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Roundup, the World's Best-Selling Weedkiller, Faces a Legal Reckoning

Plaintiffs' lawyers say research was skewed by company cooperation with scientists; Bayer AG says the product is safe

By Jacob Bunge and Ruth Bender

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For years, scientists at Monsanto Co. worked closely with outside researchers on studies that concluded its Roundup weedkiller was safe.

That collaboration is now one of the biggest liabilities for the world's most widely used herbicide and its new owner, Bayer AG [BAYRY -0.58% ▼](#), which faces mounting lawsuits alleging a cancer link to Roundup.

Plaintiffs' attorneys are putting Monsanto's ties to the scientific community at the center of a series of high-stakes suits against Bayer. Since the German company acquired Monsanto last June, two juries in California have sided with plaintiffs who have lymphoma and blamed the herbicide for their disease. Bayer's shares have fallen roughly 35% since the first verdict.

In both cases, plaintiffs' attorneys argued that Monsanto's influence on outside studies of Roundup's active ingredient tainted the safety research. The attorneys obtained certain Monsanto emails showing outside scientists asking the company's scientists to review their manuscript drafts, and Monsanto scientists suggesting edits.

Gary Kitahata, a member of a jury that ordered Bayer to pay \$289.2 million to a former California groundskeeper with non-Hodgkin lymphoma last August, said Monsanto's interaction with outside researchers played an important role in jurors' deliberations. He recalled being struck by emails allegedly dealing with "things like ghostwriting, influencing scientific studies that were done." A judge later reduced the award, which Bayer is appealing, to \$78.5 million.

Last month, a federal jury in San Francisco awarded \$80.3 million to another man with non-Hodgkin lymphoma who had used Roundup, a verdict Bayer also plans to challenge. Another

trial is under way in Oakland, involving two more of the 11,200 U.S. farmers, landscapers and others who have filed suit, threatening product-liability costs at Bayer for years to come.

Bayer said hundreds of studies and regulatory decisions across the globe show the active ingredient in Roundup, called glyphosate, is safe and isn't carcinogenic. Regulators in the U.S. and abroad have continued to approve its use, in some cases after having gone back and taken another look at research criticized by plaintiffs' attorneys.

"Plaintiff lawyers have cherry-picked isolated emails out of more than 20 million pages of documents produced during discovery to attempt to distort the scientific record and Monsanto's role," Bayer said. A spokesman said the documents at issue relate only to secondary reviews of past research, not to the original science. He added that the outside scientists have stood by their conclusions.

In the U.S., Roundup has become almost as fundamental to farming as tractors. American farmers use it or other glyphosate-based herbicides on the vast majority of their corn, soybean and cotton acres, making it a factor in American agriculture's steadily rising productivity.

Monsanto developed the chemical decades ago and later introduced crops genetically engineered to survive being sprayed with it, driving what is now a more than \$9 billion seed business for Bayer. Annual sales of glyphosate herbicides, including by competitors, total around \$5 billion, according to Sanford C. Bernstein.

Despite their regulatory acceptance, the herbicides have faced growing resistance, especially since a 2015 decision by the International Agency for Research on Cancer, a World Health Organization unit, classifying glyphosate as likely having the potential to cause cancer in humans. In January, a French court banned a Roundup product with the ingredient, even though it had a European Union seal of approval.

Costco Wholesale Corp. recently pulled Roundup herbicides from its stores, according to an executive of the retailer. Certain cities in California, Florida, Minnesota and elsewhere have forbidden glyphosate weedkillers on municipal property. Other farm-state lawmakers have defended the herbicides.

The attack on Monsanto's role in research that deems Roundup safe is led by Baum Hedlund Aristei Goldman PC, a law firm representing more than 1,400 plaintiffs. It has selectively released hundreds of company emails obtained through legal discovery and put many of them on its website.

"These documents provide evidence that Monsanto's been actively engaged in manipulating the science regarding glyphosate's carcinogenicity," said Michael Baum, the firm's managing partner.

One document cited by plaintiffs' attorneys is a 2000 email that Monsanto's Hugh Grant, later the company's chief executive, sent following the publication of a paper upholding Roundup's safety. "This is very good work, well done to the team," he wrote to Monsanto scientists.



Hugh Grant speaking in Davos, Switzerland, in January 2017, when he was CEO of Monsanto PHOTO: LAURENT GILLIERON/EPA/SHUTTERSTOCK

They weren't the paper's authors. Outside scientists were. An acknowledgements section cited Monsanto researchers as having provided scientific support. They had reviewed the text and data, according to internal Monsanto communications.

Mr. Grant, who retired after Bayer acquired Monsanto for \$63 billion, declined to comment, Bayer said.

Bayer said collaboration with outside scientists is important for purposes such as testing safety and efficacy, and it provides properly disclosed compensation for outside scientists' work, adding that this pay isn't given to influence their scientific opinions.

Helmut Greim, a retired toxicology professor at the Technical University of Munich who has worked with Monsanto, said, "There is this perception that industry is evil and that whoever is involved with them is at least equally evil."

"If the industry asks a scientist to help," he added, "I see it as my duty to do so. But one shouldn't let oneself be influenced."

Some regulators say when a research paper discloses industry funding, they take into account the possibility of corporate influence on the findings. "We generally are a bit more suspicious," said Bjorn Hansen, executive director of the European Chemicals Agency.

The chemicals agency and the European Food Safety Authority both re-examined glyphosate studies questioned by plaintiffs' attorneys and let stand their approvals. The agencies said they



Toxicologist Helmut Greim PHOTO: LOUISA MARIE SUMMER FOR THE WALL STREET JOURNAL

look at the raw data in research, so that the kind of study the attorneys question—a review of past research—generally doesn't carry much weight.

Health Canada also recently took a second look at studies on which it had based its

approval of glyphosate herbicides, after critics raised concerns about Monsanto's role in research. The Canadian agency assigned a separate group of its scientists to go over the studies. Their review didn't change its conclusion.

The U.S. Environmental Protection Agency is currently doing a periodic review of the glyphosate science, ahead of a decision expected soon on extending glyphosate's longstanding U.S. approval. The EPA's most recent review of glyphosate's potential human risk, in late 2017, continued to find the chemical unlikely to cause cancer in humans.

A spokesman for the EPA said it has practices in place to "ensure that [company]-developed data represent sound science."

Scientific research in industry and academia has become more entwined over the years, scientists say, as corporations have become a more important funding source. Since 2007, U.S. federal government spending on basic scientific research has plateaued at around \$38 billion annually, according to data from the National Science Foundation. Corporate funding has roughly doubled in that time, to about \$27 billion.

Companies or industry groups that finance research often include in contracts a right to review early versions of studies, said academics, who added that government-funded entities may attach a similar requirement.

For researchers with fewer options allowing them to be fully independent, "to some extent, they have to play by the industry's rules," said Sharon Batt, an adjunct bioethics professor at Dalhousie University in Halifax, Nova Scotia.

A 1998 review of 70 articles on the safety of a hypertension medication found that authors who produced conclusions supporting its use were nearly twice as likely as neutral or critical

authors to have financial relationships with manufacturers. The review, on drugs called calcium-channel antagonists, was published in the *New England Journal of Medicine*.

A 2003 analysis of studies on industry-sponsored biomedical research found corporate-funded studies were more than 3½ times as likely to show results favorable to companies as were studies with no industry funding. The analysis appeared in the *Journal of the American Medical Association*.



A French farmer spraying Roundup on a field last May. In January, a French court banned the use of a Roundup herbicide.
PHOTO: JEAN-FRANCOIS MONIER/AGENCE FRANCE-PRESSE/GETTY IMAGES

In 2002, researcher Susan Monheit was writing an article on glyphosate herbicides used against aquatic weeds and sent a draft to a Monsanto regulatory-affairs official for fact checking. The official forwarded it to Monsanto toxicologist Donna Farmer, according to emails that the Baum Hedlund law firm obtained in discovery and that *The Wall Street Journal* reviewed.

Ms. Farmer told the official the paper needed organizational work. “During one editing I had basically re-written the thing—then decided that was not a good thing to do so I tried to just correct the inaccuracies,” she wrote to the regulatory-affairs official, Martin Lemon.

In an interview, Ms. Monheit, who worked at the California Department of Food and Agriculture, said Mr. Lemon passed along Monsanto’s suggestions by telephone and she followed some of them, such as deleting references to old information. “I certainly didn’t want to use data that was out of date,” she said, but “I was wary of having Monsanto influence the article.”

When her article was published in a weed-control newsletter called *Noxious Times*, concluding the chemical posed minimal risk to wildlife, a note described it as the product of a review of previously published research and consultations with pesticide chemists and eco-toxicologists. The note didn’t name Monsanto.

Bayer didn't make the employees available for interviews.

In the late 2000s, Monsanto financed a study done partly by Pamela Mink, then an assistant professor of epidemiology at Emory University, reviewing past research on glyphosate's safety. Shown a draft, Monsanto's Ms. Farmer suggested some edits, mostly to the introduction, and circulated the draft to fellow company scientists, according to documents produced in the litigation and reviewed by the Journal.



Dewayne Johnson, left, a former groundskeeper who developed non-Hodgkin lymphoma, prevailed in a damage suit against Bayer in San Francisco last August. Bayer is appealing. PHOTO: JOSH EDELSON/AGENCE FRANCE-PRESSE/GETTY IMAGES

One of the Monsanto scientists, Daniel Goldstein, added his own suggestions. "There are a couple places where I read the sentences several times, and I just can't gather what the underlying message is," he emailed Ms. Farmer. The two suggested deleting redundant phrases, asked for math to be double-checked and corrected names.

When the paper was published in the journal *Regulatory Toxicology and Pharmacology* in June 2012, some of the critiqued passages didn't appear, while others were rephrased and expanded. Brian Stekloff, a lawyer representing Bayer, said in court last month that Ms. Farmer moved around words in the introduction and added context about Roundup products that outside scientists would not have had.

The final paper was significantly different from the draft but had the same conclusion, which was that the researchers had found no pattern showing glyphosate exposure caused cancer in humans.

Its authors were listed as Dr. Mink and three other researchers who, like her, were affiliated with science consultancy Exponent Inc. The paper said one of the authors had been a paid consultant to Monsanto. "Final decisions regarding the content of the manuscript were made solely by the four authors," it said.

Dr. Mink didn't respond to requests for comment.

Dr. Greim, the retired Munich toxicology professor, said Monsanto approached him in 2013 about helping it publish some unpublished internal research it earlier submitted to regulatory bodies.

He said Monsanto officials sent him a draft of a report. "I told them, 'That's not how it's done, you need a lot more information'" to support the conclusions, Dr. Greim said. He said he went back and forth with company scientists for months, asking them to add details such as the number of animals and organs studied, and changing the presentation of the results, until he felt the paper was satisfactory.

Monsanto accepted all of his suggestions, Dr. Greim said, and "there were a lot of passages I ended up writing." He said he was paid €3,000, or about \$3,400, for his work.



Bayer AG facilities in Leverkusen, Germany. Last June, Bayer acquired Monsanto, the producer of Roundup as well as seeds for crops that can withstand being sprayed with the herbicide. PHOTO: SASCHA STEINBACH/EPA/SHUTTERSTOCK

When the paper was published in *Critical Reviews in Toxicology* in 2015—finding no link between the Roundup ingredient and cancer—Dr. Greim appeared as lead author. A “declaration of interest” section said that he had been paid by Monsanto and that his three co-authors had connections to the glyphosate business, including one who was employed by Monsanto.

In an internal Monsanto memo released by the Baum Hedlund law firm, a Monsanto scientist listed among his accomplishments “ghost wrote cancer review paper Greim et al. (2015).”

Dr. Greim, who has sat on various German and EU scientific advisory committees, said he didn't care what was said internally because that wasn't what happened.

Bayer attorney Mr. Stekloff, speaking generally, said in court last month that there were instances of “dumb emails” and “bad language” among the many company documents produced in the case, but “the overall record demonstrates that this was a company committed to testing and committed to science.”

—*Sara Randazzo and Sarah Nassauer contributed to this article.*

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