

Toxic Legacy: How the Weedkiller Glyphosate is Destroying our Health and the Environment]]
Stephanie Seneff

A single, obvious explanation for a multitude of modern health problems
This is a challenging book. As was true of her fictional "Cindy & Erica's Obsession to Solve Today's Health Care Crisis," without having studied biochemistry the reader will find following it quite a strain. The educated reader owes it to him or herself to accept the necessity of Seneff's using scientific language to describe problems and to appreciate her efforts to explain things as simply as possible.

The first couple of chapters convince the reader that something is wrong. People are experiencing more, and more unusual health problems than ever before. The food we buy requires more and more chemicals to grow, and has less and less nutritional value. From the viewpoint of ecology, environmental poisons are placing an increasing number of species under threat of extinction.

Exposure to glyphosate is a thread which unites these observations. It is a simple chemical sold by the Monsanto Corporation, now Bayer Corporation of Germany, in the form of the Roundup herbicide. It has been promoted as a miracle solution – it kills weeds, but not GMO modified crops. This has been a powerful business model – make farmers dependent on seeds over which the company has a monopoly, and chemicals without which the seeds are ineffective.

Monsanto/Bayer claims that glyphosate is harmless to people. It works by disrupting the shikimate pathway, a biological process in plants that has no analog in people. No problem, they claim.

The European Union has greatly restricted the use of glyphosate on the grounds that it is a carcinogen. It is interesting that Seneff doesn't even address this question. She indicts it on other, even more damaging grounds. Whereas cancer may kill you in your old age if you have consumed too much diet Pepsi or too many cigarettes, glyphosate appears responsible for problems that become evident in childhood, rob adults of the health they need for a satisfying life, and may even persist over several generations.

Seneff writes " Glyphosate's mechanism of toxicity is unique and diabolical. It is a slow killer, slowly robbing you of your good health over time, until you finally succumb to incapacitating or life-threatening disease. Its insidious, cumulative mechanism of toxicity, which begins with the seemingly simple substitution of glyphosate for the amino acid glycine during protein synthesis, explains the correlations we are seeing with diverse diseases that seem to have little in common.' The next seven chapters describe the problems one by one.

Glyphosate and the Microbiome addresses what it does to the microorganisms in our gut. As stated above, Monsanto claims that since we humans are animal in nature, our genome does not contain the shikimate pathway. Glyphosate poses no problem, right? Wrong! Human life absolutely depends on hosts of free living bacteria in our gut and elsewhere in our organism. These bacteria produce hormones, vitamins and other chemical elements essential to good nutrition and even survival. Being plants, these bacteria do have the shikimate pathway, and glyphosate disrupts it, endangering our health.

Amino Acid Analogue: Molecular biology has a lot to do with the mechanics of how incredibly small things fit together physically. Glyphosate ((HOOCCH₂NHCH₂PO(OH)₂) is a complete glycine (HOOCCH₂NH₂) molecule, except that extra material has been attached to its nitrogen atom (-CH₂PO(OH)₂). According to Seneff, when glyphosate is available, the chemical processes that build our body proteins sometimes substitute it for glycine. The resulting proteins do not do what they're supposed to do. They bollix up our works in a great many ways.

When our bodies assemble proteins incorrectly, they may not fold into the elaborate forms that our bodies require. Alzheimer's disease is characterized by a plaque in the brain, composed of badly folded proteins. These misfolded proteins are deleterious molecules that damage the brain tissues, leading to disease symptoms. Glyphosate substituting for essential glycines in amyloid beta, the protein that is linked to Alzheimer's, would cause the protein to misfold and induce plaque accumulation. Several other diseases are similar to Alzheimer's, characterized by toxic substances going where they don't belong through deteriorated barriers.

The Phosphate Puzzle describes another way in which our body chemistry gets confused when glyphosate displaces glycine. As its name implies, and the formula above shows, glyphosate includes a phosphorus atom. When glyphosate displaces glycine, the negative charge associated with its phosphorus atom repels other phosphorus-containing particles. They cannot go where they need to go. Several of Seneff's observations are no more than hypotheses. They make sense and they warrant research, but the research is not being done or is inconclusive. It may be that powerful interests do not want the answers known.

Sulfate: Miracle Worker: Sulfur and phosphorus sit side by side in the non-metal quadrant of the periodic table. Also very abundant, they fall in the row below nitrogen and oxygen, weighing approximately twice as much. Both are quite reactive, as a consequence of which the body most often employs them in combination with oxygen in the form of sulfate and phosphate ions.

These elements have to pass throughout the body. The process requires chemical rearrangements – becoming attached to carriers, transported, and detached where needed. It usually involves catalysts, chemicals that facilitate but are not consumed in chemical reactions. Just for reference, the platinum catalyst in your car's exhaust system is not used up as it forces dangerous carbon monoxide to combine with oxygen to form harmless carbon dioxide.

When glyphosate replaces glycine in an enzyme, the enzyme stops doing what it should. Writing about hormones, Seneff notes: "All of these hormones, (viz., vitamin D is a hormone) as well as tryptophan itself, are commonly sulfated in transit. And all of these molecules are important biologically. Their disruption can have dire effects." Sulfates are key to the energy producing functions of mitochondria.

Liver Disease: the argument in this chapter is quite simple. Glyphosate damages the livers of just about all organisms, including ours. Our livers perform more than 100 metabolic functions, many of them concerned with cleansing toxins out of our system. A great many diseases are associated with malfunctioning livers.

Reproduction and Early Development: There is statistical evidence that people living in rural areas in which glyphosate (Roundup) is widely used have problems with fertility, birth defects and infant mortality. Studies with laboratory animals demonstrate that exposure to levels of glyphosate similar to that in these human environments affects fertility and the health of the offspring.

Most disturbing, some effects only appear in the offspring of lab animals exposed to supposedly safe levels of glyphosate, and may persist even after seven generations.

Neurological Disorders. It is evident to most observers that the rates of autism, Alzheimer's disease and other neurological disorders are increasing significantly. Seneff notes that these disorders are associated with a number of factors, among them the aluminum adjuvants used in vaccines, flame retardant's and also... glyphosate. Glyphosate, affecting as it does the shikimate pathway in our gut bacteria, is associated with a number of gut disorders. Autism is highly correlated with gut disorders, with strong hypotheses regarding a causal relationship.

Glyphosate is a strong chelating agent. That means that it wraps tightly to metals. It can transport toxic aluminum across the blood-brain barrier where it can cause serious problems, such as Alzheimer's. High levels of aluminum are also found in the brains of autistic children.

Autoimmunity is increasing – there is more Addison's disease, asthma, allergies and so on. Seneff cites a comparison between Amish and Hutterite farming communities, the first of which shuns agricultural chemicals and the other does not. Autoimmune disease is several times higher among the Hutterites. Related studies specifically indict Roundup. Seneff provides a theoretical basis to support the statistical observations.

Reboot Today for a Healthy Tomorrow: This final chapter is mostly just common sense. We should follow through on the effort already well underway worldwide to abolish Roundup. We should avoid every type of agricultural chemical to the extent possible – the same defective system of controls that allowed Roundup to persist in the marketplace applies as well to the others. We should grow our own food and support farmers' markets so we know what is going into our bodies.

Needless to say, we should also avoid processed foods to the extent possible – we cannot assess their chemical content, but we know that in most cases they are not nutritious in the first place. We should eat real stuff, avoiding factory made Frankenfoods such as artificial meat.

We should encourage alternative means of growing crops and weed control. As I write this review I stumble on a company called Carbon Robotics that produces a machine capable of driving itself through a field, optically distinguishing crops from weeds and zapping them with a laser. A wonderful solution, with no immediately obvious downsides, if it is economically feasible.

For most of us the take-home message is to live simply, eat natural foods, and grow as much as we can ourselves. This is not whatsoever radical. On the contrary, it is radical to assume that newfangled agricultural chemicals will have no downside. They obviously do, and it is high time we reacted to that fact.