

## Glyphosate and AMPA facts

Glyphosate is the most widely used weed killing chemical on farms, lawns, schoolyards, golf courses and other public spaces. The amount of glyphosate used in the U.S. in 2014 was 276 million pounds.<sup>1</sup>

AMPA is metabolite of glyphosate, created when organisms break glyphosate down.

A pesticide residue is the combination of the pesticide and its metabolites. According to the Food and Agriculture Organization (FAO), total or effective glyphosate residues should be calculated as the sum of the weight of glyphosate + 1.5 × the weight of its metabolite AMPA. The Effective Glyphosate level is a measure of a person's overall exposure to glyphosate.

The average effective glyphosate level measured in more than 1,000 North Americans tested through Health Research Institute's study is 0.5 parts per billion (ppb) – also sometimes expressed in terms of ng/mL. The highest level ever measured in the study is 33 ppb and the lowest was below the limit of detection of 0.02 ppb.

The average level of glyphosate measured in small study of 182 Europeans was 0.2 ppb in 2013.<sup>2</sup>

The U.S. EPA sets a maximum safe Average Daily Intake (ADI) for glyphosate at 1.75 mg/kg of bodyweight/day.

The European Union (EU) sets the ADI 5.8 times lower, at 0.3 mg/kg/day.

Under Prop 65, California is considering a daily limit of 1.1 mg/day or 0.016 mg/kg/day for a 70 kg person.

The Environmental Working Group recommends a limit of 0.01 mg/day. **If your urine level is above 1.0 ppb, then you probably exceeded the EWG daily intake limit and the level fed to animals in the studies, below.**

A study found toxic effects in the liver and kidneys of lab animals when their drinking water contained Roundup, a commercial weed killer with glyphosate as its primary constituent, at a level of 0.1 ppb.<sup>3</sup> A second study found signs of fatty liver disease in rats exposed to 0.1 ppb.<sup>4</sup>

The Maximum Residue Level (MRL) for glyphosate in drinking water in the U.S. is 700 ppb (ng/ml) while the MRL for glyphosate in drinking water in the EU is 7,000 times lower, at 0.1 ppb.

U.S. Geological Survey scientists found, "Glyphosate and AMPA were detected frequently in soils and sediment, ditches and drains, precipitation, rivers, and streams; and less frequently in lakes, ponds, and wetlands; soil water; and groundwater. Concentrations of glyphosate were below the levels of concern for humans or wildlife; however, pesticides are often detected in mixtures. Ecosystem effects of chronic low-level exposures to pesticide mixtures are uncertain. The environmental health risk of low-level detections of glyphosate, AMPA, and associated adjuvants and mixtures remain to be determined."<sup>5</sup>

The U.S. EPA considers glyphosate to be non-carcinogenic, but is currently reviewing this assessment. The World Health Organization determined that glyphosate is a probable carcinogen in March 2015.

The MRL for glyphosate set by the EPA for various foods may be found at:

<https://www.gpo.gov/fdsys/pkg/CFR-2013-title40-vol25/pdf/CFR-2013-title40-vol25-sec180-364.pdf>

**There are various reasons why an individual's level may be higher or lower than average levels:**

**Diet:** Food choices and your source of drinking water can affect levels of glyphosate and AMPA in the body. Genetically modified (GM) soybeans generally contain higher levels of glyphosate and AMPA than conventional or organic soybeans due to repeated spraying of the GM plants with glyphosate-based

herbicides during the production season.<sup>7</sup> Some non-modified foods, like conventional oats, wheat, dried garbanzo beans and lentils are often sprayed with glyphosate just before harvest to dry out or desiccate the plants and make the grain/beans easier to harvest. These can have levels measuring much more than 1,000 ppb, while other foods, like honey, can have levels on the order of 100 ppb, and beer and wine, 30 ppb. In some foods like organic produce, glyphosate is often not detected at all. Some people who have a high body burden of glyphosate report that levels dropped after switching to an organic diet in as few as 3 days.

**Preliminary results of the Glyphosate Environmental Exposure Study suggest that:**

- One out of seven people (14%) have no detectable levels at all, while 86% of people do.
- Men are more likely to have detectable levels, and higher levels, than women.
- People who eat non-organic oats have double the amount of glyphosate than people who do not.
- People who eat the most organic food (80-100% reported) have 75% less glyphosate in their urine than people who eat the least amount (0-10% reported).
- People who eat six or more servings of vegetables per day have 50% lower glyphosate levels than people who eat two or less servings of vegetables.
- Dogs that eat a diet of raw meat and vegetables have the lowest glyphosate levels. Dogs that eat conventional kibble with grain filler have high glyphosate levels. Dogs that eat grain-free kibble where lentil, chickpea or pea flour is substituted for corn and soy have the highest levels of glyphosate.

**Environment:** Glyphosate is applied to kill weeds on many farms, golf courses, public parks and schools, in suburban gardens, along highway and train right-of-ways, along fence lines, and on cracks in urban sidewalks. Where you live, work and play could affect your exposure, however, study results suggest that food is by far the highest source of exposure for people and animals compared to water or through contact.

The Glyphosate Environmental Exposure Study will identify trends and publish the results, so please check our website periodically at [www.hrilibs.org/news/](http://www.hrilibs.org/news/), and thank you again for participating. And, remember, to make this study as strong as possible, we need you to fill out the exposure questionnaire at [www.hrilibs.org/survey](http://www.hrilibs.org/survey) if you have not already done so.

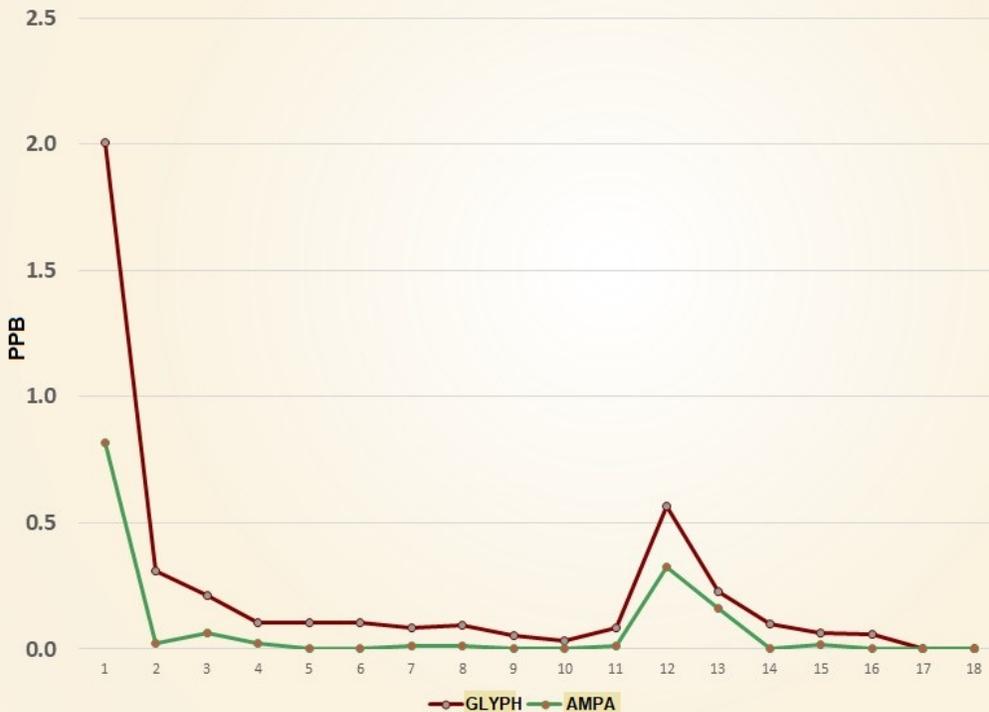
**Sampling of Glyphosate levels founds in foods**  
(measured in parts per billion)

Black Beans	3000	Blackstrap Molasses	40	Beer	8
Hummus	1435	Yellow Potatoes	29	Milk Chocolate	7
Oatmeal	1254	Honey - organic	26	Dark Chocolate	7
Cheerios	624	Wine, conventional	22	Peaches	6
Roasted Soybeans	479	Orange Juice	19	Coffee	3
Whole Wheat Bread	370	Peanut Butter	12	Wine - organic	2
Honey - near GM crops	307	Chewing tobacco	10	Ice cream	1
Cranberries	243			Milk	0.2
Green Tea	208			Apples - Fuji	~0
Wheat Flour	171			Meat	~0
Lentils, cooked	94			Olive oil	~0
Blueberries	84			Orange juice - organic	~0
				Whiskey	~0

## How fast does glyphosate leave the body?

Dr. John Fagan, Chief Scientist at Health Research Institute ran an informal study on himself to find out. He ate conventional oats and other high glyphosate foods for three days to boost his glyphosate levels. Then he went 100% organic. Tests showed a dramatic reduction in just three days. (See the graph below that starts on the first day that he went organic.) On the 11<sup>th</sup> day of his organic diet, Dr. Fagan “fell off the wagon,” enjoying a meal at a conventional Italian restaurant. His glyphosate and AMPA levels spiked the next day and returned to nearly zero after three days.

# Organic Diet Intervention



## References:

1. Benbrook, C.M., “Trends in glyphosate herbicide use in the United States and globally,” *Environ Sci Eur* (2016) 28: 3. doi:10.1186/s12302-016-0070-0
2. BUND, “Determination of Glyphosate residues in human urine samples from 18 European countries.” [http://www.foeeurope.org/sites/default/files/glyphosate\\_studyresults\\_june12.pdf](http://www.foeeurope.org/sites/default/files/glyphosate_studyresults_june12.pdf), June 2013.
3. Séralini, et al, “Republished study: long-term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize.” *Environ. Sci. Eur.*26(1):14, 2014.
4. Mesnage R, et al, “[Multiomics reveal non-alcoholic fatty liver disease in rats following chronic exposure to an ultra-low dose of Roundup herbicide.](#)” *Scientific Reports* (a Nature publication). doi:10.1038/srep39328, Jan. 2017.
5. Battaglin, et al, [Glyphosate and its degradation product AMPA occur frequently and widely in U.S. soils, surface water, groundwater, and precipitation](#): *Journal of the American Water Resources Association*, v. 50, no. 2, p. 275-290. doi:10.1111/jawr.12159, 2014.
6. Bøhn T, et al, “Compositional differences in soybeans on the market: glyphosate accumulates in Roundup Ready GM soybeans.” *Food Chem.* doi:10.1016/j.foodchem.2013.12.054, 2013.