Are children and pregnant women risking their health by eating “GMO” foods? The American Association of Pediatrics controversially says ‘yes’. The real question: Is the AAP endangering the food vulnerable?

Eating foods grown using genetically modified seeds hazardous to our health? Scientists, nutritionists, and the global medical establishment say ‘no’.

No equivocation. No qualification.

30+ years of evidence backs up the consensus. Consumers in the United States, Canada, Argentina, Brazil and dozens of other countries have been consuming food crops grown from genetically modified seeds since the 1990s. That amounts to hundreds of trillions of meals. There is not one (as in zero) documented case of anyone getting ill in the long or short term from consuming a so-called GMO food.

“When we look at the data, we don’t see any signs [of health danger],” says Fred Gould, an entomologist and plant pathologist. “We’ve undergone a multi-decade “natural experiment,” he told Time earlier this month. There have been zero reports of any evidence that consuming these foods causes genetic mutations, organ damage or fertility problems. “We don’t see any signs” of kidney disease, gastrointestinal issues, autism or food allergies.

No, Gould is not a front apologist for the ‘global industrial food complex,’ as anti-biotechnology activists like to characterize the 90+% of scientists who dismiss unsupported claims that GM crops pose unique dangers. He’s a distinguished professor at North Carolina State University who oversaw the research and writing of a 2016 National Academies of Sciences, Engineering, and Medicine report that undermined heated claims by some ‘environmental groups’ that foods grown from GM seeds pose unique harm.
Nearly 300 expert institutions across the globe have reviewed more than 5500 studies on GMO food. Not one (that’s zero, as in ‘0’) serious science organization has found any unique health or safety threats from consuming the dozen fruits, vegetables and grains that have been genetically modified via transgenesis (familiarly, GMOs) or gene editing (such as CRISPR mustard greens and high oleic soybean oil).

Follow the latest news and policy debates on sustainable agriculture, biomedicine, and other ‘disruptive’ innovations. Subscribe to our newsletter.

SIGN UP

The APA goes off the rails

Last month, the global consensus came under challenge. Not from a new study. And not by a globally-respected science research organization that had undertaken a careful re-analysis of existing data. None of that. In a startling, consensus-challenging change in position, the American Academy of Pediatrics, claimed in a December article that scientists have it all wrong.

Writing in the American Academy of Pediatrics lead journal “Pediatrics”, three physicians with no expertise in crop biotechnology link GMO crops to a host of disorders, from cancer to increased risk of preterm birth and in utero endocrine disruption in children, and they hint at dozens of other adverse health consequences.

The academic opinion piece was supplemented by what its authors characterized as an educational article directed to parents and placed in an AAP associated journal titled, “Are GMO Foods Safe for My Child? AAP Policy.”

We are four independent scientists, physicians and science communicators who have come together to write a response to the American Academy of Pediatrics repudiation of the science consensus on GMO crops. Under the guise of protecting the vulnerable, the AAP is allowing rogue physicians to resurrect anti-GMO zombie propaganda. It is reckless, and poses serious threats to the health and safety of literally billions of people worldwide, and attempts to unravel a decade of scientific education around
biotechnology. Yes, it’s that significant an issue. And we are concerned about how this “Clinical Report” is already being weaponized to promote an ideological agenda that endangers the global effort to increase sustainable food production.

The three AAP physicians pose a question in their articles: “Is it safe to serve my children food containing GMO ingredients?”

Disappointingly, they never directly answer that key question. Rather, than answering their disingenuously posed hypothetical about GMO food safety, the co-authors do a Texas sidestep. They attack all GM foods by proxy, misrepresenting the controversy over the herbicide glyphosate, which is paired with about 60% by volume of all GM crops grown worldwide.

“The presence of glyphosate and other toxic herbicides in food products is the main hazard to children’s health associated with the consumption of GMO-based foods,” they claim.

When glyphosate was first approved, it was thought to pose no threat to human health. But research from around the world now shows that these chemicals can build up in our bodies. This can increase the risks for some blood cancers, including specific kinds of leukemia and lymphoma. Some studies show that farmers who use glyphosate on their crops face a greater risk of developing these blood cancers than people with lower exposure to herbicides.

That’s an explosive claim. If true, Americans are slowly killing themselves, one GMO bite at a time. One problem with their thesis, stated boldly with no qualifications: There is no science-based evidence to justify their conclusion.

The American Academy of Pediatrics has been considered the most recognized and influential organization in childhood medicine. But this Clinical Review should not be mistaken as scholarly analysis. Twenty independent regulatory agencies around the world have conducted 24 total studies assessing glyphosate’s alleged dangers. Not one (that’s zero, as in “0’), have found persuasive evidence that traces of the chemical in our food supply endanger children, pregnant women or anyone for that matter.
As Health Canada wrote in its most recent review of the alleged child killing weedkiller,

No pesticide regulatory authority in the world currently considers glyphosate to be a cancer risk to humans at the levels at which humans are currently exposed.

To justify their contrarian position, the authors misleadingly represent one of these 24 reviews. Twenty-three of these studies are called “risk” reports, meaning they assess the real-world likelihood of a chemical causing cancer. One agency — the International Association for Research on Cancer (IARC) — assesses what’s known as “hazard” — whether a substance or a situation could cause cancer independent of exposure.

IARC has evaluated more than 115 agents, finding all but one can cause cancer. In 2015, after doing no original research (unlike many of the risk assessing agencies noted above), IARC concluded that glyphosate was a “probably carcinogenic to humans”. That sounds scary, but let’s bring some perspective. Also, in the same category as ‘dangerous glyphosate’: eating red meat, drinking hot coffee, consuming wine or beer, using oral contraceptives, frying foods, going to a barber on hairdresser and working the night shift. Even more dangerous:

Processed foods and consuming Chinese-style salted. Yes, IARC considers eating a salami sandwich more dangerous than glyphosate exposure.

But the case against glyphosate is even thinner. To the degree that it poses any danger, it’s only to applicators. IARC found “limited evidence” of carcinogenicity in agricultural workers exposed to glyphosate.

But what about claims in Pediatrics that children and vulnerable populations are endangered by micro-traces of glyphosate in our food? They didn’t get that anxiety-inspiring nugget from the IARC report, although they deceptively imply that they do. IARC’s summary statement indicates that there is no known link between trace dietary glyphosate exposure and cancer.

What else do the Pediatrics authors willfully ignore? A compilation of errors and omissions

1. Biologically Irrelevant Trace Levels, Misinterpretation of Data

The APA authors manufacture fear around glyphosate, the main herbicide used in tandem with genetically engineered crops to safely control weeds. They equate detection of glyphosate with risk from glyphosate. As physicians, the authors certainly understand that medications are chemicals with a therapeutic threshold where they are effective, and well-defined excesses that are toxic. The dose makes the poison.

Yet, this fundamental concept of chemistry is abandoned to conflate “detection” or “presence” with risk to children. The authors describe “measurable quantities” neglecting to mention that glyphosate is routinely “measurable” at 200
parts per trillion (analogous to about 1 second in ~26,000 years). They do mention (shortly after “heavy use” and “large quantities”) that “residues… remain present… in foods commonly consumed by children” and that “42.3% of… food samples tested contained detectable levels.” Yes, they are detectable but are levels far, far below any threshold scientists believe are reason for concern — in the parts per trillion.

Finding micro-trace levels of any chemical in urine is meaningless in and of itself. More than 3,000 chemicals can be detected in human urine; almost none poses any harm. Trace chemicals are the residue of the kidneys doing its filtering job. The authors here either do not understand basic chemistry, or they are deliberately exploiting the widespread misunderstanding the micro-traces of a chemical pose health dangers.

Abrams et al. cites levels detected are 160 ppt to 7.6 ppb in one study, and then cite another study reporting that “glyphosate levels were significantly higher among… individuals reporting pesticide exposure (0.63 µg/L) than … persons consuming organic diets (0.42 µg/L).” This is cherry picking and misrepresenting risk at its finest. The data from exposure and non-exposure groups are both amazingly low, far below any hint of risk. Worse, Pediatrics present these numbers as levels detected, when these are not levels detected. The numbers represent a range of levels detected, and the range is greater in the pesticide exposure group, as would be expected.

More importantly, the authors fail to mention that the same cited paper (Schutze et al, 2022) reports that the median glyphosate levels (390) in organic food consumers (400) and individuals with known exposure are essentially identical (390 vs 400 parts per trillion, respectively). Again, all levels reside far below all established safety thresholds. But those findings do not fit their narrative.

Bottom line: modern analytical chemistry can detect trace amounts of just about any chemical. Just because it is detected, does not mean it is dangerous. The Abrams et al. report recklessly scares parents and misinforms physicians by implying risk where none is demonstrated at these exposures. If anything, these studies are a testament to the lack of risk from the micro-minimal diet exposure of a relatively non-toxic chemical.

2. Fundamentally Misleading Information

- **Arguments from ignorance.** Abrams et al correctly acknowledge that the National Academies of Science have reviewed the literature and recognize the expert consensus that there is no evidence of adverse human health effects from these ingredients. But then Abrams et al does not just move a goalpost, they build goalposts—stating that the harm in consuming a GE crop ingredient is actually the ingestion of associated herbicides and the built-in insecticides (the same one applied topically on organic crops) which have not been sufficiently examined for health hazards. Later they state that the use of the herbicide merits “further study” when both insect and herbicide tolerance have been studied extensively for decades with no reproducible evidence of harm at levels encountered by occupational or dietary exposure.

- **Choice of poor quality, biased evidence.** Abrams et al. build their fear-based “possible health impact” campaign referencing “an international group of scientists drew attention to a lack of worldwide consensus about GMO safety.” In the greatest cherry pick in the orchard of the scientific
literature, Abrams et al. cite a single 2015 proclamation, “No Scientific Consensus on GMO Safety,” penned by a cadre of anti-biotech authors known for their opposition to crop genetic engineering. The article has aged like cheese. Scientists do not proclaim a consensus. A consensus emerges from alignment of evidence, and the safety of GE crops is well established. Out of all of the hundreds of high-quality reviews that align with a scientific consensus, why would Abrams et al. choose this single, dated, flawed reference?

- **Failure to yield trope.** The authors continue that the technology has not resulted in increased yields. But crops have not been engineered to increase yields. They have been engineered to resist insects, outcompete weeds, and tolerate viruses. Yield increases do sometimes occur at times of significant insect pressure when compared to non-traited crops. The traits are designed to help farmers avoid crop loss from pests – farmers can then raise the same yield with fewer costs in fuel and labor and with less environmental impact as the use of glyphosate-tolerant crops reduces tilling and soil loss.

- **Choice of denominators to make use appear extreme.** The authors cite that the use of glyphosate has increased 250-fold since 1974. This is the year it was introduced. It is like saying the sales of iPhone power cables has increased 250-fold since 2008, the year they were introduced. Numbers can appear massive when compared against a minimal denominator, again, evidence of author intent. The authors go on to describe glyphosate use as “heavy”, where only 750 grams (about two soda cans) of active ingredient are applied per acre, replacing chemicals with markedly higher toxicity and environmental impact.

- **The appeal to nature fallacy and chemophobia.** A common tactic utilized by organizations and individuals that demonize conventional agriculture (and conventional pesticides) is the convenient omission of the fact that organic agriculture also uses pesticides. Abrams et al make the blatantly false statement “A major benefit of organic food is that it substantially reduces dietary exposure to pesticides.” Aside from the obvious that this is a factually incorrect statement, it misleads parents and clinicians. Organic crop production utilizes an array of pesticides – naturally occurring toxins that often have higher acute or chronic toxicity than synthetic pesticides, bioaccumulate in the environment more readily, and have worse ecological impact by affecting non-target species. There are no credible data to suggest that organic pesticides are better or safer than conventional pesticides, and the source of a chemical – whether natural or synthetic – does not dictate the safety of it. These false claims that are being legitimized by AAP and Pediatrics further erode scientific literacy and fuel chemophobia.

- **“No evidence for a benefit”**. Abrams et al. note, “we currently have no evidence for a benefit to GMO usage internationally”. The technologies are used on every continent except Antarctica, with massive acreage in Brazil, Argentina, India, Australia, and Canada. There are historical plantings in Spain and trials in England. Emerging acreage is growing in China and Kenya. As mentioned above, the Bt Brinjal has had great benefit for small farmers in Bangladesh. The impact of GE crop should have been much greater, but anti-biotech sentiment has arrested the deployment of real solutions, like Golden Rice. While Abrams et al. see no evidence of benefit, the farmers tending over 200 million hectares in at least 26 countries might disagree.

3. **Conflating Hazard and Risk**

Genetically engineered crops in the US are monitored and regulated by the FDA, the EPA and the USDA. GE crops are rigorously monitored for safety, nutrition, and environmental impact, while their ‘non-GMO’
counterparts are not. Moreover, several additional global expert authorities on chemical and food safety have reviewed decades of scientific evidence as it pertains to GE crops and foods containing ingredients from them. These include the Joint FAO/WHO Expert Committee on Food Additives (JECFA) and the European Food Safety Authority (EFSA). These organizations have similarly concluded that GE crops and associated pesticides that may be utilized during cultivation do not pose health or environmental risks.

However, Abrams et al. omit the conclusions of these expert agencies and instead state that “glyphosate and other toxic herbicides” pose carcinogenic risks to people. They cite the classification of glyphosate as a class 2A substance by the International Agency for Research on Cancer (IARC). According to naming conventions, IARC Group 2A substances are termed “probably carcinogenic to humans”. This classification means that there is limited evidence of substance likely causing cancer in humans (such as positive statistical association, but not evidence of causal relationship), and either strong mechanistic evidence (why it could cause cancer) or sufficient evidence of substance causing cancer in animal models.

Aside from the authors misinterpreting this to make inflammatory statements, they fail to mention that IARC uses a hazard-based approach to assessing risk, compared to a more clinically appropriate risk-based approach. Hazard-based approaches examine the theoretical potential of something to cause harm, irrespective of the potential exposure or likelihood of said exposure. Risk-based approaches also factor in the likelihood to cause harm, and include in assessment potential exposures, route of exposure, and many other factors, such as how the body processes an exposure. Those expert agencies that assess food additives and food safety, such as JECFA, EFSA, and FDA utilize a risk-based assessment. In addition to reasserting that glyphosate does not pose a human health risk, EFSA even responded to the IARC classification of glyphosate: “EFSA concluded that glyphosate is unlikely to pose a carcinogenic hazard to humans and the evidence does not support classification with regard to its carcinogenic potential.” These conclusions match those of dozens of international regulatory bodies.

The authors of the *Pediatrics* piece conveniently emphasize the hazard-based approach from IARC (which does not specialize in food safety), while omitting the more clinically relevant risk-based assessments from dozens of other international scientific expert agencies. They also neglect to mention the World Health Organization’s conclusion, ‘unlikely to pose a carcinogenic risk to humans from exposure through the diet’.

4. Omission of Literature that Does Not Support the Narrative

The authors paint a narrative by conveniently ignoring literature that does not support their conclusion. When addressing the highly controversial, loose link between glyphosate and non-Hodgkin lymphoma, their star support is a 2019 meta-analysis by Zhang (which showed a modest increase in highest exposure levels in an apples-to-oranges mismatched analysis) but do not discuss the criticisms leveled against it by Kabat and colleagues in 2021. More importantly, the authors neglected to include the conclusion from the Agricultural Health Study, the largest, longest duration epidemiological assessment of high exposure subjects (Andriotti et al., 2018). This analysis of 54,000 applicators did not reveal associations between glyphosate exposure and any lymphoma.

The authors also suggest that the 2015 IARC classification “merits further study.” In the eight years since the IARC decision there have been over 77,000 entries in Google Scholar containing the term
“glyphosate”. Further study merits attention.

5. Failure to Note Study Limitations

Abrams et al. reference numerous studies with grim outcomes as conclusive, where the authors that performed the original analyses properly note significant limitations to interpretations. One is the study of pregnant women in Puerto Rico and their gestation period as a function of glyphosate exposure, as determined by analysis of urine. While differences were relatively small between ‘exposure’ and ‘non-exposure’ groups, there was a statistically significant association between exposure and pre-term birth. In this study and others to follow, this difference was minor. Another study shows a slight association between glyphosate and pre-term birth, but no effect on head circumference or birth weight, two other associated metrics of fetal development. The authors of the pre-term birth studies note that these are small studies with many limitations and confounding factors, such as the young age and previous pre-term birth histories of the women in the “exposure” group. Yet Abrams et al. do not discuss limitations or confounding variables, making findings appear conclusive and supportive of the “glyphosate danger” narrative.

6. Inappropriate Alarmist Language

There are several instances where unnecessary terminology is used that does not enhance the understanding of the science and, instead, conflates crop technology with negatively perceived terms.

- **Agent Orange.** The authors bring up “Agent Orange” in a discussion of the emergence of glyphosate-tolerant weeds, a part of the literature they discussed correctly, along with an increasing dependence on other herbicides like dicamba and 2,4-D. But why Agent Orange? Agent Orange was a concoction of herbicides weaponized by the US government in 1960s-70s jungle warfare, and its application was directly responsible for widespread suffering and illness in soldiers and civilians. Why is this relevant? Agent Orange contained 2,4-D, and this paragraph is a perfect place to invoke the perception of contemporary danger with this dreaded military exercise from five decades ago. However, the herbicide 2,4-D was not the component that caused the associated illnesses. The problem was 2,4,5-T which co-purified with a highly toxic dioxin during manufacture. The mention of Agent Orange in the context of modern agriculture is perhaps another indicator of author intent.

- **Contamination.** In a paragraph that notes that 99.4% of crop samples in Canada present glyphosate levels that are below an extremely conservative standard, Abrams et al. describe that residues are detected in silage and animal feeds (they do not discuss levels), suggesting “increasing the risk of contamination of meat or dairy products.” “Contamination” is a loaded term, again implying risk. The authors cite a review by Bohn and Millstone, not primary research, and the review derives its conclusions from feeding studies where animals are subjected to amounts of herbicide that are orders of magnitude higher than residual levels (and do not mention silage). Abrams et al. does not site the comprehensive by Van Eenennaam and Young that shows glyphosate has never been detected in meat or dairy products and notes zero effect on livestock health from historical records.
7. Misleading Generalizations

In table 1 the authors present a horribly non-specific list of “Potentially GMO-Containing Food Crops Permitted in the United States”. The list says “apples” and “potatoes” when there is one variety of apple and maybe a few potato varieties that are almost impossible to find at retail. “Papayas” are listed, but only the Hawaiian papaya is genetically engineered to resist viruses, and that saved a traditional industry. A consumer is misled to think that all papayas, apples and potatoes are dreaded “GMOs” when it close to impossible to find any fresh food product in the produce aisle that has been genetically engineered.

8. Red Herrings

The authors state, “Although there has been some concern about the possibility of glyphosate being present in human breast milk…” they fail to note that these concerns originate from science-denying groups like Moms Across America based on zero data. The authors then note that a non-peer reviewed report shows no evidence of detection. Then they note legitimate examination of breast milk by experts shows no evidence of even trace amounts in breast milk and fail to cite the authors (McGuire et al, 2016). They conclude with the study by German regulators that fails to detect glyphosate in breast milk. The real story here is one sentence. Glyphosate has never been detected in breast milk.

9. Fingerprints of Intent, Fallout, and Conclusion

The errors and oversteps above are just a sample of the many major errors within Abrams et al. that render it worthy of criticism, correction, and perhaps retraction. While it is not possible to know intent, the Abrams et al have failed to respond to multiple invitations to publicly discuss the content of the article, and the Pediatrics Editor-In-Chief Lewis First refused an offer to produce a correction for publication in Pediatrics. The typical response to experts offering a legitimate scientific correction should not be ignore and deflect. The sound of crickets may suggest a motivation.

10. Exploiting Authoritative Sources to Perpetuate Misinformation

The false information stands on the credible shoulders of Pediatrics, which means every day parents will now be misinformed from misinformed physicians. These recommendations will hit food-insecure families and those in choice-limited communities particularly hard.

- **Tarnishing a Solid Reputation.** Pediatrics is an important journal because of its credibility. In the days where rumor and disinformation grab headlines, we need Pediatrics as the hard tether to legitimate evidence and medical guidance.
- **Harm to Science Communication and Public Trust in Science.** Pediatrics has now placed a tremendous burden on scientific communicators that attempt to teach the real risks and benefits of genetic engineering and associated products. In less than a month, this Clinical Report has been shared and discussed as an authoritative document in popular press news outlets that have far more reach and impact than any correction will receive.
Manipulating the reader

The authors present themselves as if they are on a noble mission, stating that “pediatricians play a vital role in their efforts to minimize fear-based messaging and support families through shared decision making”. They were posturing. They took science out of context to generate fear and uncertainty, promoting food shaming.

Their polemic, now spreading like a poisonous weed through social media and pro-organic websites, will undoubtedly drive parents (especially those of lower scientific literacy and/or socioeconomic status) away from safe, nutritious and affordable food toward organic alternatives (but only if they can afford them). Indeed, data demonstrate that unfounded fears about conventional pesticide residues on fresh produce items lead people, particularly lower income families, to buy and consume fewer fruits and vegetables.
Their idealization of food using organic farming techniques is ideology and not science. The AAP can do better. When it comes to contentious issues like agricultural biotechnology they need to work with certified dietitians, cancer epidemiology, experts in risk assessment and agricultural scientists, to ensure that their
guidance matches the best evidence.

To restore their credibility, the AAP must retract the deeply flawed and misleading published work and issue a clear statement based on prevailing evidence. At the very least the article should be labeled as “opinion” and provide readers with a Statement of Concern detailing the issues noted above.

The Pediatrics author write:

Many families express concerns about the safety of GMO containing foods.

They are correct. This concern originates in a rich misinformation ecosystem that this Pediatrics article now augments. Action is immediately required to end fear-based messaging to support families in decisions around food.

Jessica Steier DrPH. is a public health scientist, CEO of Vital Statistics Consulting, science communicator, and Co-host of The Unbiased Science Podcast. Find Jessica on X @unbiasedscipod

Andrea Love Ph.D. is a microbiologist, immunologist, and science communicator with decades of scientific expertise and education in academic, biotechnology, and translational research. Co-host of the Unbiased Science Podcast. Find Andrew on X @unbiasedscipod

Nicole Keller, DO is a General Pediatrician, Chair, Department of Pediatrics

Kevin Folta Ph.D.is a Professor, Keynote Speaker and Host of the Talking Biotech Podcast. Find Kevin on X @kevinfolta