Glyphosate found in 100% of wines tested in California–Reason for concern?

The headline was scary enough:

> Widespread Contamination of Glyphosate Weedkiller in California Wine
> 100% of wine tested showed positive results for Glyphosate weedkiller

Kicking off a news release from the anti-GM group Moms Across America, these headers were backed by data from an analysis of glyphosate (the active ingredient of Roundup, an herbicide that is used with genetically modified, glyphosate-resistant crops, as well as many, many other applications):

The Moms Across America study found glyphosate at:

> 18.74 ppb from a 2013 Cabernet Sauvignon from a conventional, chemically farmed vineyard. The lowest level was from a biodynamic and organic vineyard, 2013 Syrah, which has never been sprayed according to the owner, with a level of .659 ppb. An organic wine from 2012 mixed red wine grapes had 0.913 ppb of glyphosate.

Yes, those measurements are in parts per billion. To give some reference, the National Environmental Services Center at West Virginia University says a ppb is, “like adding a pinch of salt to a 10 ton bag of potato chips.” But according to Moms Across America founder Zen Honeycutt, for glyphosate even those trace levels are enough to cause harm. “It has to stop now,” she said. “It is poisoning America and destroying future of this great country. If we don’t face up to the overall contamination from glyphosate, we can’t change it.”

On the other hand most science advocates and toxicologists argue that *the dose makes the poison.* How could such small amounts of any chemical cause this kind of harm, in the short or long term?

One issue with these studies is that Moms Across America admits that the data was never intended to be part of a scientific study. Another issue lies with the use of biomonitoring data.

Getting small with biomonitoring

Biomonitoring is a relatively new way to very precisely detect and measure trace amounts of just about any chemical you’d want to detect and measure. It involves measuring levels of a chemical, or metabolites of that chemical, in human blood, urine and tissues. Today’s technology can now determine existence of chemicals in very, very small levels. And there are two ways to interpret those very small levels—the one, taken by Moms Across America, the Natural Resources Defense Council and other advocacy groups, is to warn that any amount of a chemical is dangerous. Another way is to look at a dosage response curve, as well as exposure to determine the actual danger of a chemical. Comparing a dose curve to a chemical’s lethality (measured as a LD50, or the dose at which half of a population of test animals dies) could give a picture of a chemical’s potential for harm. The larger the LD50, the less likely a miniscule dose of that

chemical will cause harm. Glyphosate's LD50, by the way, is very, very high—slotting slightly safer than baking soda and table salt on the toxicity chart.

Some scientific study data

The largest (and longest) biomonitoring study was the Farm Family Exposure Study, headed by researchers at the University of Minnesota. The researchers studied 95 farm families in Minnesota and South Carolina, who had to apply glyphosate, chlorpyrifos or 2,4-D to their farms. They also had to submit urine samples, which were measured by methods that could detect chemicals down to 1 ppb.

Of the three pesticides, glyphosate had the lowest concentrations found in urine, with an average concentration of 3 ppb. One farmer had a urine concentration of 233 ppb, which was due to not following basic application precautions—he didn't wear gloves, wasn't in an enclosed cab, was exposed to a spill, and smoked during the application. But to put that 3 ppb in perspective, the EPA reference dose is a concentration 30,000 times higher. A reference dose is the amount of "daily oral exposure to the human population, including sensitive subgroups such as children, that is not likely to cause harmful effects during a lifetime," according the EPA.

To compare that to the Moms Across America wine/glyphosate report, "You would have to drink 2,500 glasses of wine a day for 70 years to reach the EPA's level of concern," Gladys Horiuchi, spokeswoman for The Wine Institute of San Francisco, told the *Napa Valley Register*. "We are talking about minuscule, trace amounts."

These are just comparisons to the EPA reference, which adds a buffer of safety about 10 times that of a dose that could really start to cause harm. Taking the buffer into account, the amount of wine you'd have to drink to cause harm would be 25,000 glasses a day. For 70 years. With that level of consumption, other health issues would probably arise before glyphosate poisoning.

Biomonitoring data has a lot of caveats. Programs like the US Centers for Disease Control and Prevention's National Biomonitoring Program use the data to:

- Determine which chemicals are getting into people's bodies and how much of those chemicals are in blood, urine, breast milk, and saliva.
- Monitor the number of people who have levels of a chemical above a known toxicity level (e.g., blood lead levels).
- Track exposure trends and impacts of public health programs.

While biomonitoring data have resulted in changing recommended exposure levels of certain chemicals, determining the dangerous exposure level of a new chemical, and reaffirmed some existing regulations, it does not mean that any exposure level is automatically dangerous.

The CDC program and others look at a wide range of chemicals every two years to determine exposure and potential public health problems. The chemicals scanned include pesticides, herbicides like glyphosate, and other chemicals that have recently become fodder for scare tactics—PBA and other phthalates, the so-called "endocrine disruptors" for their perceived ability to muck with human hormones

and nerve cells, and those that might cause “epigenetic events,” changes in gene regulation that might persist through generations. However, as Genetic Literacy Project Executive Director Jon Entine observed in Forbes:

> BPA, phthalates and dozens of other common chemicals every day; and yes, they show up in our urine. It’s estimated that more than 160 chemicals can be detected in human urine, many of which are potentially dangerous if consumed at high enough doses over a long enough period of time. However, our liver regularly detoxifies chemicals from the environment and food, which is why we don’t keel over from drinking coffee, which has dozens of “killer” chemicals.

Just because detectable levels are now down to 1 ppb (compared to 10 ppb 25 years ago), does not mean that those now-discoverable lower thresholds are harmful. Different chemicals have different harmful doses, and it’s now a challenge for public health agencies to keep up with chemical innovation.

The European Commission wrote as it began efforts to integrate biomonitoring in its (and member countries’) environmental and health plans:

> Biomonitoring is not an automatic instrument, which can be considered in isolation, but has to be integrated with environmental monitoring, toxicological and eco-toxicological data and especially with considerations related to analytical epidemiology.

The devil remains with the dosage.

Andrew Porterfield is a writer, editor and communications consultant for academic institutions, companies and nonprofits in the life sciences. He is based in Camarillo, California. Follow @AMPorterfield on Twitter.