Roundup (Glyphosate)

DISCLAIMER: the following is not meant to treat anyone with advice or tell you what you should do, such as relative to use of medication, exercise, or changing your diet. The information in this handout is merely offering what has been published in the research literature, as well as based on my professional experience. Talk to a doctor or other appropriate professionals as to what is best for your own specific needs.

It should also be appreciated that everyone has their own perspective on how to improve health. Nutritionists do it through food. Physicians do it through medicine. Psychologists do it through changing thoughts, feelings, and behaviors. Consequently, what is offered here is a reflection of my own bias and perspective.

Roundup (glyphosate is the active ingredient in it) is the most heavily utilized herbicide in the world. (Other trade names it can be found under since the patent expired include: WeatherMax, UltraMAX, Buccaneer, Razor Pro, Rodeo, and AquaMaster.) It is the active ingredient in over 750 herbicide products. Roundup has more than just glyphosate to it, and the other ingredients including those considered 'inert' can have adverse health effects too. For the sake of simplicity in this article the Roundup and glyphosate will be used interchangeably.

Just to give you an idea of its widespread usage and how much has been applied

- worldwide between 1994-2014 9.5 million tons were sprayed on fields – enough to apply nearly a half pound on every cultivated acre on the planet.
- in the U.S. 3 billion pounds of it were applied between 1974-2014 to U.S. agriculture.
- globally, its usage has increased by almost 15-fold since its 'Roundup Ready GMO' crops were introduced (meaning the crop won't die from being sprayed but weeds hopefully will)
- soybeans, corn and cotton have gotten heavily sprayed for it in the U.S., along with many citrus fruits. A 2018 study by the EPA found residue of the chemical in 63.1% of corn, and 67% of soybeans. One study found that non-GMO and organic soybeans did not contain any residue of the chemical. It did not disclose residue levels in oatmeal or honey products. Levels in US honey were double the level allowed by the European Union. It can also be found in canola, alfalfa, and sugar beets. Internal emails of the EPA in 2018 indicated that they had trouble finding food samples without traces of the chemical.

Is it safe? It depends on whom you ask.

- in 2015 the World Health Organization (WHO) classified as 'probably carcinogenic to humans."

- in 2016 the EPA said glyphosate "is not likely to be carcinogenic to humans" at doses relevant to people – but a subsequent review of the EPA's work by another part of the Department said it had not followed proper protocols in its evaluation of the chemical and said it is "likely" carcinogenic. But, in 2017 the EPA stuck with its original position saying it is not likely to be so.
- but then in the same month of 2017 the US Agency For Toxic Substances and Disease Registry said there are links between glyphosate and cancer, including non-Hodgkin's (the most common type of cancer linked to the chemical), lymphoma and multiple myeloma. And in 2020 the EPA stuck with its position that it is unlikely to cause cancer.
- California's EPA in 2017 said it would add the chemical to its Prop. 65 list of chemicals known to cause cancer, but a California court said it could not require cancer warnings for the chemical. However, Monsanto and Bayer have been subject to over $2 billion worth of verdicts in lawsuits over this chemical.
- a study done in Indiana (Environmental Health, "Glyphosate exposure in pregnancy and shortened gestational length: a prospective Indiana birth cohort study" S. Parvez et al, March 2018) looked at glyphosate exposure in pregnant women and found detectable levels in more than 90% of them which were significantly correlated with shorter pregnancy lengths. A 2011 study on boys found it impairs their reproductive development (Reproductive Toxicology, "Glyphosate impairs male offspring reproductive development by disrupting gonadotropin expression" Marco Romano et al, Nov. 2011).
- a study published in 2019 that looked at more than 30,000 farmers in France, Norway and the U.S. reported links between the chemical and diffuse large B-cell lymphoma.
- a study (Chemosphere, "Glyphosate and the key characteristics of an endocrine disruptor: a review" Juan Muñoz et al, May 2021) concluded that glyphosate meets at least 8 of 10 key characteristics of what are known as an 'endocrine disrupting chemical' such as something that can disrupt female fertility at low doses in that it mimics estrogen. Estrogen mimickers can cause problems such as
    - cognitive issues
    - reproductive problems
    - weight gain in men
    - hormonal imbalances
    - cancers (especially of the breast. Even in tiny quantities like parts per trillion it has been found to make breast cancer cells proliferate, meaning it stimulates tumor growth)
- another 2020 study found that about 54% of gut microbiome species in people are "potentially sensitive" to the chemical so that it "may severely affect the composition of the human gut microbiome." A literature review done that year concluded that "it may cause dysbiosis ['leaky gut' and] …it may be a critical environmental trigger in the etiology of several disease states associated with dysbiosis including celiac disease, inflammatory

bowel disease, and irritable bowel syndrome. [It] may also have consequences for mental health, including anxiety and depression, through alterations in the gut microbiome." (Frontiers in Microbiology, "Separating the empirical wheat from the pseudoscientific chaff: a critical review of the literature surrounding glyphosate, dysbiosis, and wheat-sensitivity" Jacqueline Barnett et al, September 2020). A study on 1,532 adults (Environmental Research, "Association between glyphosate exposure and cognition function, depression, and neurological diseases in a representative sample of US adults: NHANES 2013-2014 analysis" Ching Chung Hsiao et al, Nov. 2023) said "our findings suggest that the odds of having severe depressive symptoms were significantly higher than having no symptoms in individuals with higher glyphosate levels." (Other findings include lower cognitive scores, and an increased risk of hearing difficulty with those who had higher glyphosate levels. Beyond gut issues, it can impact the hormonal, immune and nervous systems.

- a large nationwide study (Neurotoxicology, "Pesticides applied to crops and amyotrophic lateral sclerosis in the U.S." Angeline Andrew et al, Dec. 2021) found a significantly increased risk of ALS (Lou Gehrig's disease) from use of herbicides including glyphosate, 2,4-D, and chlorpyrifos.
- according to studies in the US and Paraguay, infants and kids in agricultural areas where glyphosate is used may be at higher risk for developing birth defects including cardiac abnormalities and deformities. There is rat research (offered in Scientific Reports, 4/23/19) that found that exposure to glyphosate on consequences on the third and fourth generational offspring as to birth defects, kidney-, ovarian- and prostate disease.
- other possible health risks include chronic kidney disease based on a study done on farmers in Sri Lanka. Also, the chemical may suppress natural bacteria leading to colitis. It may cause neural cell death which is found in those with Alzheimer's. Parkinson's disease may result by damaging brain cells that are linked to the disease.
- it is also said to chelate iron, cobalt, molybdenum, and copper out of the body, along with impairing synthesis of tryptophan and tyrosine, amino acids that are vital to protein and neurotransmitter production.
- There is also evidence that the herbicide Roundup (glyphosate) is creating manganese deficiency in the food supply by inhibiting plants ability to absorb the mineral. Glyphosate chelates the manganese causing a deficiency in it. Manganese is used by certain essential gut bacteria such as lactobacillus. Some members of the lactobacillus family can produce GABA, the calming neurotransmitter (Surgical Neurology International, "Glyphosate, pathways to modern diseases [part] III: manganese, neurological diseases, and associated pathways" Anthony Samsel, March 2015). So if the bacteria are reduced so might be the amount of GABA leading to higher anxiety. There is also research that people with chronic fatigue syndrome often have gut microbiome imbalances along with elevated anxiety. A study was done using lactobacillus casei probiotics over a two month period with chronic fatigue patients. The end result was more lactobacillus and bifidobacterial along with a significant decrease in anxiety.

- A study commissioned by the Environmental Working Group (EWG, https://www.ewg.org/news-insights/news/2019/02/glyphosate-contamination-food-goes-far-beyond-oat-products) found glyphosate in over 95% of oat-based food samples, and in all of the wheat-based products including pasta and cereals. A Canadian study (https://ici.radio-canada.ca/nouvelle/1153714/glyphosate-pesticide-alimentation?fbclid=IwAR1p2pobGQ6uezln-8wlQqbWQAuu6DvBzrU6LMnMIqIBJtU5CWUbRLgx7BI; written in French) listed food items with the higher percentage of glyphosate including

- 90% of pizza
- 84% of crackers
- 73% of couscous
- 70% of oats
- 67% of lentils

The EWG study said that the FDA found 63% of corn samples and 67% of soybean samples with glyphosate. EWG says that "Understanding the scope of glyphosate contamination in our food supply is critical to protecting public health, as more scientific evidence continue to link glyphosate with cancer, specifically non-Hodgkin lymphoma."

- types of cancers it has been linked to include brain, breast, prostate, lung, and blood. Others include leukemia, bone, kidney, skin, and pancreatic islet cell tumors, along with chromosomal and DNA damage.
- Yet other problems where links exist include for autism, ADHD, hypothyroidism, heart and liver disease, Parkinson's, Alzheimer's, and depression.
- It also has been found in breast milk, placentas, and umbilical cords including in people who were actively trying to avoid GMO foods that are contaminated with the chemical. i.e. It is pervasive in our environment and very hard to avoid.
- Dr. Stephanie Steneff, a MIT researcher who is a big name in the study of Roundup, has speculated that glyphosate may be incorporated into proteins because its chemical structure is like that of an amino acid, glycine and so the protein mistakenly takes it up. Glycine is in many proteins including in those that make energy for mitochondria. Studies have shown that cells exposed to high doses of glyphosate cause mitochondrial damage and stress, suggesting that glyphosate may have played a direct part. Glycine is also involved in proteins that regulate fat and insulin which would then create potential for obesity and diabetes.
- Dr. Seneff also notes another pathway that is disturbed in pregnancy. There is an enzyme that converts testosterone to estrogen and glyphosate disrupts it. Boys need it for brain development and naturally do not have access to many other sources of estrogen. And girls can end up with polycystic ovary syndrome (PCOS) which is the most common cause of infertility in women.
- and if you care about pollination such as by honeybees, a study found that the chemical damages the beneficial gut bacteria in the bees and made them more prone to deadly

infections (Applied Biological Sciences, "Glyphosate perturbs the gut microbiota of honey bees" Erick Motta et al, Sept. 2018). Another similar issue is that glyphosate has been seen to impact ecosystems especially waterways, as to destroying food supplies and natural habitats fish and animals need. It also kills 50-80% of the beneficial insects that are present in the application area including earthworms.

- there is Danish research that Roundup can impact cattle such as dairy cows (Sustainable Pulse, "World exclusive: new study reveals Roundup is toxic to dairy cows" 9/12/2013).
- by 2021 Bayer had set aside over $16 billion to cover litigation liability associated with more than 125,000 US lawsuits on glyphosate-based herbicides causing non-Hodgkin lymphoma.

Three more important facts: Roundup kills weeds by inhibiting a metabolic process called the shikimate pathway. It is critical for plants but does not exist in people. But the human digestive system contains microorganisms that do make use of the pathway. Research by Dr. Stephanie Seneff and Anthony Samsel found that by disturbing healthy gut bacteria it allows bad pathogens like fungus, bacteria and parasites to take over leading to dysbiosis, food sensitivities, inflammation, neurological disorders, and autoimmunity. It also inhibits an enzyme called cytochrome P450 that is crucial for detoxification and other vital functions.

A second fact is that Roundup contains glyphosate plus a bunch of other 'inert' chemicals including arsenic which is a toxic heavy metal. Some studies have found that Roundup is significantly more toxic to people than is just glyphosate. So, saying 'Glyphosate is safe' may be missing the boat. Some studies have found that Roundup is three times more toxic than glyphosate alone. Another 'inert' chemical in it (POEA, polyethoxylated tallowamine) has been found more deadly to human embryonic, placental and umbilical cords than the herbicide itself. The EPA and Dept. of Agriculture recognize POEA as an inert ingredient and it is allowed in products certified organic by the USDA. The EPA says it is not dangerous to public health or the environment. Others, such as some French researchers (Gilles-Eric Seralini and others) say otherwise.

Third, it depletes important brain neurotransmitters, serotonin and dopamine, that have effects on mood, appetite, energy, cognitive functioning and behavior, and thought. These neurotransmitters being impacted can lead to depression, panic and anxiety disorders, violence, suicide, obesity, Alzheimer's, alcoholism and addiction, compulsive overeating and other eating disorders, autism, ADHD, Parkinson's, and more.

Glyphosate also reduces folate and other vitamins from food crops it is sprayed on. Added to the gut dysbiosis this erodes the nutrient-absorbing ability of the digestive system.

Glyphosate also has been found to linger in soil for years after it has been sprayed which can then suppress beneficial fungi which help plants obtain nutrients from the soil while offering protection from disease.

How are people exposed to it most often? Breathing it in, eating food that has been treated or tainted with it, and through skin absorption.

Who is at most risk for such exposure is said to consist of:

- professional gardeners
- landscapers
- farmers
- agricultural workers
- herbicide applicators
- groundskeepers

How to best avoid eating Roundup contaminated food? First, avoid GMO food and eat organic. Second, sulfur-containing foods (e.g. cruciferous vegetables, onions, garlic) can help. Glyphosate depletes sulfur and effects sulfate pathways. Third, glyphosate is a patented antibiotic so increase your probiotic consumption (e.g. fermented foods may help such as sauerkraut, yogurt, vinegar). And fourth, do not use the chemical in your own yard, and look for all natural weed killers instead such as

- lemon juice and vinegar (1:1 ratio)
- vinegar by itself
- baking soda mixed with boiling hot water
- boiling salt water and pour it over weeds while still hot
- vinegar and salt (1 quart boiling water, 5 T vinegar, 2 T salt and pour on weeds while still hot)
- vinegar and dish soap (1 c vinegar, ½ c dish soap)
- salt (¼ t sprinkled around the base of weeds)
- vodka and water (3 T vodka, 2 c water, sprayed on weeds)
- borax (5 t borax, 1 quart of water, sprayed on weeds)
- for poison ivy: 1 quart water and ¼ t of clove and/or cinnamon oil

Drs. Joseph Mercola and Seneff say that taking a glycine supplement can help push glyphosate out of your body and mitigate its toxicity as to there being more glycine present then and so will more likely be picked up by proteins.

Water filtration methods that can reduce or eliminate Roundup include reverse osmosis, distillation, nanofiltration which removes stuff down to 0.001 microns which is good enough to remove the chemical. Activated carbon filters can also help such as the ‘Big Berkey Countertop’ and ‘Clearly Filtered Pitcher’ which can remove 99.9% of glyphosate from tap water by report. Boiling water does not help remove it.