Conflicting Studies and Tons of Controversy Are Muddying the Water.

Who Should You Believe When It Comes to the Safety of Genetically Engineered Foods?

by Jill Richardson

Controversy and genetic engineering go together like peanut butter and jelly, so naturally, there's another brouhaha over genetically engineered (GE) crops in the news. Back in September 2012, a French study led by Gilles-Eric Séralini found that rats fed Monsanto's GE corn were more likely to develop tumors than rats fed non-GE corn. The study was published in the journal *Food and Chemical Toxicology*, the same journal that routinely publishes Monsanto's own studies finding that its GE corn is safe to feed to rats. Now, over two years later, the journal has retracted the Séralini study.

So what's going on? Does GE corn give rats tumors? How about people? And how do Americans, the vast majority of whom are not scientists, know what is safe to eat? Here's a look at what the Séralini study found, why it should not have been retracted, and how to tell the difference between valid and bogus claims about GE food.

Rats fed Monsanto's GE corn were more likely to develop tumors than rats fed non-GE corn.

Both Monsanto and Séralini's feeding studies follow the same general model. Get a large group of a type of rats called Sprague-Dawley and divide them into groups. Feed some groups GE corn and feed the others non-GE corn. Occasionally test their blood and urine, and watch to see if any get sick and die. At the end of the study, euthanize the remaining rats and dissect them to check their organs. Pretty simple, right?

Here are the differences. Monsanto studied its rats for only 90 days, but Séralini studied the rats for two years. Monsanto used twice as many rats—20 male rats and 20 female rats in each group—as Séralini.

Then there's the corn used. Both studied a variety of Roundup Ready corn called NK603. (Roundup Ready means that the corn resists Monsanto's herbicide Roundup, so cornfields can be sprayed with Roundup, killing the weeds and leaving the corn alive.) In addition to the Roundup Ready corn that was sprayed by Roundup, as a control they used what's known as a "near isoline." A near isoline means corn that is genetically identical to the Roundup Ready corn, with the exception of the Roundup Ready gene. The near isoline corn was grown in the same location at the same time as the Roundup Ready corn, so they would be as similar as possible.

But each study added some additional groups. Séralini examined groups fed Roundup Ready corn that was never sprayed with Roundup. He also studied rats fed a control diet but given water spiked with Roundup herbicide. The extra groups would help find out if any impacts of the Roundup Ready corn were attributable to the Roundup and not to the corn itself.

Monsanto, for its part, added extra groups called "reference controls" that obscured its data. Rats fed reference control diets were fed various kinds of non-GE corn grown in different locations.

Whenever Monsanto found a statistically significant difference between the Roundup Ready rats and the control rats, they could often dismiss the difference by saying that the results of the Roundup Ready rats were within the normal range for the reference control rats. Michael Hansen, senior scientist at Consumers Union, compares this to a pharmaceutical company testing a drug. If the group taking the drug gains 10 pounds and the control group doesn't, it's not okay for the pharmaceutical company to brush that off because a 10 pound weight gain is a relatively normal occurrence within the wider human population.

Monsanto, of course, concluded that its Roundup Ready corn is perfectly safe to eat. Séralini did not, because more rats fed GE corn developed tumors than rats fed non-GE corn. What accounted for the different results?

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Perhaps it's because Séralini's study continued for two years, whereas Monsanto ended its study after 90 days. Imagine a study of the health of a human population. You'd find more disease among a study that continued to age 80 than you would in a study that ended at age 30.

There's also the different sizes of the study groups. Monsanto studied 20 rats per sex per group, and Séralini studied only 10. However, Monsanto only gathered and analyzed blood and urine from 10 rats per sex per group. So, in essence, the study groups were the same size for many of the measurements taken.

Séralini's study is not conclusive. As Hansen and others point out, the number of rats in each group is too small. "However," Hansen adds, "both the French Food Safety Agency (ANSES) and the European Food Safety Authority (EFSA) have agreed with Dr. Séralini that such long-term safety assessment should be done on GE foods." The European Commission announced on June 28, 2013 that it would spend 3 million euros to do just that.

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So why did the journal retract the study? In its statement, *Food and Chemical Toxicology* noted that the study was neither fraudulent nor did it intentionally misrepresent the data. However, there were concerns with the size of the study groups and the strain of rats used. "Ultimately," the press release concluded, "the results presented (while not incorrect) are inconclusive, and therefore do not reach the threshold of publication for *Food and Chemical Toxicology*."

"This really is a scandal," Hansen says when asked about the retraction. He points to the journal's own policy for what merits a retraction: "Infringements of professional ethical codes, such as multiple submission, bogus claims of authorship, plagiarism, fraudulent use of data or the like. Occasionally a retraction will be used to correct errors in submission or publication."

The reasons given for retracting the Séralini study do not meet those criteria.

Why is it okay for Monsanto to use Sprague-Dawley rats—which it does in numerous feeding studies published in the same journal—but not Séralini? Hansen points to a Chinese study the journal just published that used the same strain of rats in a two-year feeding study of GE rice. The study concluded that the GE rice "exerts no unintended adverse effects on rats."

Likewise, Hansen notes Monsanto's studies based its conclusion that its GE corn is safe on blood and urine from only 10 rats. "If you're going to say that 10 is too small a number to conclude that there's a health problem, how can you turn around and include a study that concludes there's no problem?" he asks.

If inconclusiveness is a fatal flaw in a study, an awful lot of other studies ought to be retracted, too.

"It's a double standard," Hansen says. "Any study that concludes a problem with genetic engineering is gone through with a fine-tooth comb and they try to rip it up but the same is not done" for studies with conclusions favorable to genetic engineering. "This is a form of scientific censorship. When you retract a paper, it means it no longer appears in that journal so it's no longer in the public domain."

The Séralini study notwithstanding, how do we know what to believe about GE crops? In addition to any good science out there, there are ideologues and kooks on both sides of the debate.

To start, a 2011 article found that professional associations with the biotech industry affect experimental outcomes. The study examined a total of 94 different journal articles published on the nutritional and health impacts of GE food and feed. Of those studies, 41 had at least one author with a professional tie to the biotech industry. All 41 had outcomes favorable to biotech. The remaining 53 papers, in which none of the authors had professional ties to the biotech industry, were split: 39 in favor of biotech, 12 against, and two neutral.

In other words, any time a study has at least one author with a professional tie to the biotech industry, you don't even have to read the study to know the conclusion. It's concluded that GE crops are A-okay.

You might conclude that the best way to go is simply to find independent research on GE crops. That's a great idea. Unfortunately, the biotech companies use their intellectual property rights to restrict independent research on their products. Even scientists see this as a problem: in 2009, 26 university entomologists wrote to the EPA protesting scientists' inability to conduct independent research.

Even the FDA does not test these crops for safety. In fact, Hansen points out, they only require biotech companies like Monsanto to perform voluntary "safety consultations" on their crops. After

Monsanto does its own safety check, the FDA sends back a letter confirming that Monsanto found its own product to be safe. It's a foregone conclusion that 100% of Monsanto's voluntary "safety consultations" found that Monsanto's products were perfectly safe.

A Norwegian study examined the differences in opinion on GE crops among different groups of scientists. It found that ecologists were more likely to have a moderately negative attitude to GE crops and worry about the uncertainty and ignorance involved when human beings tinker with plant genes, whereas molecular biologists—particularly those who worked for the biotech industry or those funded by industry— had a strongly favorable view of GE crops and felt that the crops are useful and "do not represent any unique risks." The only molecular biologists who sided with the ecologists were those working in foundations, with public funding, studying the risks of GE crops.

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The paper notes that "industry funding might impose limits on scientists' possibilities to reflect on the social dimension of their work or at least that the recruitment process is biased and thereby indirectly influences the reflection that will take place." In other words, as noted before, independent research is key.

The authors suggest a solution may be more interdisciplinary training for scientists or even dialogue between scientists of different disciplines. However, "open-minded dialogue might be difficult to facilitate, as there seems to be a lack of trust between the different groups."

Unfortunately, in the end, it's hard for most of us to figure out whether the headlines we read about GE foods are true or not. Look for independent research that is not conducted by scientists employed by the biotech industry, and consider the perspectives of scientists from a variety of scientific disciplines, not just molecular biology. Consider the research of social scientists like economists and anthropologists as well.

If that's not enough to make you feel good about eating GE foods, the only option is to try to avoid them. So far, only a few GE crops are grown and sold, but they are found in an awful lot of our food: corn, soy, cotton, canola, sugar beet, alfalfa, and papaya. Since they aren't labeled, the easiest way to avoid them is to buy organic.

Hopefully, a few years from now, the European Commission's long-term rat feeding study will shed more light on this issue—although by then, odds are the US will have legalized a whole bunch of new GE crops for us to worry about.

Jill Richardson is the founder of the blog La Vida Locavore and a member of the Organic Consumers Association policy advisory board. She is the author of *Recipe for America: Why Our Food System Is Broken and What We Can Do to Fix It*

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