



New Evidence About the Dangers of Monsanto's Roundup

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Mondialisation.ca, 18 mai 2016

[The Intercept](#) 17 mai 2016

Région : [Europe](#), [USA](#)

Thème: [Biotechnology and GMO](#),
[Environment](#), [Science and Medicine](#)

John Sanders worked in the orange and grapefruit groves in Redlands, California, for more than 30 years. First as a ranch hand, then as a farm worker, he was responsible for keeping the weeds around the citrus trees in check. Roundup, the Monsanto weed killer, was his weapon of choice, and he sprayed it on the plants from a hand-held atomizer year-round.

Frank Tanner, who owned a landscaping business, is also a Californian and former Roundup user. Tanner relied on the herbicide starting in 1974, and between 2000 and 2006 sprayed between 50 and 70 gallons of it a year, sometimes from a backpack, other times from a 200-gallon drum that he rolled on a cart next to him.

The two men have other things in common, too: After being regularly exposed to Roundup, both developed non-Hodgkin lymphoma, a blood cancer that starts in the lymph cells. And, as of April, both are plaintiffs in a suit filed against Monsanto that marks a turning point in the pitched battle over the [most widely used agricultural chemical](#) in history.

Until recently, the fight over Roundup has mostly focused on its active ingredient, glyphosate. But mounting evidence, including [one study](#) published in February, shows it's not only glyphosate that's dangerous, but also chemicals listed as "inert ingredients" in some formulations of Roundup and other glyphosate-based weed killers. Though they have been in herbicides — and our environment — for decades, these chemicals have evaded scientific scrutiny and regulation in large part because the companies that make and use them have concealed their identity as trade secrets.

Now, as environmental scientists have begun to puzzle out the mysterious chemicals sold along with glyphosate, evidence that these so-called inert ingredients are harmful has begun to hit U.S. courts. In addition to Sanders and Tanner, at least four people who developed non-Hodgkin lymphoma after using Roundup have sued Monsanto in recent months, citing the dangers of both glyphosate and the co-formulants sold with it. As Tanner and Sanders's complaint puts it: Monsanto "knew or should have known that Roundup is more toxic than glyphosate alone and that safety studies of Roundup, Roundup's adjuvants and 'inert' ingredients" were necessary.

Research on these chemicals seems to have played a role in the stark disagreement over glyphosate's safety that has played out on the international stage over the last year. In March 2015, using research on both glyphosate alone and the complete formulations of Roundup and other herbicides, the World Health Organization's International Agency for Research on Cancer (IARC) [declared](#) glyphosate a probable human carcinogen. The IARC report noted an association between non-Hodgkin lymphoma and glyphosate, significant evidence that the chemical caused cancer in lab animals, and strong evidence that it damaged human DNA.

Meanwhile, in November the European Food Safety Authority issued a report [concluding](#) that the active ingredient in Roundup was “unlikely to pose a carcinogenic hazard to humans.” The discrepancy might be explained by the fact that the EFSA report included only studies looking at the effects of glyphosate alone. Another reason the agencies may have differed, according to [94 environmental health experts](#) from around the world, is that IARC considered only independent studies, while the EFSA report included data from unpublished industry-submitted studies, which were cited with redacted footnotes.

On Friday, April 29, the Environmental Protection Agency weighed in — briefly — when it posted a long-awaited report on the reregistration of glyphosate concluding that the herbicide is “not likely to be carcinogenic to humans.” But the agency [removed](#) the report and 13 related documents from its website the following Monday, saying the publication had been an error. The U.S. House of Representatives Committee on Science, Space and Technology is looking into the EPA’s “[apparent mishandling](#)” of the glyphosate report, and the EPA said it will release the reregistration materials by the end of this year.

In response to queries from *The Intercept*, a spokesperson for the EPA wrote that “the safety of all inert ingredients are considered” during the pesticide registration process, though an 87-page “[Cancer Assessment Document](#),” which was among the documents accidentally released, contains no references to research conducted on the co-formulants.



Photo: Mike Mozart

Naming the Toxins

Some European governments have already begun taking action against one of these co-formulants, a chemical known as polyethoxylated tallowamine, or POEA, which is used in Monsanto’s Roundup Classic and Roundup Original formulations, among other weed killers, to aid in penetrating the waxy surface of plants.

Germany removed all herbicides containing POEA from the market in 2014, after a forestry worker who had been exposed to it developed [toxic inflammation of the lungs](#). In early April, the French national health and safety agency known as ANSES took [the first step toward banning](#) products that combine glyphosate and POEA. A draft of the European Commission’s reregistration report on glyphosate proposed banning POEA. In April, the European Parliament passed a non-binding resolution that supported the POEA ban and also suggested requiring member states to compile a list of other co-formulants to be banned from herbicides. The European Commission’s final vote on glyphosate’s reregistration is expected later this month.

In response to inquiries about POEA, Charla Marie Lord of Monsanto referred *The Intercept* to the company’s [April 8 blog post](#), which noted that Monsanto has “already been preparing for a gradual transition away from tallowamine to other types of surfactants for commercial reasons.” The post also said that “tallowamine-based products do not pose an imminent risk for human health when used according to instructions.”

Independent scientists have been reporting since at least [1991](#) that pesticides containing glyphosate along with other ingredients were more dangerous than glyphosate on its own.

More recently, two papers — [one](#) published in 2002, the [other](#) in 2004 — showed that Roundup and other glyphosate-containing weed formulations were more likely to cause cell-cycle dysregulation, a hallmark of cancer, than glyphosate alone. In [2005](#), researchers showed that Roundup was more harmful to rats' livers than its "active ingredient" by itself. And a [2009](#) study showed that four formulations of Roundup were more toxic to human umbilical, embryonic, and placental cells than glyphosate by itself.

But because manufacturers of weed killers are required to disclose only the chemical structures of their "active" ingredients — and can hide the identity of the rest as confidential business information — for many years no one knew exactly what other chemicals were in these products, let alone how they affected health.

Escaping Regulation

In 2012, Robin Mesnage decided to change that. A cellular and molecular toxicologist in London, Mesnage bought nine herbicides containing glyphosate, including five different formulations of Roundup, and reverse engineered some of the other components. After studying the chemicals' patterns using mass spectrometry, Mesnage and his colleagues came up with a list of possible molecular structures and then compared them with available chemical samples.

"It took around one year and three people (a specialist in pesticide toxicology, a specialist of chemical mixtures, and a specialist in mass spectrometry) to unravel the secrets of Monsanto's Roundup formulations," Mesnage explained in an email. The hard work paid off. In [2013](#), his team was able not only to deduce the chemical structure of additives in six of the nine formulations but also to show that each of these supposedly inert ingredients was more toxic than glyphosate alone.

That breakthrough helped scientists know exactly which chemicals to study, though obtaining samples remains challenging. "We still can't get them to make experiments," said Nicolas Defarge, a molecular biologist based in Paris. Manufacturers of co-formulants are unwilling to "sell you anything if you are not a pesticide manufacturer, and even less if you are a scientist willing to assess their toxicity."

So when Defarge, Mesnage, and five other scientists embarked on their most recent research, they had to be creative. They were able to buy six weed killers, including Roundup WeatherMax and Roundup Classic, at the store. But, finding pure samples of the co-formulants in them was trickier. The scientists got one from a farmer who mixes his own herbicide. For another, they went to a company that uses the chemical to make soap. "They were of course not aware that I was going to assess it for toxic and endocrine-disrupting effects," said Defarge. András Székács, one of Defarge's co-authors who is based in Hungary, provided samples of the other three co-formulants studied, but didn't respond to inquiries about how he obtained them.

In February, the team [published its findings](#), which showed that each of the five co-formulants affected the function of both the mitochondria in human placental cells and aromatase, an enzyme that affects sexual development. Not only did these chemicals, which aren't named on herbicide labels, affect biological functions, they did so at levels far below the concentrations used in commercially available products. In fact, POEA — officially an "inert" ingredient — was between 1,200 and 2,000 times more toxic to cells than glyphosate, officially the "active" ingredient.

The paper highlights the folly of letting co-formulants fly under the regulatory radar. Although the general public is never exposed to pure glyphosate, government agencies set safe exposure levels for the declared active ingredient in Roundup and other herbicides without considering POEA or any of the other chemicals that are bottled with it. In February, the Food and Drug Administration [announced plans](#) to monitor food for glyphosate residue. But the agency has no plan to test food for POEA or other additives, according to FDA press officer Lauren Sucher. And the EPA hasn't focused squarely on POEA because it isn't officially an active ingredient.

Evidence of Toxicity

But the EPA has possessed evidence of POEA's toxicity for years, including several reports of substantial risk to human health and the environment. One, submitted in 1998, noted that 1,000 fish died after 60 gallons of a mixture of chemicals including POEA spilled into a ditch, according to the company responsible for the spill, whose name is redacted in the document. Another report, filed by the chemical company BASF in 2013, noted that several rats that inhaled POEA in an experiment died. Researchers exposed rats to four different levels of the chemical, and at each level, at least some animals were killed. Even at the lowest level, 4 out of 10 rats died.

The EPA has also reviewed the long-term environmental effects of POEA, including its impact on [frogs](#). In 2008, the agency [reviewed](#) the effects of both POEA-containing Roundup formulations and POEA itself on fish and amphibians, and [showed](#) that Roundup Original, which has 15 percent POEA, is moderately toxic to wood frogs and that POEA itself is "highly toxic" to rainbow trout.

As evidence of the harms of co-formulants has been building, the U.S. has increased the amount of glyphosate to which it is theoretically safe to be exposed, which has in turn also increased our actual exposure to the chemicals it is packaged with. Almost [300 million pounds](#) of glyphosate was used on crops in the U.S. in 2013, up from approximately 16 million pounds in 1992, according to the U.S. Geological Survey.

For the lawyers litigating the cases against Monsanto, the idea that POEA and the other ingredients contribute to the toxicity of Roundup is critical. "That's one of the central theories of our case," said David Wool, an attorney at Andrus Wagstaff, who is working on suits against Monsanto on behalf of four people who developed non-Hodgkin lymphoma after years of regularly using Roundup. "It's not only that glyphosate is carcinogenic and dangerous," said Wool. "Monsanto had every reason to know that, by including POEA, it increased the danger of all of these products."

Robin Greenwald, the Weitz & Luxenberg attorney who filed Sanders and Tanner's case, is confident that discovery, which will begin over the next few months, will show that Monsanto intentionally mislabeled dangerous co-formulants. "My assumption is that we will find documents in their files that show they had ample evidence that the surfactants were not inert and that they too had the potential to cause illness in people," said Greenwald.

But for her client, John Sanders, who is now in remission after undergoing chemotherapy, it doesn't really matter which chemical did what. When he was using Roundup, Sanders had no idea that anything in the liquid that sometimes dripped on his clothes and skin might cause cancer. "That was never in my wildest dreams," he said recently. Now Sanders, who is 67, dreams about staying healthy. He is due for a CT scan next month to see if his cancer

has returned.

When asked to comment on the lawsuits, Monsanto provided the following statement:

While we have sympathy for the plaintiffs, the science simply does not support the claims made in these lawsuits. The U.S. EPA and other pesticide regulators around the world have reviewed numerous long-term carcinogenicity studies and agree that there is no evidence that glyphosate causes cancer, even at very high doses. Surfactants such as tallowamines are soapy substances that help to reduce surface tension of the water and are found in many everyday products such as toothpaste, deodorant, shampoo, detergent and many other cleaning products. Tallowamine-based products do not pose an imminent risk for human health when used according to instructions. In a 2009 review of toxicological data on tallowamine, the U.S. EPA found no evidence that tallowamines are neurotoxic, mutagenic or clastogenic.

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