



# Glyphosate

A Round Up of the Research

Heidi Honegger Rogers

ESB Board Meeting October 15, 2020





## Glyphosate

- Patented Herbicide in 1974 by Monsanto in 1996 "Round Up Ready" genetically modified crops were introduced.
- Most common herbicide in the world with over 750 products that contain this substance – it is also being used as a pre-harvest desiccant /accounts for 53% of all herbicides 81.6-83.9 billion kilograms per year in the US.
- Applied topically to leaves and grasses
- Used in industrial areas, agriculture, forestry, lawns and gardens
- It is toxic to humans, animals and insects to varying degrees
- Breaks down to formaldehyde and aminomethylphosphonic acid (AMPA)





# Glyphosate

- This substance is ubiquitous
  - Found in
  - Livestock tissue
  - Vegetables and fruits
  - Grains (even after baking) – worse now because of new practices
  - Fish
  - Baby Formula
  - Drinking Water
  - Dust – and transmitted in the air

Monitoring of levels is not standardized across systems, and more plants are now resistant to this herbicide, resulting in great dosing and addition of more herbicides to the traditional formulas/ mixing accounts for greater toxicity to animals, insects humans and the soil microbiome. Levels of Glyphosate are not monitored in humans or most eco-systems. Mixtures of herbicides are industry protected information/impairing research.



# Human Health Impacts of Glyphosate

- In humans the symptoms of exposure are burning in the eyes, nose mouth and throat, skin irritations, if ingested nausea, vomiting, diarrhea and possibly death. Ingestion and inhalation of this substance are extremely dangerous, not well-absorbed in skin, but highly irritating
- Endocrine Disruption & Fertility
- Non-Hodgkin's Lymphoma and Multiple Myeloma (needs more research)
  - EPA findings vs International Agency on Research for Cancer
- Oxidative stress – leads to cellular damage
- Chronic Kidney Disease in agricultural workers
- Liver Disease
- Nutritional deficiencies (zinc, cobalt, manganese) – decreased nutrient absorption from soil
- Microbiome disruption and antibiotic resistance (current research)
- Correlations to Alzheimer's, Parkinson's, ADHD and Autism





# Impact on the more than human world

- Toxic to animals
- Interferes with the gut microbiome of animals, making them more susceptible to pathogens – may be linked to antibiotic resistance in animals
- Binds to the soil, impacts the soil microbiome/can be taken up by lettuces & carrots,
- Impacts the gut microbiome of bees/butterflies – linked to death in these two species
- Adversely Impacts aquatic ecosystems (run off)
- Earthworms
- Beneficial soil microbes
- Long term adverse impacts on soil health





## References

Benbrook, C.M. How did the US EPA and IARC reach diametrically opposed conclusions on the genotoxicity of glyphosate-based herbicides?. *Environ Sci Eur* **31**, 2 (2019). <https://doi.org/10.1186/s12302-018-0184-7>

Exposure to glyphosate-based herbicides and risk for non-Hodgkin lymphoma: A meta-analysis and supporting evidence, *Mutation Research/Reviews in Mutation Research*, Volume 781, 2019, Pages 186-206, ISSN 1383-5742, <https://doi.org/10.1016/j.mrrev.2019.02.001>. (<http://www.sciencedirect.com/science/article/pii/S1383574218300887>)

Gillezeau, C., van Gerwen, M., Shaffer, R.M. *et al.* The evidence of human exposure to glyphosate: a review. *Environ Health* **18**, 2 (2019). <https://doi.org/10.1186/s12940-018-0435-5>

Luoping Zhang, Iemaan Rana, Rachel M. Shaffer, Emanuela Taioli, Lianne Sheppard, Motta EVS, Raymann K, Moran NA. Glyphosate perturbs the gut microbiota of honey bees. *Proc Natl Acad Sci U S A*. 2018 Oct 9;115(41):10305-10310. doi: 10.1073/pnas.1803880115. Epub 2018 Sep 24. PMID: 30249635; PMCID: PMC6187125.





## References

Myers JP, Antoniou MN, Blumberg B, Carroll L, Colborn T, Everett LG, Hansen M, Landrigan PJ, Lanphear BP, Mesnage R, Vandenberg LN, Vom Saal FS, Welshons WV, Benbrook CM. Concerns over use of glyphosate-based herbicides and risks associated with exposures: a consensus statement. *Environ Health*. 2016 Feb 17;15:19. doi: 10.1186/s12940-016-0117-0. PMID: 26883814; PMCID: PMC4756530.

Tarazona JV, Court-Marques D, Tiramani M, Reich H, Pfeil R, Istace F, Crivellente F. Glyphosate toxicity and carcinogenicity: a review of the scientific basis of the European Union assessment and its differences with IARC. *Arch Toxicol*. 2017 Aug;91(8):2723-2743. doi: 10.1007/s00204-017-1962-5. Epub 2017 Apr 3. PMID: 28374158; PMCID: PMC5515989.

Van Bruggen AHC, He MM, Shin K, Mai V, Jeong KC, Finckh MR, Morris JG Jr. Environmental and health effects of the herbicide glyphosate. *Sci Total Environ*. 2018 Mar;616-617:255-268. doi: 10.1016/j.scitotenv.2017.10.309. Epub 2017 Nov 5. PMID: 29117584.





# Glyphosate

Local use

Local actions

Recommendations