

Re-examining 10 science-challenged studies suggesting GMOs are harmful



Activists often cite the alleged health risks of genetically modified foods. A classic example of this—“10 Scientific Studies Proving GMOs Can Be Harmful To Human Health,” posted on Collective-Evolution.com — outlines many familiar concerns and points in each case to “credible scientific studies that clearly demonstrate why GMOs should not be consumed”.

Are these concerns really credible? What do the studies cited actually claim?

1) Multiple toxins from GMOs detected in maternal and fetal blood

The blog post cites a 2010 study that alleges to show this danger. The authors identified the [Bt](#) protein Cry1Ab in maternal and fetal blood, a protein found in some GMOs, but also commonly used as [a pesticide in organic farming](#). The paper is flawed. The researchers' measurements were based on an experiment/assay designed to detect *Bt*'s Cry1Ab in plants, not in humans. [As this post](#) in Biofortified.org explains, the pregnant women in the study would have had to eat several kilos of corn in order to get the Bt measurements that were detected in their blood.

Additionally, there's the “so what” factor. Humans lack the receptors for the protein, so it has no impact on us. Did you know that [chocolate is toxic to dogs](#)? Are you concerned that it might be toxic to you? Probably not (if you *are* concerned, then you've missed out on the greatest source of joy known to human taste buds...). Some chemical compounds behave differently among species, and both *Bt*'s Cry1Ab and chocolate are examples of this.

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2) DNA from genetically modified crops can be transferred into humans who eat them

That's not what the cited 2013 [study](#) concluded. The authors found that whole genes from our food can be detected in our plasma. That does not mean that they've integrated into our DNA; it means that they've been found floating in the space between cells. And that's any food, not just GMOs. DNA from GMOs behave no differently than DNA from organic or conventional foods

If you aren't concerned about the DNA from blueberries “transferring” into you, then you should not be concerned about DNA from GMOs either. The paper's deepest flaw is that a negative control was not included in the sequencing experiments. Several recent papers (see [here](#) and [here](#)) have outlined the importance of including a negative control in experiments where there is very little DNA to account for possible contaminants from the environment and reagents. (For a lay introduction to the concept of contaminants in sequencing, see [here](#)).



Credit: Illinois Farm Bureau

3) New study links GMOs to gluten disorders that affect 18 million Americans

The article quotes for an alleged “study” by the Institute for Responsible Technology (IRT). But there is no study on the link of GMOs to gluten allergies. There’s a link to a post on a webpage, but there isn’t a peer-reviewed article. IRT is a one-man band run by activist Jeffrey Smith. It is an NGO that [advocates for the elimination of GMOs from our food supply](#). It’s not a university, college or research institution. It doesn’t do studies.

I’ve written about [gluten allergies](#) and GMOs. The Celiac Disease foundation has [spoken out](#) against the IRT’s report. GMO wheat has not been commercialized, so any association of gluten allergies with the consumption of GMO wheat is on its face absurd. As for charts that track an increase in GMO consumption in general and gluten allergies, it’s a case of association with no causation (i.e. the incidence of gluten allergies have increased over the past decade and the amount of GMOs we eat have increased too. But, so have the number of plasma screens manufactured).

4) Study links genetically modified corn to rat tumors

This claim is the infamous Seralini paper, which was retracted, and [recently republished](#), in a different journal without being peer reviewed. The paper identified tumors in rats that were fed GMOs and/or the herbicide glyphosate longterm. But the strain of rat used was predisposed to tumors. The paper did not perform statistical analyses and used too few rats, so it was not possible to determine if the tumors were due to the food, the chemical or to the fact that the strain of rats would get tumors regardless of what they were fed. Finally, the findings from Seralini's paper are contrary to other long-term feeding studies. An overview of the criticisms regarding this paper can be found [here](#).

5) Glyphosate induces human breast cancer cells growth via estrogen receptors

This claim relates to glyphosate, an herbicide used in tandem with herbicide-resistant genetically modified crops. [The cited paper](#) examines the impact of glyphosate on breast cancer cell growth. In approximately 80 percent of instances of breast cancer, the diseased cells are hormone sensitive, meaning they need estrogen in order to proliferate and spread. These researchers took two breast cancer cell lines: one was estrogen sensitive and one was not, and they examined the impact of increasing amounts of glyphosate on cell growth. They found that glyphosate has similar impact on breast cancer growth as estrogen, although the relationship was not as strong, and it did not have an impact on the proliferation of the non-hormone sensitive breast cancer cell line.

The paper had numerous technical problems, including the absence of data on controls, a potentially critical omission. Additionally, there actually seems to be a protective effect at higher concentrations of glyphosate: instead of reaching a saturation point where the addition of glyphosate no longer has an effect on cell growth, there is no significant difference in cellular growth between the cells that received the highest doses of glyphosate and the controls (which is why the data from the controls is an important factor).

This experiment was done with cells in a petri dish—what's called an *in vitro* tissue-culture experiment. Such research is of limited real-world value. The cells are often finicky and need plenty of TLC in order to grow well; different cell lines can also behave very differently. The authors of the paper note some of these issues, along with the fact that their data doesn't mesh with previous studies that have examined the impact of glyphosate on cellular proliferation ([this previous paper](#) suggests that glyphosate actually *protects* against cell proliferation *in vitro* in eight different cancer cell lines and that glyphosate might be developed into an anti-cancer drug!).

[Monsanto wrote a response to the paper](#) noting that many studies examined the potential carcinogenicity of glyphosate and none has found that the compound causes cancer. Some news reports misinterpreted the study, writing that researchers concluded that glyphosate causes cancer when that is **not** the researchers' findings: they *suggest* [glyphosate](#) *may* cause breast cancer to *proliferate*. Monsanto pointed out that even this finding is contrary to the body of evidence that exists on the topic. The authors admit to this fact and discuss the appropriate next steps to examine this issue in mice/rats models for breast

cancer. I think that that's a great next step. I'd also look at a few more breast-cancer cell lines.

This is the most compelling research paper that I've read about that suggests a *potential* health risk surrounding glyphosate. But the study must be reproduced and its issues ironed out. However, as I mentioned, the paper isn't really about GMOs as a class: keep in mind that only a fraction of GMOs are glyphosate resistant (i.e. Round-up Ready crops) and the use of glyphosate is not limited to [GMOs](#).

Additionally, the paper does several experiments with [a compound in soybean](#) whose impact on breast cancer cell growth is very similar to that of glyphosate's—meaning that there are “natural” compounds in our food that seem to have the same impact on breast-cancer proliferation that this paper's findings suggest for glyphosate. There does not seem to be a scientific consensus on the topic of soy intake in breast cancer patients, although several publications have examined this issue without finding a positive correlation (examples [here](#), [here](#), and [here](#)).

glyphosate

Image not found or type unknown

6) Glyphosate linked to birth defects

No peer-reviewed, published scientific study makes such claims. The source of this health concern is a publication by Earth Open Source, an anti-GMO NGO co-founded by an individual who also owns a GMO-testing and certification company, and whose business would clearly benefit through the promotion of anti-[GMO](#) sentiments (see “About the Authors” in this document).

7) Study links glyphosate to autism, Parkinson's and Alzheimer's

[The paper](#) that led to this health claim does not constitute research. It's a hypothesis and no research was done to support the hypothesis. The paper was [reviewed by science journalist Keith Kloor at Discover Magazine](#) who aptly compared it to a [Glenn Beck chalkboard drawing](#). The claims were printed in a pay-for-play journal (also known as predatory journal), meaning that for a fee, one can get nearly anything published. There have been several exposés on pay-for-play journals, and many scientists believe that the phenomenon is eroding the quality of science (here's [an overview](#) from Nature.com; here's an [exposé](#)

of pay for play journals)

8) Chronically ill humans have higher glyphosate levels than healthy humans

[This claim is based on a paper](#) published in the Journal of Environmental and Analytical Toxicology, [owned by the Omics](#) publishing group — a notorious predatory publishing company. The authors examined glyphosate levels in humans and different animals. There's no indication of what the animals were fed, how much, how they were kept or myriad other variables. Any of these could invalidate the study. The researchers do not say anything about the age, sex, weight, height, or genetic background of the humans, or how much they ate, if they washed their food, how long they had been eating organic/conventional diets and, most mind-blowing of all, there's absolutely no definition for what constitutes being "chronically ill". Any single issue that I've listed here would be considered a fatal flaw that would exclude the paper from publication in a more prestigious journal.

9) Studies link GMO animal feed to severe stomach inflammation and enlarged uteri in pigs

In the [study](#) on which this claim is based, the researchers gave pigs GMO feed and non-GMO feed and identified the differences between the two groups. The paper has been thoroughly challenged by many journalists and scientists:

- Journalist Mark Lynas highlighted the degree to which the data is cherry-picked. The difference in "inflammation" between the GM-fed and non-GM-fed pigs is apparent only when you break down the degree of inflammation into subcategories, but there's no difference if you view it as a single category. Overall, there's a high rate of inflammation for both groups, which is not explained in the paper. At the same time, there are several parameters where GM-feed could be argued as having a protective effect (there are 50 percent fewer heart-abnormalities in pigs fed GM-grain), but this isn't discussed.
- As explained by [geneticist Anastasia Bodnar](#), the authors do not analyze the compositional differences in the feed between the two groups. [Previous studies](#) have determined that the environment (i.e., water, soil, geography) of a crop has a greater impact on proteins and metabolites than whether or not the crop is a GMO. As such, the differences seen in the pigs may not be due pesticides or presence/absence of the transgenic protein; rather, they are most likely due to differences in composition of the feed
- Geneticist Val Giddings [notes](#) that the animals had abnormally high rates of pneumonia, which points to the possibility that something wonky was going on.

In conclusion, even if the paper's findings are real, there's no knowing whether that's due to something associated with transgenes or not, because the researchers do not account for natural variation in the feed.

10) GMO risk assessment is based on very little scientific evidence in the sense that the testing methods recommended are not adequate to ensure safety

Let's set aside the fact that this isn't a "Scientific Study Proving GMOs Can Be Harmful To Human Health," which is the claim set out in the title. There are three papers associated with this bullet point. The first one is a review and I agree with a few of the points it makes. It highlights the need for *standardized* tests and statistics in animal feeding studies for GMOs, and anyone who followed the Seralini debacle would probably agree. It summarizes papers that have performed feeding studies and their results. However, the review does not remove flawed papers from their overview and nor does it distinguish between feeding studies for GMO crops that have been commercialized vs. crops that have never been submitted for regulatory approval. The paper does not conclude, "GMO risk assessment is based on very little scientific evidence".

The second paper is also a review piece. The first author is affiliated with "[Friends of the Earth](#)," an anti-GMO NGO. It does not constitute novel research and has a clear editorial slant.

The [third paper](#) does not even qualify as a review. It's a commentary published in 2002 in Nature Biotechnology, which is a high caliber journal. It outlined possible unintended consequences that *could* happen with a GMO—none of which have ever been documented or identified since then, to the best of my knowledge.

In conclusion, despite the title of the article, none of these studies proves or even persuasively suggests that GMOs can be harmful to human health. The majority are either obviously flawed or are not scientific studies.

The [current scientific consensus](#) regarding GMOs remains unchanged: they are safe and do not pose a health risk to humans. However, a scientific consensus is subject to change if there is sufficient *reproducible* evidence that may impact it, but none of the studies reviewed here constitute such evidence.

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