

23rd March

The Deception is Clear- Stop Listening

This blog is a critical demonstration between what good science says, and how the anti-GM activists twist meanings beyond what the data say, even contradicting the authors' interpretations.

GMO-Free USA is an activist organization that does a great job blanketing the internet with false associations. Their tactics are crystal-clear to scientists and to anyone that takes the time to look past their facade.

Their recent attempt is the kind that upsets me most. They use actual published science that looks decent, not a bad paper, and published in a peer-reviewed source. However, they take the real data and sensationalize it with imagery that does not match the research findings.

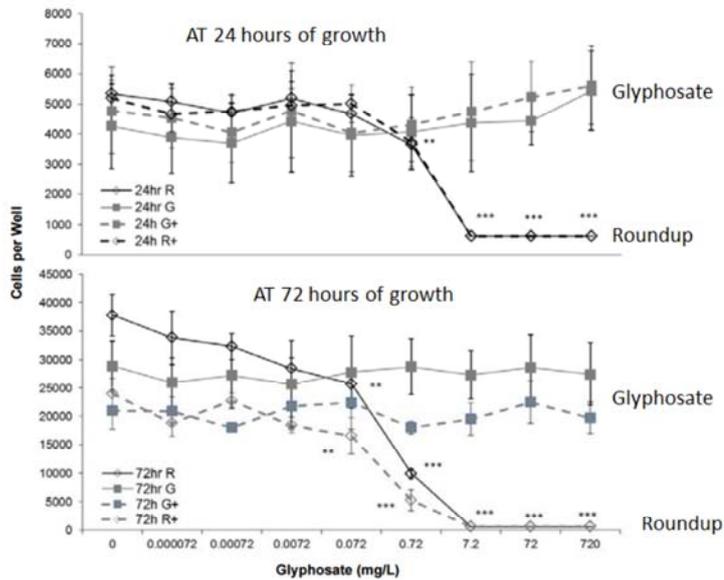
The work was performed by Dr. Fiona Young at Flinders University. From her website, it is clear that she has expertise in reproductive toxicology, and studies the effect of potential environmental compounds on reproduction-relevant cell lines. These efforts are important because they are the first step in assessing thresholds for potential cellular interactions.

It is sort of like the work Seralini did where the methods and data are sound- that you can add compounds to cells and watch them respond. It provides researchers a first glimpse of potential interactions between a compound and a biological system. These are important tests to start to assess environmental and health risk.

This is how I might have reviewed the work and interpreted the results if I was asked to review it:

The paper itself makes no secret about setting out to identify the effects of glyphosate, mostly as the Roundup formulation. The lengthy Introduction provides some rationale for the test and the use of a placental cell-line system. The placental cells are immortalized tumor cells that behave like placental cells in culture, releasing progesterone. The researchers use two assays to assess cell function in response to glyphosate or Roundup treatment-- cell viability by an MTT-based staining and then ELISA assays to detect progesterone. This all seems quite straight forward.

The first test was to add either glyphosate or Round up to the cell cultures and test how they grew over 24 and 72 hours. The results are here in Figure 1:

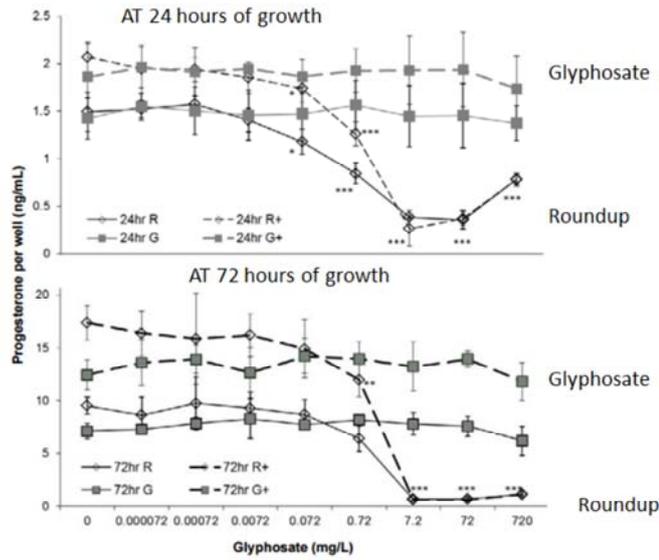


[[http://3.bp.blogspot.com/-](http://3.bp.blogspot.com/-dAgHswQNacQ/VQ7f0E49TEI/AAAAAAAAAGRI/K1EBgcT3v-Q/s1600/young01.PNG)

[dAgHswQNacQ/VQ7f0E49TEI/AAAAAAAAAGRI/K1EBgcT3v-Q/s1600/young01.PNG](http://3.bp.blogspot.com/-dAgHswQNacQ/VQ7f0E49TEI/AAAAAAAAAGRI/K1EBgcT3v-Q/s1600/young01.PNG)]

Figure 1 shows that glyphosate does nothing to cells, that they grow just fine, even at super high concentrations. The little "+" means they added cyclic AMP (cAMP) to stimulate cell proliferation. These results may be interpreted that while glyphosate has no effect, the addition of the surfactants (detergents) are harmful to cell lines.

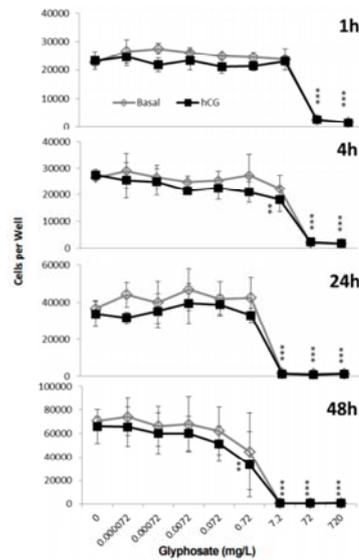
Such results are not surprising. We know mammalian cells don't care about glyphosate too much. Seralni has shown this well too in his tests on Leydig and placental cells. Clearly it is when you add the surfactant, that membranes are being disrupted and cells are dying. Anyone that ever grew cells in culture knows that these are pretty sensitive systems. Increasing the surfactant (POEA) would be expected to cause issues. Cell do not survive well when grown in detergents for 72 hours. Got it.



[[http://3.bp.blogspot.com/-](http://3.bp.blogspot.com/-iCP_8NZBRyM/VQ7hhVKEHpi/AAAAAAAAAGRU/nBCuzehdLd0/s1600/young02.PNG)

[iCP_8NZBRyM/VQ7hhVKEHpi/AAAAAAAAAGRU/nBCuzehdLd0/s1600/young02.PNG](http://3.bp.blogspot.com/-iCP_8NZBRyM/VQ7hhVKEHpi/AAAAAAAAAGRU/nBCuzehdLd0/s1600/young02.PNG)]

Figure 2 expands the results from Figure 1, reminding us that dead cells do not produce progesterone.



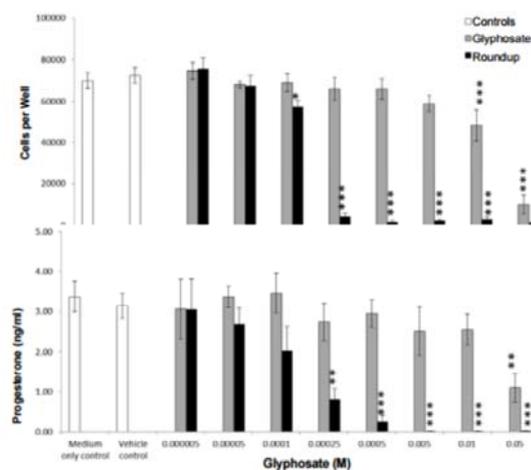
[[http://3.bp.blogspot.com/-](http://3.bp.blogspot.com/-Z_7JE6B302Y/VQ7js1fv78I/AAAAAAAAAGRg/gaEyaRcF_6A/s1600/young03.PNG)

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Figure 3 shows the results of cell growth in response to being grown in the presence of serial (10x) dilutions of Roundup (Glyphosate + surfactant). The results mirror what is seen in Fig 1, only shows a

higher-resolution time course and growth in the presence of human chorionic gonadotropin, a placental hormone that stimulates growth, cannot save a cell being killed by the surfactant.

The paper gets a little confusing in the last two paragraphs of on page 19 where they refer to Figure 3 and I think they mean Figure 4. Here they use the concentrated herbicide (320 g/L) dilutions and measure cell viability and progesterone levels at the 24 h time point. I'm not sure how this is different from the data presented in panel A from Figure 1 and 2.



[<http://4.bp.blogspot.com/->

[Tyi_yfd2x8k/VQ7mIcXnUI/AAAAAAAAAGRs/9UnUx3nXScw/s1600/young04.PNG](http://4.bp.blogspot.com/-Tyi_yfd2x8k/VQ7mIcXnUI/AAAAAAAAAGRs/9UnUx3nXScw/s1600/young04.PNG)

Again, Figure 4 reminds us that as you grow cells in herbicides they don't survive well, and dying/dead cells don't make as much hormone.

The authors provide a good Discussion that starts out in line with the limitations of the assay.

First,

Transformed cell lines are less sensitive than primary-derived cells in vitro [20,21], and therefore provide conservative estimates for potential cytotoxicity in vivo

And then:

These in vitro cell culture systems did not model in vivo absorption, distribution, metabolic or excretory parameters, northe (sic) regulation of serum carrier and binding proteins.

Which is exactly correct. This is an artificial system in many ways and have limits about what they really mean relevant to whole-organism physiology based on cells dying in a dish.

The authors also recognize that it is the surfactant that is causing observed issues:

The EC50 values for Roundup spanned two orders of magnitude, whereas the differences in cell lines and culture conditions had less effect on the Glyphosate EC50 values; observations partially explained by the membrane-disrupting mechanism of action of Roundup.

The authors then go on to say the same thing I did... dead cells don't make hormones. They say flat out that there is no evidence of endocrine disruption:

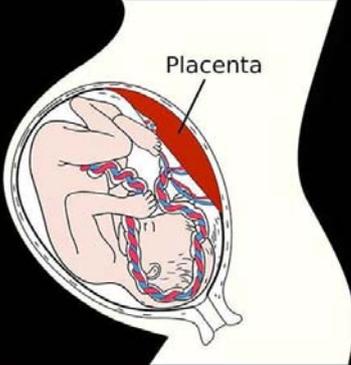
In our study, the inhibition of progesterone secretion did not precede cytotoxicity, and endocrine disruption effects were a consequence of cell death.Given this lack of data, the proposal that Roundup has endocrine disrupting activity independent of its cytotoxic activity, needs further study.

The rest of the language is that of a good toxicologist that is interested in the risks associated with the herbicide. It is all guarded, conservative, and puts the concentrations into context.

BOTTOM LINE: You can kill cells with Roundup, and it looks like it is the surfactant that is the problem in tissue culture. The decrease in hormones does not precede cell death, so there is no evidence of endocrine disruption.

Now contrast this with what GMO Free USA says:

NEW STUDY
GLYPHOSATE CAUSES ENDOCRINE
DISRUPTION IN HUMAN PLACENTAL CELLS AT
LEVELS ALLOWED IN U.S. DRINKING WATER



Placenta

In vitro study found Roundup was more toxic to human placental cells than glyphosate alone.
LOOKS LIKE HUMAN
CELLS ARE NOT ROUNDUP READY.

www.facebook.com/gmofreeusa www.gmofreeusa.org www.facebook.com/gmofreecanadagroup

[[http://2.bp.blogspot.com/-](http://2.bp.blogspot.com/-iwsJsuqQNDg/VQ7p11ndWOI/AAAAAAAAAGR4/rKWjVnFWNj8/s1600/placenta%2Bdeception.jpg)

[iwsJsuqQNDg/VQ7p11ndWOI/AAAAAAAAAGR4/rKWjVnFWNj8/s1600/placenta%2Bdeception.jpg](http://2.bp.blogspot.com/-iwsJsuqQNDg/VQ7p11ndWOI/AAAAAAAAAGR4/rKWjVnFWNj8/s1600/placenta%2Bdeception.jpg)]

This says it all. GMO Free USA are simply manipulating public sentiment by distorting science. This is shameful misrepresentation of good work done by a solid scientist.

To show a fetus in the womb, claim evidence of endocrine disruption, and then make bold pronouncements of "human cells not Roundup Ready"... it is beyond unethical.

Why does anyone believe them?

Did they fool you too?

And this was on Henry Rolands' GMO Evidence website:



Dr Young: Roundup Herbicide Is Endocrine Disruptor in Human Cells at Drinking Water Levels

Roundup is an endocrine disruptor and is toxic to human cells in vitro (tested in culture dishes in the laboratory) at levels permitted in drinking water in Australia, a new study has found.

This is the first study to examine the effects of glyphosate and Roundup on progesterone production by human female cells in an in vitro system that models key aspects of reproduction in women.

[http://1.bp.blogspot.com/-6REbBUHOF_0/VQ7vUK8036I/AAAAAAAAAGSI/UaEGl8obA2Y/s1600/young06.PNG]

Quoting exactly what Dr. Young didn't say!

And for what it's worth-- I'm blocked from responding to their facebook page, so I can't provide real analysis of this paper and show how they use it to bring fear to their followers.

Posted 23rd March by [Kevin M. Folta](#)

27 View comments



Mary M March 22, 2015 at 12:35 PM

Can you link to the paper or give the DOI?

Of course surfactants interfere with membranes. That's their job. I wish someone would do this test with the "magic" herbicide that contains Dawn dish detergent.
<http://weedcontrolfreaks.com/2014/06/salt-vinegar-and-glyphosate/>

[Reply](#)



Mary M March 22, 2015 at 2:16 PM

Found it: 10.15761/IPTG.1000104 Oddly, though, it's not in either PubMed or Google Scholar. Found the publisher on Beall's list of possible predatory ones.

<http://scholarlyoa.com/publishers/>
Open Access Text (OAT, OA Text)

I wish they had plotted both a negative and positive control with their other data.

Interesting how they say with serum it's all very different. I wonder where one would find serum....

[Reply](#)



Michael [March 22, 2015 at 3:35 PM](#)

So why isn't Dr. Young on the phone, chewing off the ass of GMO Free USA? Sometimes I think scientists are too timid....

[Reply](#)



Tom Calarco [March 22, 2015 at 3:45 PM](#)

All well and good, Kevin. I can follow the gist of your presentation.

I still don't understand why you're against labeling, especially when such a noxious, predatory company like Monsanto which has no concern for the welfare of the human race -- they have vigorously marketed GMOs before we can know for certain they are safe (they've been doing this for 20 years) -- is spending so much money and effort to prevent it.

As a scientist, who stands for free and open dissemination of information, you are being hypocritical in opposing labeling.

Like I have said, studies have shown it will not increase the cost of food -- oh, yes, it might affect the profits of Monsanto, which in turn might increase the cost of fast and processed food. That might be a good thing.

[Reply](#)



MikeB [March 22, 2015 at 4:08 PM](#)

"...when such a noxious, predatory company like Monsanto which has no concern for the welfare of the human race. . . ."

This is why the anti-GMO movement, and labeling, can't be taken seriously.

You. Are. A. Bigot.

[Reply](#)



Kevin M. Folta [March 22, 2015 at 5:34 PM](#)

Tom, I'm not against labeling. I am 100% against the horrible labeling proposals presented so far.

That's a big difference. It can be done if it is done scientifically and fairly.

Those goofballs in Maui just outlawed seedless watermelons.

It has nothing to do with Monsanto. It has to do with food farmers produce. It is safe and nutritious, and farmers should not be punished by activist fear mongering.

Plus rigorous labeling laws already exist for safety. Plus, lots of voluntary non-GMO labeling. It is such a non-issue.

[Reply](#)



Statistique [March 22, 2015 at 7:34 PM](#)

Kevin, Weren't seedless watermelons produced by mutagenic breeding?

[Reply](#)



Kevin M. Folta [March 22, 2015 at 9:52 PM](#)

Statistique,

No, they are polyploids. One of the parents is an induced tetraploid. Anything with doubled chromosomes is banned, as it is considered a "GMO" even if it is not made with recombinant DNA technology.

This is why we NEVER should support labeling laws. They are thus far written by people that don't understand science.

[Reply](#)



Tom Calarco [March 22, 2015 at 10:25 PM](#)

Then, Kevin, why don't you get involved in creating labels that meet your scientific standards? I know, you think it's a non-issue.

Also, Mike B who called me a bigot, you should examine the history of Monsanto, and you will see that it's historically one of most vile corporations in existence.

The fact that Monsanto, which has such a bad reputation, is fighting labeling, is a problem for me. If there are no problems with GMOs, I don't see why they oppose it.

[Reply](#)



Tyson Adams [March 22, 2015 at 11:34 PM](#)

"GMO-Free USA is an activist organization that does a great job blanketing the internet with false associations. Their tactics are crystal-clear to scientists and to anyone that takes the time to look past their facade."

This needs to be shouted from the rooftops more. I got into an argument with one of the GMO-Free numpties. They posted a list of science papers that supposedly supported their claims. Pity I recognised several of the authors, including my wife, as being pro-GMO.

[Reply](#)



Marc L [March 23, 2015 at 12:28 AM](#)

Unfortunately most of the people who read your blog are probably also banned from the GMO Free USA's page. Not that it really does any good to offer a rebuttal there, anyway.

Oh, and Monsanto was also the first company to provide us with a decent marketable LED. For the sake of consistency I think anyone who has a problem with Monsanto should also boycott LEDs and any subsequent technology derived from them. Let's see how far that gets...LOL!

[Reply](#)



Bernie Mooney [March 23, 2015 at 12:42 AM](#)

"GMO-Free USA is an activist organization that does a great job blanketing the internet with false associations."

Kevin's too nice. What GMO-Free USA does is traffic in bald and bold-faced lies.

[Reply](#)



Marc Brazeau [March 23, 2015 at 1:50 AM](#)

Tom,

Let me suggest Steve Savage's take on how to do labels correctly:
<http://www.biofortified.org/2013/06/how-to-do-gmo-food-labeling-right/>

And my take on why mandatory labels are not the proper role of government.
<http://fafdl.org/blog/2014/08/16/a-principled-case-against-mandatory-gmo-labels/>

[Reply](#)



Tyson Adams [March 23, 2015 at 3:59 AM](#)

There already is a GMO free label in the market: Organic.

So why would organics and others be pushing for GM and GMOs to be labelled? They wouldn't be trying to demonise a safe technology, would they?

[Reply](#)



Jesse Gunn [March 24, 2015 at 1:26 AM](#)

"Organic" has zero to do with GMO. It has everything to do with what you do AFTER you plant the seed.

[Reply](#)



Anonymous [March 24, 2015 at 3:15 PM](#)

Jesse,

Regulations define "Organic" as non-GM (at least in Canada).

[Reply](#)

[Replies](#)



Angela T [April 8, 2015 at 9:44 PM](#)

Regulations are the same in America. Organic is GMO free by definition.

[Reply](#)



Van Lynch [March 24, 2015 at 8:23 PM](#)

It's this patent spreading of bullshit that actually made me pro-gmo. I really didn't have much of an opinion, but the outrageous claims and twisting of facts made me dig deeper. Also i came upon Nathaniel Johnsons' series on Grist. After reading and thinking about the issue the people who support GMOs made a lot more sense,

[Reply](#)



Mike W [March 25, 2015 at 9:35 AM](#)

Is it just me, or does this study feel a little weak. The actual study seems kind of well done. The conclusion was about 1 paragraph, and it didn't really conclude what the study findings would lead one to conclude:

"...A 24h exposure to a concentration of Glyphosate (in Roundup) similar to that recommended as an acceptable level for Australian drinking water caused significant cytotoxicity in vitro, which supports a call for in vivo studies to characterise the toxicity of Roundup."

Totally unsupported by the study.

Where's a control for cytotoxicity via the wetting agent? Shouldn't there be some kind of control for wetting of a cell membrane? It leaves the door open to keep misinterpreting cell death via wetting out as cell death via cytotoxicity.

I also was pretty confused by the editorializing near the end of the discussion section:

"It is possible that children, pregnant women, the elderly and those suffering chronic illnesses, may be more vulnerable to environmental toxic insults such as that caused by exposure to Roundup sprays than the general population."

Seemed like a strange place to guess about the dangers of roundup, right after talking about how it's not really toxic.

I'm not a researcher, so maybe those of you here can help me out. But, this feels like an the researcher wanted to get worse results, didn't, then tried to frame it as "well...roundup's still probably bad for you."

[Reply](#)



Mike W [March 25, 2015 at 9:38 AM](#)

Also, isn't calling reduced progesterone as a result of cell death "endocrine disruption" a little less than accurate?

Found the study here:

<http://www.gmo-evidence.com/wp-content/uploads/2015/03/IPTG-1-104.pdf>

[Reply](#)



Anonymous [March 25, 2015 at 10:43 AM](#)

I had some questions for anybody who might know.

First, I understand the purpose of glyphosate in solution with a surficant -- the surficant increases adhesion to plant surfaces and helps break down cell membranes to better enable the active ingredient to enter. (without the surficant, you would need to spray a lot more active ingredient and you'd have a lot more active ingredient migrate off target. What is the environmental fate of the surficant, i.e. does the glyphosate remain in solution with the surficant portion of the formulation, and does the surficant persist or degrade?

Secondly, do we have a water quality standard for Roundup, or do we have a water quality standard for glyphosate and a separate standard for the surficants used.

Finally, would you get the same results if you soaked cells in tomato juice, snapple ice tea, vinegar, dawn dishwasher soap, etc?

[Reply](#)



Anonymous [March 25, 2015 at 12:51 PM](#)

Also, I wanted to add that I agree with assessment of the article -- the GMO Free USA item appears to be a completely irresponsible, distorted representation of the results and implications of the underlying research item.

On an intellectual level, I personally absolutely oppose gmo labeling. On a realistic level, I understand that the issue is one of risk perception not actual risk and that some manner of labeling is probably a political inevitability. But items like the GMO Free USA ad this article points do not make the argument for labeling, they only reinforce all the reservations I have about labeling.

[Reply](#)



Mike W March 25, 2015 at 2:04 PM

Anonymous

Surfactants help the sprayed on pesticide penetrate the outer layer of plant leaves (I'm sure the actual plant scientists here could improve on my explanation.)

I'm sure at weak concentrations it would have a similar effect at the cellular level, assuming the surfactant didn't result in total membrane rupture.

You would definitely kill cells with most of the items you listed.

Detergent methods or "wetting out" of cells is a method of disruption to collect non-excreted metabolites in various fermentation or cell culture applications. Could do it with salt too.

Mammalian cells in culture are not particularly robust.

I'm not a pure scientist, but a chemical/biochemical engineer with experience in industrial cell culture and fermentations.

[Reply](#)



Anonymous March 25, 2015 at 3:51 PM

Mike W:

Thanks. I have been trying to find info on my own, but so far not successful. I was wondering does the glyphosate remain in solution with surficants after application. I suspect that if you left Roundup in a tank long enough, the individual components of the solution would eventually dissipate out so that eventually youd have a layer of surficant, a layer of glyphosate, water and whatever else is in the solution.

My guess is that the individual components of Roundup separate, disperse and degrade separately. The components are after all in solution, not compound. Perhaps I am wrong, but I am assuming the glyphosate is absorbed and transported within the plant, but the surficant does not penetrate past the outer cell layers of the leaf and other plant parts. I was therefore wondering if it is even a logical assume that the surficants would even remain with the plant to be consumed with any glyphosate residues.

Potentially, I suppose, glyphosate could remain in solution with surficants in the Roundup formulation if entering water as whole Roundup. I still however wonder if the surficant and glyphosate don't separate and have a different environmental fate from each other.

I am anonymous above and providing my name below. I just wanted to avoid another registration

Rick Leonard

[Reply](#)



Mike W March 25, 2015 at 4:11 PM

Rick,

I would assume the opposite on the formulation separating. Judging by the nature of water, glyphosate in sodium salt form (I think that's how it comes) and most surfactants, everything should be very miscible. So it's not just a mix-ed up emulsion or suspension of a solid in the liquid, it's the molecules of each being loosely 'bound' to each other at the molecular level. Not chemically bonded, but basically it wouldn't have any reason to phase out or separate based on densities.

Separating components that are truly solvated or miscible is a big part of chemical engineering - like getting diesel, gasoline, jet fuel, motor oil etc out of crude oil.

Not sure how far each component gets into the plant tissue. Another one for the plant scientists. But

tissues have the ability to act like selective membranes and do the separations based on affinity, size or other criteria-your kidneys are essentially a reverse osmosis membrane for example, your intestines let certain things through and not others for another.

I don't really have any reason to think that the solution of components would have any real effect on their degradation.

You can use the Name/URL option. I just use google to login. I also try to keep a low-ish online profile for professional reasons, so I don't like using my last name.

[Reply](#)



Mike Drake [April 3, 2015 at 10:09 AM](#)

I'm a little disappointed that comments like Tom's, reading like an advertising pamphlet for the Anti-Science movement, would even show up here without being ironic or something.

Why am I anti-labelling? I think it requires re-framing the conversation slightly into, what precisely are the reasons FOR labelling? Currently, legally-mandated labels reflect the safety and nutrition content of a food. GM ingredients affect neither of these.

So I'm anti GM labelling on a mandatory basis for the same reason I'm against mandatory labelling for other arbitrary scare causes. The examples I like to use the most are, mandatory labelling for foods picked on a Tuesday, and mandatory labelling for foods picked by Minority X. Who cares if it's racist and costly to demand specialized labelling for foods picked by Minority X - and who cares that "SCIENTISTS" say it makes no difference - we demand to know, damnit!!!1

[Reply](#)



Hell_Is_Like_Newark [April 15, 2015 at 9:40 PM](#)

{And for what it's worth-- I'm blocked from responding to their facebook page, so I can't provide real analysis of this paper and show how they use it to bring fear to their followers.}

I had something similar happen to me during the "poisonous tri-sodium phosphate in food!" scare that went on not too long ago. I countered the scare arguments (in a respectful manner) complete with links backing up my statements. My post was 'disappeared' shortly thereafter.

[Reply](#)

Comment as: