppresses cytochrome P450 enzymes in the liver, which play many important roles in the body, including making bile acids, activating vitamin D, metabolizing drugs, and detoxifying toxic metabolites produced by pathogens.

Multiple studies have shown that glyphosate damages mitochondria, the organelles inside cells that supply energy in the form of adenosine triphosphate. Mitochondrial dysfunction is associated with many chronic diseases, including autism. Glyphosate also causes a reduction in glutathione in the liver, and it increases the ratio of oxidized to reduced glutathione, which is important because it is the reduced form that protects from oxidative damage. Glutathione deficiency in both the liver and the brain are features of autism.

After studying glyphosate for nearly a decade, I published a book on it titled *Toxic Legacy: How the Weedkiller Glyphosate Is Destroying Our Health and the Environment*. In that book, I explained my theory that glyphosate is a slow killer, and I proposed that its insidious cumulative mechanism of toxicity can be explained by its unique ability to substitute for the coding amino acid glycine during protein synthesis. Glyphosate is an amino-acid analogue of glycine, and is in fact a complete glycine molecule except that it has extra material attached to its nitrogen atom. That extra material is important, because it makes the molecule bulkier and gives it a negative charge, making it behave very differently — biophysically and biochemically — from glycine in the protein.

In my book, I provide strong evidence, much of it coming from biotech company and glyphosate manufacturer Monsanto's own studies, that glyphosate is getting inserted into proteins in place of glycine. I identified what I call a "glyphosate susceptibility motif" in proteins — namely, a short sequence of amino acids that contains at least one glycine residue at a site where the protein binds phosphate. There are many proteins that match this motif, including EPSP synthase, the protein glyphosate suppresses in plants. Succinate dehydrogenase, a crucial enzyme in the mitochondria, contains a sequence, "GAGGAG" (glycine-alanine-glycine-glycine-alanine-glycine), at the site where it binds nicotinamide adenine dinucleotide, a phosphate-containing molecule. This is a perfect example of a glyphosate susceptibility motif, and it has been shown to be suppressed by glyphosate.



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**Solution:** While not foolproof, buying organic produce is a good way to avoid glyphosate. Better still is to either grow one's own produce or find a small, local, organic farm to purchase it from.

(JayYuno/Getty Images Plus)

Today, just about everybody in America knows at least one person who is gluten intolerant. Gluten-free sections are a feature at most grocery stores these days, and many products are now available that are explicitly labeled as gluten-free. When I was a child back in the 1950s, I didn't know anyone who was gluten intolerant. Gluten is a protein found in wheat, and it has unusually high amounts of proline, an amino acid that is difficult to break free from the peptide chain during digestion. *Lactobacillus* bacteria are especially skilled at assisting the host in breaking the bond between proline and its neighbor, having several enzymes that are devoted to this task. When they fail to thrive due to chronic glyphosate exposure, short proline-containing peptides from gluten remain intact, and the immune cells recognize them as foreign peptides and develop antibodies against them. Through a process called molecular mimicry, these antibodies can attack human proteins by mistake, causing disease.

Celiac disease is a specific diagnosis of a severe sensitivity to wheat due to the presence of autoantibodies induced by gluten that attack the protein transglutaminase. Celiac disease has been rising in prevalence in step with the rise in glyphosate use, specifically on wheat. Casein (a major milk protein), like gluten, contains a lot of proline, so it, too, becomes problematic when a person is chronically exposed to glyphosate. Unfortunately, switching to a gluten-free, casein-free diet often means switching to a diet that is even higher in glyphosate contamination, because soy, legumes (such as chickpeas, garbanzo beans, and lentils), and oats have been found to have some of the highest levels of glyphosate contamination.

People who suffer from celiac disease have on average a shortened life span, and the main reason for this is an increased risk of cancer, especially non-Hodgkin's lymphoma. This blood cancer has been linked to glyphosate exposure among agricultural workers, and this has caused great aggravation for the company Bayer, which bought Monsanto in 2016. The very first lawsuit brought to trial against Monsanto was a case involving a California school groundskeeper, Dewayne Lee Johnson, who developed non-Hodgkin's lymphoma in his early 40s. Roundup was the only pesticide he used on the school grounds. He was awarded \$289 million in a landmark jury trial, and this surprise victory has led to tens of thousands of follow-on lawsuits against Bayer. Since then, several more of the plaintiffs have been awarded substantial sums in jury trials.



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Mexico should be recognized for its leading role in trying to legislate against glyphosate. Mexico had originally planned to ban imports of glyphosate starting on April 1, 2024. However, the U.S. government worked very hard to try to get Mexico to back down, and their efforts have apparently succeeded, as the president of Mexico has recently announced that the ban will be postponed indefinitely.

There is a common perception that we cannot grow enough crops to feed the world without using toxic chemicals, but this is not true. In fact, regenerative agriculture is our only rational path forward. This approach leads to improvements in soil health over time, which in turn increases yield and gives the crops increased resistance against drought, insects, and fungi. People would also be much heartier, with an immune system that can fight off infections and cancer much more easily, if we were to switch to a strictly certified organic diet. This is a great way to reduce medical bills, and to feel strong and vibrant all the time.





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