Glyphosate Found In 93% of Urine Samples

The Detox Project is a research organization bringing awareness to the public by testing for man-made chemicals in our bodies and in our food. The project gives consumers an accurate report on the levels of glyphosate in their urine.

Through this unique public testing project carried out by a laboratory at the University of California San Francisco (UCSF), glyphosate was discovered in 93% of urine samples during the early phase of the testing in 2015. The urine and water testing was organized by The Detox Project and commissioned by the Organic Consumers Association.

The project has provided more urine samples for testing than any other glyphosate bio-monitoring urine study ever in America. It was supported by members of the public, who themselves paid for their urine and water samples to be analyzed for glyphosate residues by the UCSF lab.

The data released in a presentation by the UCSF lab only covers the first 131 people tested. Further data from this public bio-monitoring study, which is now completed, will be released later in 2016.

Later this year, The Detox Project will be working alongside a new, larger lab to enable the public to once again test their urine for glyphosate residues. The Detox Project is also researching whether or not an organic diet has an effect on the level of man-made chemicals in our bodies. They’re not just testing for glyphosates either, they are also testing for 150+ man-made chemicals.

The Results

Biomonitoring of glyphosate across the United States in urine and tap water using high-fidelity LC-MS/MS method

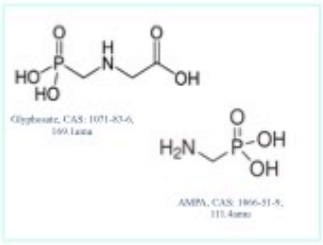
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Introduction

•Glyphosate (N-(phosphonomethyl)glycine) is arguably the most important herbicide ever discovered[1] and is the most widely used herbicide in the world with U.S. of 185 million pounds in 2007[2]

•Its mode of action as a herbicide is via inhibition of synthesis of aromatic amino acids in plants[3]

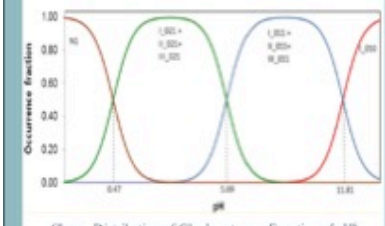
•Main breakdown product is (aminomethyl)phosphonic acid (AMPA)



•March 2015, IARC ruled glyphosate as a Group 2A carcinogen based upon a meta-analysis linking glyphosate exposure to Non-Hodgkin's Lymphoma (OR: 1.5, 95%CI 1.1-2.0, I^2=32.7%)[4,5]

•Glyphosate is a notoriously difficult analyte

- Small, polar, and amphoteric (pKa's of pH 0.47, 5.69, and 11.81)[6]
- No fluorophore or chromophore
- Structurally similar to many small polar molecules in biological matrices (e.g. glycine)
- Strong chelator of divalent metal cations[7]



Charge Distribution of Glyphosate as a Function of pH[6]

•Aims:

1.Develop a direct method for analysis of glyphosate in urine and tap water for future use in both biomonitoring studies and assessment of acute intoxication.

2.Demonstrate utility of method in a public glyphosate testing in the United States.

Analysis

- LC: Agilent binary 1260 Infinity LC pump and autosampler injector
- MS: AB Sciex Triple Quad 5500 LC-MS/MS
- Column: Obelisc N column (100mm x 2.1mm x 5˚m, SIELC Technologies)
- Quantitation in urine done using standard addition with IS of ^{13}C-2-glyphosate with spike concentrations at 0.2, 1, and 2ppb
- Quantitation in tap water done using stable isotope dilution method using peak area ratios[8]

MRM Transitions

Analyte	MRM Transition	DP	CE	CXP
Glyphosate	168.071/62.900	-40V	-32V	-11V
	168.071/81.000	-40V	-22V	-7V
Glyphosate-2-^{13}C	169.400/63.000	-30V	-40V	-9V

LC-MS Conditions

LC Conditions	
Autosampler Temp.	4°C
Column Temp.	40°C
Elution Gradient	Isocratic
Mobile Phase	1% Formic Acid/HPLC-Grade H_2O
Mobile Phase pH	2.2
Flow Rate	1000µL/min
Injection Volume	25µL
MS Conditions	
MS Mode	Negative
Curtain Gas	20.0bar
Collision Gas	9.0bar
Ion Spray Voltage	-4500V
Temperature	700°C
Ion Source Gas 1	60.0bar
Ion Source Gas 2	60.0bar
Method Duration	6.00 min
Validation	Matrix / Concentration
LOD	Urine / 0.2ppb
LLOQ	0.5ppb
LOD	Water / 0.01ppb
LLOQ	0.005ppb

Results from Public Testing[L]

Matrix	Population	n	Avg. Glyphosate Conc. (ppb)	Standard Error
Urine	Overall	131	3.096	0.186
	Women	75	2.941	0.214
	Men	56	3.304	0.329
	Children (confirmed <18years old)*	7	3.586	0.300
	Adults*	124	3.069	0.196
	Region			
	Northeast	21	3.000	0.343
	Midwest	19	3.050	0.289
	South	16	2.313	0.828
	West	75	3.053	0.275

[L]Glyphosate residues were not observed in any tap water samples – as would be expected due to phosphorus removal during water treatment
*Only 60/131 participants included age on requisition forms

Limitations:

-Selection bias: people likely to pay for this service are not representative of general U.S. population and the West is represented disproportionately
-Consistency of sample collection; urine concentrations were corrected based upon urine osmolality

Public Testing Reports

- Public Testing offered as a fee for service
- Participants received a summary report of the glyphosate levels in urine along with infographics comparing their results to results obtained for different regions of the U.S.



Conclusions:

•Glyphosate residues were observed in 93% of urine samples in voluntary public testing in the U.S. general population; this is higher than the frequency observed in Europe using GC-MS (43.9%)[9]

•Tap water obtained was free of glyphosate residues as expected; exposure is likely due to dietary intake or environmental exposure

Future Directions:

•Develop method for AMPA in urine

•Develop direct LC-MS method not requiring standard addition

•Develop method for glyphosate and AMPA in other biological matrices such as serum and breast milk

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UCSF University of California San Francisco — Berkeley UCSF Joint Medical Program

Glyphosate was found in **93% of the 131 urine samples** tested at an average level of 3.096 parts per billion (PPB). Children had the highest levels with an average of 3.586 PPB.

The regions with the highest levels were the West and the Midwest with an average of 3.053 PPB and 3.050 PPB respectively.

Glyphosate residues were not observed in any tap water samples during the early phase of the project, most likely due to phosphorus removal during water treatment.

The Method

Glyphosate (N-(phosphonomethyl)glycine) is directly analyzed using liquid chromatography- tandem mass spectrometry (LC-MS/MS). Water and urine samples are prepared for analysis by solid phase extraction using an ion exchange column. Extracted samples are injected to the LC-MS/MS and the analyte is separated using an Obelisc N column (SIELC Technologies, Prospect Heights, IL) through isocratic elution. Ionization of glyphosate is achieved using an electrospray ionization source operated in negative polarity. The analyte is detected by multiple reaction monitoring using a 13C-labelled glyphosate as the internal standard. Quantification of the analyte is done by isotope dilution method using an eight-point calibration curve.

The assay has a limit of quantification of 0.5 ng/mL. The intra- and inter-day precision observed are 6-15% in concentrations that range 0.5-80 ng/mL. Recoveries for glyphosate range 70-80% at concentrations within the assay’s linear dynamic range.

Glyphosate and Health Concerns



Glyphosate-containing herbicides are sold under trademarks including Monsanto's "Roundup". Glyphosate was labeled a "probable human carcinogen" by the World Health Organization's cancer agency IARC in 2015. The European Union is currently putting restrictions on the use of glyphosate due to health concerns.

Glyphosate has never been studied at the level of exposure that we in the U.S. are currently being subjected to (under 3 mg/kg body weight/day). Industry-funded science many years ago suggested that lower exposure is likely safe, but that more exposure could prove to be dangerous. Modern independent science has discovered that many toxic chemicals can have major effects on our endocrine system, sometimes at very low doses. Interestingly enough, due to the nature of endocrine disrupters, there's often a "sweet spot", where less or more exposure would be more damaging to health. These chemicals are known as hormone disruptors, or endocrine disruptors.

For more on the endocrine system check out *Holistic Guide to Healing the Endocrine System and Balancing Our Hormones.*

A study from March 2015 stated that the health cost to the European Union of only a few of these endocrine disrupting chemicals is over EUR 150 Billion per year. The same report also said that lower IQs, adult obesity, and potentially 5% or more of autism cases may be linked to exposure to endocrine disruptors like glyphosate.

"With increasing evidence from laboratory studies showing that glyphosate-based herbicides can result in a wide range of chronic illnesses through multiple mechanisms, it has become imperative to ascertain the levels of glyphosate in food and in as large a section of the human population as possible. Thus, the information gathered by the glyphosate public testing service being offered by The Detox Project is most timely and will provide invaluable information for the consumer and scientists like myself evaluating the toxicity of real world levels of exposure to this most widely used pesticide."

> *These results show that both the U.S. regulators have let down consumers in America. Independent science shows that glyphosate may be a hormone hacker at these real-life exposure levels found in the food products. The safe level of glyphosate ingestion is simply unknown despite what the EPA and Monsanto would have everyone believe." – Henry Rowlands, Director, The Detox Project*

> *If consumers had any doubt about the extent to which they are being poisoned by Monsanto's Roundup, these tests results should put those doubts to rest," – Ronnie Cummins, International Director of Organic Consumers Association*

It's interesting to note that the testing is on a volunteer bases, and some speculate that people getting tested are more likely than the general public to purchase organic foods and

avoid GMOs.

How to Avoid and Detox Endocrine Disruptors

The most common endocrine disruptors we are likely to have in our bodies include Bisphenol–A, AKA BPAs, Phthalates (added to plastics to make them softer and last longer), Parabens, PBDE's (found in flame retardants) PCB's, Dioxin: (an unintentional by-product of many industrial processes), pesticides and herbicides, and heavy metals. It's a scary list, and there's obviously many more chemicals we haven't heard about yet.

The good news is that studies have shown that fresh, raw, organic vegetables detox the body of all of these toxins. It's becoming more and more imperative that we grow our own food and buy unpackaged, unprocessed food to prepare at home. Get gardening and get detoxing if you're not already. See the recommended reading list below for more on this.

Conclusion

If you're ready to send in a sample, unfortunately, the project was put on hold. Due to the enormous interest, they had to temporarily stop the urine and water testing program until they are working with a much larger lab, which is supposed to begin in "summer, 2016." You can sign up if you're interested at The Detox Project here.

Recommended Reading:

- *Understanding and Detoxifying Genetically Modified Foods*
- *Detox Cheap and Easy Without Fasting – Recipes Included*
- *Holistic Guide to Healing the Endocrine System and Balancing Our Hormones*
- *How to Start a Vegetable Garden – How to Grow Vegetables*

- *How to Start an Organic Garden*

Sources:

- Detox Project
- *UCSF Presentation Reveals Glyphosate Contamination in People Across America* – Organic Consumers Association
- *Nine Out of 10 Americans Tested Positive for Monsanto's Cancer-Linked Weedkiller Glyphosate* – Alternet