

Glyphosate can cure cancer? Yes, some research ‘shows’ that — but what does it mean? And what does it say about Roundup doomsday claims?

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Cameron English | July 1, 2021



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Now that three juries have said Bayer’s weed killer Roundup (glyphosate) causes cancer, many people believe there is clear evidence that the herbicide is dangerous. Organic industry-funded advocacy group U.S. Right to Know (USRTK) certainly wants consumers to believe that. The California-based nonprofit has played a key role in the three cases, providing evidence the plaintiffs’ lawyers have used to make their case.

“Studies link glyphosate to a range of health concerns,” USRTK declared in a recent article, Glyphosate Spin Check: Tracking Claims About the Most Widely Used Herbicide, “including cancer, endocrine disruption, liver disease, shortened pregnancies, birth defects and damage to beneficial gut bacteria”

This is part one of a two-part series. Read part two: Another study finds glyphosate herbicide kills tumor cells. Is the much-maligned weedkiller a cancer fighter?

None of these claims stand up to scrutiny from independent scientists or oversight agencies, as GLP has reported extensively. But USRTK has employed a tactic (favored by political groups of all persuasions) in its opposition to glyphosate that is worth examining: Sifting through the peer-reviewed literature to find studies that support their argument, while dismissing contradictory research—widely known as “cherry picking.”

Selectively citing studies can lead to erroneous conclusions, which is why scientists criticize the practice and insist on evaluating all the available research, a standard known as “preponderance of evidence.” But if you want to show that glyphosate is dangerous, despite a mountain of contrary data, picking cherries is a useful approach.

To illustrate how easy it is to defend an unsubstantiated hypothesis, and why we should be skeptical of sensational claims about chemical harm or safety, let’s “demonstrate” that glyphosate might be a ‘cure’ for cancer by highlighting only the research that helps make the case.



Over the past several years, a handful of studies published in peer-reviewed journals and conducted by researchers at reputable universities has in fact suggested that glyphosate possesses cancer-fighting properties. The first such study was published in 2013. Researchers exposed human cancer cells in-vitro, or outside their normal biological context, to glyphosate and AMPA (the degradation product produced when glyphosate is metabolized). The experiment showed both substances inhibited cancer cell growth and promoted apoptosis (cell suicide), but left healthy cells unharmed, “.... suggesting that they have [potential] to be developed into a new anticancer therapy,” the authors concluded.

The researchers published a followup study in 2015 and got a similar result. They exposed human prostate cancer cell lines to AMPA and a chemical called methoxyacetic acid (MAA), concluding that both chemicals could “.... be used as potential therapeutic drugs in the treatment of prostate cancer.”

Glyphosate testing in animals hints at therapeutic potential

In a 2016 study, the research team that found potentially therapeutic effects of glyphosate tested their thesis in animals. They exposed 25 mice to two different doses of AMPA. Compared to a control group of 14 mice, the experiment revealed that “....treatment significantly inhibited growth and metastasis of prostate tumors and prolonged the survival time of the mice.” Summarizing their findings, the authors wrote:

[T]hese results demonstrate that AMPA may be developed into a therapeutic agent for the treatment of prostate cancer.

Adding another interesting piece of data to the equation, consumer products company Procter & Gamble owns the patent on a pharmaceutical drug that contains glyphosate as an active ingredient and is designed to kill colon, breast and lung human tumor cells. According to the company, glyphosate in combination with a plant growth regulator called chloroprofam was “.... effective in killing tumor cells without significantly affecting healthy cells.” The unmarketed drug is potentially very interesting because it targeted cancer cells specifically and was also effective against viruses including HIV, herpes and influenza.

Related article: Despite continued public debate, weed killer glyphosate is safe, EPA says
The first and most obvious question we should ask is, “What do we make of this research?” Scientists do a lot of experiments in the lab. What does it prove that glyphosate impacted cancer cells positively or negatively in a petri dish or low-level animal? Studies on cultured cells are notoriously unreliable, as even first year biology students should know, so it’s difficult to conclude much from this preliminary research.

What do independent experts conclude?

With these cautionary caveats in mind, the GLP reached out to two experts to assess the results of these recent studies suggesting a therapeutic benefit from controlled exposure to glyphosate. Biologist Mary Mangan, who reviewed the 2013 and 2016 papers, explained in an email to the GLP:

Both studies employ widely used techniques and methods, overall. These are reasonable strategies for basic research investigations.

After reviewing the studies, cancer epidemiologist Geoffrey Kabat, author of more than 150 academic papers and two books on health risk, and a GLP Board member, concurred:

These findings are interesting and appear to be robust. Reports from another laboratory seem to support the AMPA cell culture findings and also demonstrated that AMPA treatment inhibited growth and metastasis of prostate tumors transplanted into athymic nude mice. However, further whole animal studies using different animal models (rats as well as mice) and with larger sample sizes would strengthen the case. If these are supportive, clinical trials in humans could be considered to see whether glyphosate and AMPA can be used to treat human cancer.

This article could have ended here with an iconoclastic bang, specific studies conveniently cited and experts carefully quoted, suggesting with blaring headlines that “Glyphosate Could Cure Cancer”—the kind of overheated rhetoric that emanates from USRTK and other campaigning environmental groups that has helped taint the jury pool in the glyphosate trials.

Credit: iStock

But skepticism of this research is warranted, as responsible, independent scientists like Kabat and Mangan suggest. Because these are small, preliminary studies, it would be premature to make too much of them, although the data is certainly intriguing. Despite the current hysteria among juries concerned that glyphosate is carcinogenic, it may actually turn out that glyphosate is a promising cancer therapy. But much more research would have to validate these results before we reached such a consensus conclusion. Cell culture and even animal studies often don't translate to humans, even if they're well done. As Mangan added in her email:

Exposing cultured cells to any compound in a dish, or in some other artificial system, is fraught with complications. The cells themselves are already not in a normal state. You can affect the cultures in many ways that might distort the outcomes, intentionally or not. It might offer some leads to follow further, but much of what you see will not be reflected in whole real biological systems at the end of the day.

Kabat agreed. Although this research is not without merit, he said, “...we know from experience that many promising findings in cell culture and animal models fail to pan out when tried in humans.”

In fact, this glyphosate-can-cure-cancer research is very similar to much of the glyphosate-causes-cancer research conducted by the anti-GMO scientist Gilles-Éric Séralini in 2005. He and his team examined the effect of Roundup and glyphosate on cultured cells derived from a human placental cancer (choriocarcinoma). Aromatase activity, which is required for the production of certain steroid hormones, was found to decrease when these tumor cells were

exposed to high concentrations of Roundup in a petri dish for 18 hours. They concluded that glyphosate is an endocrine disruptor based on effects in human tumor cells originally derived from a cancer of the placenta.

In 2015, an *in vitro* study by a different team of scientists suggested glyphosate could impact bacterial populations when exposed to antibiotics, although the amount found necessary to induce a response was well above concentrations used by farmers or gardeners. These two studies are among those often cited by organizations like USRTK as evidence that glyphosate is an endocrine disruptor.

What's the difference between mainstream research on glyphosate and 'activist science'?

This brings us back to the original point. Cherry picking a handful of studies showing that glyphosate is harmful (or beneficial) from a body of evidence of over 800 papers can be used to reconfirm almost any prejudice. And it's grossly hypocritical, too.

For example, the popular anti-GMO website Green Med Info, which argues Roundup should be banned, rebuffed the 2013 study showing that glyphosate could treat cancer when it first came out, writing "Roundup may kill cancer cells, but so does bleach and chemical weapons grade nitrogen mustard." This pithy reply is revealing, because Green Med Info had no problem promoting the 2015 cell culture study purporting to show that glyphosate exposure has "endocrine-disrupting effects." Anyone could just as easily dismiss this study by saying, "glyphosate damages the endocrine system in the lab, but we don't live in a lab." The only way to meaningfully resolve the question is to evaluate all the data we have. The EPA and European Food safety Authority did so, and found no evidence that glyphosate harms the endocrine system.

Image: AP

In fact, all of these *in vitro* and small animal studies, while interesting, standing alone have no relevance to a living animal or the debate over the relative safety of glyphosate. Further research is necessary. That's why glyphosate has been tested on higher order animals, where it has been found to have no serious health consequences. Other studies reaffirmed it is not an endocrine disruptor. The European Union, in its assessment of glyphosate, considered 16 *in vitro* genotoxicity tests and 2 *in vivo* studies performed in mammals and found no genotoxic effects.

That leads to a second critical difference between science and activism. While finding that a much maligned weed killer might help treat cancer would be an explosive development, the researchers GLP spoke to were unwilling speculate beyond the existing evidence. The authors of the research discussed above were equally conservative, always careful to qualify

their conclusions with statements such as, “If a positive outcome is obtained in preclinical animal [studies]” What they all agreed on, as Kabat noted, is that all the evidence appears “.... to converge in indicating that glyphosate is not carcinogenic.”

More than a dozen independent regulatory and research bodies around the world, including three divisions of the World Health Organization and numerous European research bodies, have conducted and reviewed studies of glyphosate *in vitro*, on live animals and field data that reflect real-world conditions, finding unanimously that the herbicide and its active ingredient do not cause cancer or disrupt endocrine function.

Compare that to the claim made by the lawyers arguing these cancer cases against Bayer. “There is overwhelming evidence...that exposure to [Roundup] causes [non-Hodgkins Lymphoma],” they wrote, citing one report, from the International Agency for Research on Cancer (IARC). What they didn’t mention is that IARC excluded studies which found no indication that glyphosate is carcinogenic and placed Roundup in the same ‘dangerous’ cancer-causing category as drinking a glass of wine, eating bacon or going to the hairdresser.

In a now famous 2013 paper titled *Is everything we eat associated with cancer?* Jonathan Schoenfeld and John Ioannidis made an amusing point relevant to the glyphosate controversy: “Associations with cancer risk or benefits have been claimed for most food ingredients.” But, they concluded, “.... the vast majority of these claims were based on weak statistical evidence.”

If USRTK and other advocacy groups want to claim that glyphosate causes cancer, citing a relative handful of cherry-picked studies outside the context provided by the rest of the relevant research isn’t good enough. As University of California Berkeley’s Understanding Science project explained, science advances as new studies allow “... us to link isolated facts into coherent and comprehensive understandings of the natural world.” If we ignore that fundamental law of science, we can accept or reject any idea that fits our prejudices.

Cameron J. English is the director of bio-sciences at the American Council on Science and Health. Follow him on Twitter @camjenglish

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