Viewpoint: Exploiting chemophobia—Environmental Working Groups’s manufactured study claiming oat cereal contains dangerous pesticides designed to manipulate the media

The Environmental Working Group (EWG) and media outlets are trying to scare people away from demonstrably safe and nutritious conventional food products.

Headlines about harmful pesticides in conventional foods are lying to you to create fear.

It is wildly irresponsible of supposed “journalists” to continue to platform this long-standing coordinated campaign by the EWG to erode science literacy and harm public health.

Some background: The Environmental Working Group (EWG) is a pro-organic activist organization funded by large organic farms like Earthbound, Organic Valley, Stony Field Farms, and Applegate Farms to demonize conventional products and encourage consumers to buy their products instead. EWG brings in $13 million dollars a year that funds their disinformation campaigns. This is the same group that creates the falsified “Dirty Dozen” list of conventional produce supposedly ‘contaminated’ (they’re not).

EWG routinely exaggerates risks to consumers, promotes products backed by their donors, and uses flawed methodology to make claims not backed by legitimate data. EWG issues product safety warnings that have no evidence to support them. They are in opposition to modern agriculture, biotechnology, and have even spread unfounded claims about vaccine safety.

EWG is notorious for spreading fear about chemicals and exploiting chemophobia, the appeal to nature fallacy, and low chemistry literacy. The problem is, through their lobbyist arm, their disinformation impacts health policy and our laws.

The accuracy of EWG reports and statements has been criticized by scientific experts. Its warnings have been labeled “alarmist,” “scaremongering,” and “misleading”. Even though their claims are misleading, millions of people, even those making policy are influenced by disinformation they distribute.

While the EWG claims to help human health through research and by advocating for industry changes, in reality, they do the opposite.

EWG should never be utilized as an ‘expert source’ of information, even though they are routinely quoted by media outlets on topics related to chemicals and food.

Toxicologists and other scientific experts have detailed their flawed science and faulty research
methodologies which they base their claims on.

- They routinely make claims that are in direct opposition to credible scientific and medical agencies, their methods are not supported by any legitimate scientific organization, and frequently cite studies that are not peer-reviewed.
- They exaggerate toxicological risks of chemicals, overstate potential impacts to human health, and take findings wildly out of context.
- Their methods routinely implement chemophobic messaging and appeal to nature fallacies and utilizes fear-based marketing to scare consumers away from products that are demonstrably safe.
- They frequently cherry-pick data that are favorable to their donor corporations, particularly claims related to unsubstantiated benefits of organic products and harms of gene technology, while simultaneously omitting more robust and relevant data.

The “science” EWG uses lacks credibility, but preys on emotions of consumers, leverages fear-based marketing, and coerces people into buying specific products.

Their newest fearmongering campaign? Oat-based cereals, supposedly because of harmful levels of chlormequat.

What’s worse? Media outlets are echoing this nonsense. Headlines like:

“Pesticide linked to reproductive issues found in Cheerios, Quaker Oats and other oat-based foods”

“Chemical That May Cause Infertility Found in Cheerios, Quaker Oats”

“80% of Americans test positive for infertility-linked chemical: Study”

To be clear: these claims are not truthful. Media outlets are sharing clickbait that demonstrates they didn’t even look at the study or the data.

Their website (linking for visibility, but don’t give them any more traffic), shows their history of demonizing chlormequat. Loaded and false phrases like “highly toxic”, “highly problematic”, “disrupts fetal growth”, “damages the reproductive system”, are everywhere, paired with a photo of a baby. ALL of this is designed to target your emotions, and NONE of this is supported by data.

Chlormequat has been around since the 1950s and is approved for use globally. In the US, it is approved for ornamental plants as a plant growth retardant. It is primarily used in greenhouses and nurseries for geranium, poinsettia, begonia, African daisies, and hibiscus. Contrary to EWG claims, chlormequat is rapidly metabolized and degraded by plants, animals, bees, and soil microbes.
EWG wants everyone to believe that ANY chemical at ANY dose that isn’t ‘organically approved’ is TOXIC. They love using that word toxic, and they almost always use it without context.

**With everything, the dose makes the poison.**

Their war on chlormequat has continued with a recent self-funded ‘study’ from the EWG which they claim proves how widespread and harmful chlormequat is.

Their study “A pilot study of chlormequat in food and urine from adults in the United States from 2017 to 2023” is now being circulated by nearly every media outlet. Yes, it is highly irresponsible of media outlets to continually use EWG as a “credible” source – they couldn’t be further from it.

Main claims the EWG makes:

- Detectable levels of chlormequat were in 92% of nonorganic oat-based foods purchased in May 2023.
- Chlormequat was present in 77 of 96 (80%) of urine samples taken from 2017 and 2023, with levels increasing in the most recent years.

Detection does not equal clinical relevance.

This is a common strategy used by people who spread fear about certain chemicals (ironically, not other chemicals). Everything is chemicals. You’re a sack of chemicals. The dose makes the poison with everything. EWG employees seem to have forgotten all of this. The [EWG’s foundation of fear-mongering is based on wild exaggeration of ‘detectable’ chemicals.](https://www.ewg.org/factsheet/1144/chlormequat)

We have some of the most sensitive analytical chemistry tools on the planet. That means, we can “detect” levels of substances that are miniscule. Parts per billion. Parts per trillion. For context: a part per billion (ppb) is one part per 1,000,000,000 parts. A part per trillion (ppt) is one part per 1,000,000,000,000 parts.

A part per billion is equivalent to 50 drops of water in an Olympic-size swimming pool, or one second of time in approximately 31.7 years. A part per trillion is equivalent to 1 drop of water in 20 Olympic-size swimming pools, or one second of time in approximately 31,700 years.

Think about how small those values are for a minute. This is the range we are talking about when we talk about ‘detectable levels’ or ‘residues’ of pesticides. These are TRACE levels. TRACE levels do not equal clinically-relevant levels. Detectable does not equal meaningful.

Ok, let’s look at the data now. They claim 92% of non-organic oat-based products contained chlormequat. *How many samples did they look at? How many different products did they test?*
Media outlets like CBS are using these data to say things like chlormquat is “showing up in the overwhelming majority of oat-based foods sold in the United States, including popular cereal brands Quaker Oats and Cheerios.” WRONG.

The overwhelming majority?! They looked at 25 samples in TOTAL. Twenty-five. Most of them from 3 name brands.

25 conventional oat-based products, 8 organic oat-based products, and 9 conventional wheat-based products, most from 3 major name brands were used. This is egregious cherry-picking. Do you realize how many different products exist containing oat and wheat?

As a good scientist, I looked at supplemental data to see what was actually tested.

Two Boxes each of:

- General Mills Cheerios (one in May 2023 and one in June 2022).
- General Mills Honey Nut Cheerios (one in May 2023 and one in June 2022).
- Kellogg’s Special K Fruit & Yogurt one in May 2023 and one in June 2022).
- Quaker Oatmeal Squares Honey Nut (one tone in May 2023 and one in June 2022).
- Quaker Old Fashioned Oats (one in May 2023 and one in June 2022).
- Quaker Instant Oatmeal Maple & Brown Sugar (one in May 2023 and one in August 2022).
- Quaker Oatmeal Squares Brown Sugar (one in May 2023 and one in August 2022).
- General Mills Cheerios Oat Crunch Oats n’ Honey (one in May 2023 and one in August 2022).
- General Mills Frosted Cheerios (one in May 2023 and one in August 2022).
- Quaker Simply Granola Oats Honey & Almonds (one in May 2023 and one in August 2022).
- Quaker Chewy Dark Chocolate Chunk (one in May 2023 and one in August 2022).

One box each of:

- Walmart Great Value Oats & Honey Granola
- 365 Whole Foods Market Fruit & Nut Muesli
- Good & Gather French Vanilla Almond Granola

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### Table 2. Chloromequat in oat and wheat-based products purchased in U.S. grocery stores.

<table>
<thead>
<tr>
<th>Food Type (Year)</th>
<th>Number of Samples Tested</th>
<th>Number of Samples With Detections</th>
<th>Range</th>
<th>Median (μg/kg or ppb)</th>
<th>LOD/LOQ (μg/kg or ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Oat-based products (May 2023)</td>
<td>12</td>
<td>11 (92%)</td>
<td>ND - 209</td>
<td>114</td>
<td>3/40</td>
</tr>
<tr>
<td>Conventional Oat-based products (June and August 2022)</td>
<td>13</td>
<td>12 (92%)</td>
<td>ND - 291</td>
<td>90</td>
<td>10/100</td>
</tr>
<tr>
<td>Organic Oat-based products (2023)*</td>
<td>8</td>
<td>1 (12.5%)</td>
<td>ND - 17</td>
<td>ND</td>
<td>3/40</td>
</tr>
<tr>
<td>Conventional Wheat-based products</td>
<td>9</td>
<td>2 (22%)</td>
<td>ND - 12.6</td>
<td>ND</td>
<td>3/40</td>
</tr>
</tbody>
</table>

ND none detected.  
*One organic sample was purchased in 2022; individual sample results can be found in Table S2.
• 365 Whole Foods Market Organic Raisin Granola
• Quaker Instant Oatmeal Organic Maple & Brown Sugar
• Simple Truth Organic Instant Oatmeal Maple & Brown Sugar
• Simple Truth Organic Oats & Honey Granola Clusters
• 365 Whole Foods Market Organic Chocolate Chip Chewy Granola
• 365 Whole Foods Market Organic French Vanilla Granola
• 365 Whole Foods Market Organic Old Fashioned Rolled Oats
• Simple Truth Organic Toasted Oats Cereal
• Arnold Whole Grains Healthy Multi-Grain Bread
• Band of Bakers Harvest Loaf
• General Mills Cinnamon Toast Crunch
• Gold Medal Premium Quality All Natural Whole Wheat Flour for Baking, 5 lb.
• Great Value Half-Length Spaghetti
• Kellogg’s Frosted Mini Wheats
• King Arthur Flour All-Purpose Unbleached Flour
• Nabisco Ritz Crackers
• Nature’s Own 100% Whole Grain Bread

I need to emphasize that buying a single box of one specific product at one grocery store in Washington, DC during one specific date does not constitute the OVERWHELMING majority of oat-based foods.

They tested singular boxes of a selected array of various brands of food products for chlormequat. Already sounds like a fishing expedition. Let’s go back to that data table.

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Detected levels range from ND, which means NOT detectable, to, at the very high end, 291 parts per billion. 291 parts per billion. Let’s visualize that.

291 parts per billion is 3 cups of water in an Olympic swimming pool (660,000 gallons). 291 parts per billion is equal to 4 minutes 51 seconds in 31.7 years.

Do either of these seem like a lot?
In a box of cereal weighing 14 ounces:

We’ll use the highest detected level of chlormequat for argument sake: 291 parts per billion, found in one box of Quaker Old Fashioned Oats in June 2022.

291 parts per billion. 291 parts per 1,000,000,000 parts. 291 g per 1,000,000,000 grams.

14 ounces is 396.893 grams. That means there was 0.0001155 grams of chlormequat in a 14-ounce box. That’s 0.1155 milligrams of chlormequat in an entire box.

That’s separate from the fact was one sample (of only 25), and the values measured ranged from undetectable. This is not how robust studies are conducted.

Let’s assume we happened to get that one box of Old Fashioned Oats and we ate the entire thing because we love oatmeal. We ate 0.1155 milligrams of chlormequat. Do we need to be concerned like the EWG and clickbait media outlets would have us believe?

How much chlormequat poses a risk to us?

Remember, the dose makes the poison for all things.

There are 2 levels set for regulated chemicals like conventional pesticides: acute exposure level and chronic (daily) exposure level. Acute exposure refers to what one can be exposed to in a single setting and not experience adverse effects (since our excretory system can only do so much work at once), whereas chronic exposure limit assumes daily exposure over one’s life.

Based on the body of scientific data (epidemiological, animal, in vitro, and in silico data) and likelihood of exposure, a no-observed-adverse-effect-level (NOAEL) is set. This is the value at which point no effect has been measured in ANY of the data related to that substance. Regulatory agencies set an even more conservative level to account for population-level variability in sensitivity to chemicals (e.g. young children, those with kidney issues whose excretory systems may be impaired). This is the population adjusted dose (PAD).

The NOAEL level for acute exposure is 100 milligram per kilogram body weight per day (mg/kg/day), and chronic exposure is 5 mg/kg/day.

The acute population adjusted dose (aPAD) for chlormequat is 1 mg/kg/day.

The chronic population adjusted dose (cPAD) for chlormequat is 0.05 mg/kg/day.

Both PAD values are 100 times lower than their respective NOAEL levels, meaning they are extremely conservative. But using the PAD levels:
An average adult weighing 70 kg (154 lbs) would need to consume 70 milligrams of chlormequat to reach the aPAD, equal to 606 boxes of cereal containing 291 ppb chlormequat in a single sitting.

An average adult would have to consume 3.5 milligrams every single day for the rest of their life to reach the cPAD, equal to 30 boxes of cereal containing 291 ppb chlormequat.

So, do we really need to be concerned?

No. Trace levels of chlormequat in these products are not a concern to human health.

The EWG is doing what it always does: exploiting the fact that most people, even news outlets, won’t bother looking at the data, how weak the study was, and put those numbers into real-world context.

What about chlormequat accumulation in our bodies?

A common argument is, “we don’t know about the accumulation of these chemicals”. Chlormequat is rapidly excreted in our urine, meaning, it doesn’t accumulate, and our urine is doing what it should: removing things we don’t need. Over 60% of any ingested chlormequat is excreted in urine within hours (4-6 hours), and over 95% of it will be excreted within 46 hours. The EWG uses urine levels to insinuate that people are ingesting concerning levels of chlormequat, but in reality, anything detected in urine is waste.

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 in urine are the residue of the kidneys doing its filtering job. EWG routinely assesses ‘urine levels’ of chemicals, either because they do not understand basic chemistry, or they are deliberately exploiting the widespread misunderstanding people have about how chemicals are processed by our bodies in order to spread fear.

But either way, let’s look at the data. They CLAIM that chlormequat was detected in 77 of 96 urine samples taken from 2017 and 2023, with levels increasing in recent years.

The data do not say that, at all.
So, first off, they aren’t sampling from the same areas of the country over time. They look at 50 samples in Florida in 2023, then 23 samples in Missouri between 2018 and 2022, then 23 samples in South Carolina and Missouri in 2017. How do they know chlormequat use is simply higher in Florida where they sampled because there is a higher prevalence of ornamental plant nurseries? You cannot take completely different data sets from different parts of the world and say ‘oh levels are increasing’, because they aren’t matched data! And I feel like it needs to be repeated, but 50 samples here, 23 samples there; that does not make a robust data set to begin with.
Then they include data they didn’t even collect in a primary data table. From previously published studies, from Sweden? The major flaws in these data really underscore how if you suggest a peer-reviewer, you can get your paper approved for publishing (more on that in the future).

Let’s look at their data, figure 1B (1A is just linear representation of the same). These data are presented incorrectly to be misleading. It is presented as though these are longitudinal data, collecting from the same group over time. That’s wrong. These are entirely different collection sites and populations, and as such, there is zero normalization or standardization of these numbers.

Next, they compare chlormequat levels to excreted creatinine, a method which has inherent flaws as excreted creatinine is variable person-to-person. In addition, their units are manipulated to make this look meaningful. If they were actually normalizing to creatinine, units need to match. Instead, they’re using micrograms for chlormequat (1000-fold smaller than a milligram), and grams for creatinine (1000-fold BIGGER than a milligram) to make the data appear inflated. The data need to be divided by 1,000,000 in order to present as mg/mg.

It gets better. When you look at the data in the supplemental table, there are several data points where chlormequat was below the level of detection, yet somehow, they are reporting a value when they ‘normalize’ to creatinine? That sounds like data fabrication to me. If you don’t detect a value, you can’t just say the value is your level of detection. That’s called lying.

Anyway, I went back to the supplemental data to correct for unit consistency. See below for the correctly
Looks different now. The data overlap, with no real changes in trace levels detected over the last 6 years, even if you ignored the fact that these data were not collected from the same locations. The mean value is 0.00002178 milligrams of chlormequat per milligram creatinine in urine.

Average creatinine in urine ranges from 20–275 mg/dL in women and 20–320 mg/dL in men (1 dL = 100 mL). Average urine output is 800-2,000 mL per day. Some more quick math: assuming an average of 100 mg/dL creatinine for the ‘subjects’ and 1000 mL of urine per day – both of these values are squarely mid-range:

\[
0.000217 \text{ mg of chlormequat/dL of urine x 10 dL (for a liter) = 0.00217 mg chlormequat on average these people are peeing out.}
\]

1 ppb = 1 microgram/L, so this level is equivalent to 2.17 parts per billion. 10-fold lower than the completely benign levels in cereals.

The cPAD level is 0.05 mg/kg/day (that’s the most conservative exposure limit), 3.5 mg for a 154 lb person. Chlormequat is rapidly excreted in urine and residual levels aren’t hanging out in the body.

These values of what someone in this study might be peeing out in a day are 1,613 TIMES LOWER than the most conservative level set by regulatory agencies for chlormequat exposure.

**These trace levels “detected in urine” are not remotely physiologically relevant.**
They also claim that chlormequat is linked to infertility and birth defects in animals, and therefore, we should also be concerned about fertility and birth defects in humans.

**How much chlormequat impacts fertility in animals?**

Based on the body of evidence, a lot. Not remotely anywhere near levels humans would ever encounter.

*Long-term studies among rats* who were given 1,000 parts per million (that’s 1,000,000 parts per billion, so 3,448 times higher levels than what was ‘detected’ in that one box of oatmeal by the EWG) found no impact on fertility, fetal development (teratogenicity), or development of young rats. Recent studies have found similar, including in *larger mammals like boar*.

The EWG, and every major news outlet that has picked up this flawed study and reported on it without even looking at the methods or the data are contributing to spreading disinformation and exacerbating health anxiety.

The EWG is lying to you about what are real concerns and what aren’t when it comes to our food. This study doesn’t demonstrate any of the claims they are making, but their PR team and their figureheads have lines of contact to media outlets who foment fear with clickbait headlines and misrepresentation of reality.

*If you see someone citing the Environmental Working Group as a source, do not trust what they say. EWG has a long and documented history of falsifying claims.*

Disinformation like this (yes, these are intentional false claims) is the cornerstone of EWG’s business model. They are eroding trust in science and literacy, and are a danger to public health.

If you found this useful, please share with friends and family, especially though who fall prey to fear-based headlines. If you know a reporter who has written on this or other EWG claims, please send it to them as well. I’ve seen headlines from nearly every news outlet, including CBS, Fox, NewsNation, Forbes, MarketWatch, and others.

Anti-science rejection and science misinformation is a global public health threat. This is no time to be complacent about this. This discussion is not about “industry” or “government” – it is about activist organizations and the media outlets they have relationships with spreading lies about scientific data. All of us can help combat the spread of these falsehoods.

*Dr. Andrea Love, a microbiologist and immunologist, provides the facts (and the data!) on science and health topics. Find Andrea on X [@dr_andrealove](https://twitter.com/dr_andrealove)*

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