



## Genetically engineered apples: Any way you slice it, a rotten idea

Unnecessary, risky, unlabeled and coming soon to applesauce, Happy Meals and school lunches

From apple pie to baby's first applesauce and the apple in your child's lunchbox, apples are a core part of a natural, healthy diet. However, apples are about to become not-so-natural, and consumers, especially parents and other caregivers may soon want to think twice about that apple a day.

As early as the end of 2013, the genetically engineered Arctic Apple® may enter our food supply in everything from packaged, pre-sliced apples served in school lunches and Happy Meals to applesauce and other baby food. Like other genetically engineered foods, this new GMO apple won't be labeled, despite polls showing that the majority of Americans want GMO labeling.<sup>1</sup> Furthermore, these apples will not undergo independent safety testing; instead, regulators will rely on the company's own assessment that the apple is safe for human consumption.<sup>2</sup>

Worse yet, it may also carry a heavier load of pesticide residues than other conventional apples; it was produced using a new, experimental and potentially hazardous new genetic engineering technique; and threatens apple farmers, particularly organic apple farmers. Apple growers and consumers alike say they don't need or want this GMO apple.<sup>3</sup>

That's why Friends of the Earth is urging baby food companies and other food companies to commit to not sell food made with this unnecessary and potentially



problematic GMO apple, should it come to market.

### The Arctic Apple®: Far from the tree

Normally, when an apple is cut or bitten into, the exposed part will slowly brown. This natural browning is caused by an enzyme that produces melanin, polyphenol oxidase, which gives cells a brown tint when exposed to oxygen. Scientists believe the browning may play an important role in helping apples to fend off pests and disease.<sup>4</sup> The Arctic Apple®, on the other hand, was genetically engineered by the Canadian company Okanagan Specialty Fruits to not brown for up to 15-18 days after being sliced, bruised or bitten.<sup>5</sup>

How does this work? The company inserted a synthetic gene comprised of 4 natural PPO genes into an apple.<sup>6</sup> This gene is called "double-stranded RNA," and its function is to "silence" the genes that govern the production of PPO. The apple's own natural defense system attacks the inserted extra foreign gene and destroys both the copy and the original gene in the process. With no genes left to create the browning chemical, the apple does not turn brown after it has been cut, and may look fresh when it is actually decaying.<sup>7,8</sup>

This almost entirely untested genetic engineering technology is called RNA interference, and has raised serious concerns within the scientific community about health risks as the new gene or RNA enters our digestive systems and blood.<sup>9</sup> Although some in the biotech industry claim that human digestion destroys the dsRNA, recent



research shows that dsRNAs from food can remain intact through the digestion process and can enter the bloodstream and cells. Once in cells, this dsRNA can affect how they function. It is unclear what the unintended impacts



on the cells might be, and according to Professor Judy Carman, whose research focuses on genetically modified plants, “we won’t know (about the impacts) until we do thorough assessments, and these assessments have not yet been done.”<sup>10</sup>

#### A problem masquerading as a solution

Apples don’t lose any flavor or nutritional value when sliced. Individual consumers and food industry leaders like Crunch Pak, a leading supplier of pre-packaged sliced apples, are able to prevent apples from browning without using genetic engineering, simply by coating the apples in vitamin C and other minerals.<sup>11</sup> These age-old techniques do not compromise the health of the apple.<sup>12, 13, 14</sup>

However, the Arctic Apple® was not designed for greater nutritional value, but for purely cosmetic purposes. Furthermore, the public does not want GMO apples. Polls show that one third of people do not want to consume GE food, and 93 percent want genetically engineered food to be labeled.<sup>15</sup>

#### Poison apple? GMO apples may require increased pesticide use

Apples are already at the top of the charts for produce with the highest levels of toxic pesticide residues and residues from up to 40 different pesticides that may be found on any one apple.<sup>16, 17</sup> We know that many of these pesticides, such as organophosphates, are linked to adverse health impacts including hormone disruption, reproductive disorders and even ADHD.<sup>18, 19</sup> These pesticides have been found in 90 percent of Americans tests by the Centers for Disease Control, and the highest levels of pesticides were found in children’s bodies.<sup>20</sup>

We also know that this apple has been engineered to lack the natural browning enzyme that may help fight diseases and pests, meaning farmers may have to use even

more pesticides in growing the Arctic Apple, impacting farm workers and communities near farms and consumers.<sup>21</sup> These pesticides cannot all be washed off as some are systemic (meaning they are absorbed into the plant). Some common apple pesticides have been found to be polluting our kids at levels far above the government mandated “safe” level of exposure, especially during the height of apple season when children eat more apples.<sup>22, 23</sup>

Pound for pound, kids eat more food and have higher levels of pesticide exposure — and we know that early life exposures to toxic pesticides can be especially harmful because children’s brains and bodies are still developing and can be irreversibly impacted. This is yet another reason that we don’t need to introduce this new GMO apple into our children’s diets.

#### Other health concerns

There are insufficient long-term studies which show that consumption of genetically engineered food is safe for humans. Given that children are amongst the most sensitive to food allergens, it is critical that the first foods children eat are shown to be safe by independent, peer-reviewed, long-term safety studies.<sup>24</sup> These precautionary steps should happen before federal regulators allow the Arctic Apple® to enter the market.



#### One bad apple could spoil the bunch: Apple industry thinks GMO apples are a rotten idea

In addition to the contamination caused by increased pesticide use, genetically engineered apples may contaminate non-GMO apples, including organic apples. As with much of our food, bees are responsible for pollinating apple trees. Although Okaanagan’s own study, based on a single orchard in Canada, claims that bees do not cross pollinate apple trees, the diversity of bees and the varying



sizes of apple orchards means that the risks of cross-pollination between GE apples and non-GMO apples is high.<sup>25</sup> In fact, studies show that cross-pollinating bees can travel several kilometers, and that other animals such as bats, squirrels, and birds could also spread pollen from apple trees, and cross pollinate with crab apple trees.<sup>26, 27</sup> Farmers are also concerned that this “one bad apple” could spoil the whole bunch -- harming sales here and abroad. Apple growers, including the U.S. Apple Association (which represents most commercial apple growers), Northwest Horticultural Council (which represents Washington apple growers who grow over 60 percent of the apples in the U.S. and more than 80 percent of the U.S. certified organic apples), British Columbia Fruit Growers Association and other grower groups have already voiced their disapproval of these GE apples due to the negative impact they could have on farmers growing organic and non-GMO apples, and the apple industry as a whole.<sup>28, 29, 30</sup>

Apple growers have expressed concerns that the introduction of the GMO apple would force them to implement costly measures to protect against cross-contamination which could potentially cause valuable export markets to reject U.S. apples as happened in past when wheat and rice were found to be contaminated by GMOs.<sup>31, 32</sup>



Exports are extremely valuable for the apple industry and more than a third of apple revenue is derived from exports. The

U.S. Apple Association reports it does not support the approval of genetically engineered apples because it could risk consumer rejection and undermine the fruit’s image as a healthy and natural food, one that “keeps the doctor away and is as American as, well, apple pie.”<sup>33, 34</sup>

### Keeping unnecessary and risky GMO apples out of baby’s first foods

The GMO apple has been rejected by the apple industry, could increase use of toxic pesticides, and is simply unnecessary. For the minor cosmetic convenience of

preventing browning, GMO apples are not worth the environmental, human health, and economic risks that they pose. We already have safe, proven, and cheap ways of preventing apple apples from turning brown and do not need to create any new problems for apple growers or risks for apple eaters, especially vulnerable populations including babies and children.

That’s why Friends of the Earth is urging baby food companies, one of the biggest purchasers of apples, to commit to not use this GMO apple if approved to enter the food supply.

Gerber, one of the world’s largest baby food companies, has stated that it currently doesn’t use GMO fruits or vegetables in its baby food. Until now that’s been easy because there weren’t any staple GMO fruits or vegetables, like apples, on the market. But since GMO apples are likely to flood the market in the near future, we need your help to send a strong message to Gerber: keep GMO apples out of baby food.

Here’s how you can help:

Visit [www.NoGMOApples.org](http://www.NoGMOApples.org) to learn more and take action.

1. Sign our petition to Gerber asking it to keep GMO apples out of baby food.
2. Ask your family and friends on Facebook, Twitter and other social media to take action against GMO apples and spread the word.

Baby food and other food companies and retailers can demonstrate their leadership on this issue by committing to not source or sell GMO apples. Please contact Dana Perls, Food and Technology campaigner at [dperls@foe.org](mailto:dperls@foe.org).

Image credits:

Wendi Riggins Photography, [wendiriggins.com](http://wendiriggins.com)


Daniel Nvota, Flickr/[pj\\_vanf](https://www.flickr.com/photos/pj_vanf/), Creative Commons

Jeroen Kransen, Flickr/[jkransen](https://www.flickr.com/photos/jkransen/), Creative Commons

Endnotes:

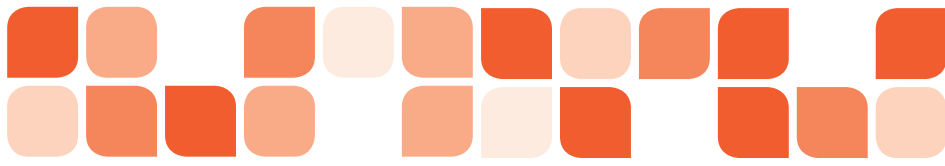
- 1 “Strong Support for Labeling Modified Foods” (2013, July 27). The New York Times. [http://www.nytimes.com/2013/07/28/science/strong-support-for-labeling-modified-foods.html?\\_r=0](http://www.nytimes.com/2013/07/28/science/strong-support-for-labeling-modified-foods.html?_r=0).
- 2 Paul, K., Cummins, R. “Biotech’s Latest Creation: Franken-Apples Coming to a





Store Near You." AlterNet. <http://www.alternet.org/food/biotechs-latest-creation-franken-apples-coming-store-near-you?page=0%2C1>

- 3 Pollack, A. (2012, July 12). That fresh look, genetically buffed. Retrieved June 14, 2013, from New York Times website: <http://www.nytimes.com/2012/07/13/business/>
- 4 Mayer, Alfred M. "Polyphenol Oxidases in Plants and Fungi: Going Places? A Review." *Phytochemistry* 67.21 (2006): 2318-331.
- 5 Taking the bite out of GM apples. (2012, July). Common Ground. <http://commonground.ca/2012/07/bite-out-of-gm-apples/>.
- 6 Thompson, H. (2012, September 26) "If Genetically Modified Apples Don't Brown, Can You Tell if They are Rotten?" <http://www.npr.org/blogs/the-salt/2012/09/17/161295119/if-gm-apples-dont-brown-how-can-you-tell-if-theyre-rotten>
- 7 Lester, D. (2013, February 10). Genetically modified apples raise concerns. Retrieved June 14, 2013, from Yakima Herald website: <http://www.yakimaherald.com/photosandvideos/localphotos/809616-8/genetically-modified-apples-raise-concerns>
- 8 Paul, K., Cummins, R. (2013, April 17). "Frankenapple: Bad News No Matter How You Slice It." Organic Consumers Association. [http://www.organicconsumers.org/articles/article\\_27376.cfm](http://www.organicconsumers.org/articles/article_27376.cfm)
- 9 Paul, K., Cummins, R. (2013, April 17). "Frankenapple: Bad News No Matter How You Slice It." Organic Consumers Association. [http://www.organicconsumers.org/articles/article\\_27376.cfm](http://www.organicconsumers.org/articles/article_27376.cfm)
- 10 "New kinds of GM plants and pesticides are not being assessed for safety" (2013, March 21). GM Free Cymru. [http://www.gmfreecymru.org/pivotal\\_papers/crucial36.html](http://www.gmfreecymru.org/pivotal_papers/crucial36.html)
- 11 Pollack, A. (2012, July 12). That fresh look, genetically buffed. Retrieved June 14, 2013, from New York Times website: <http://www.nytimes.com/2012/07/13/business/>
- 12 Mayer, Alfred M. "Polyphenol Oxidases in Plants and Fungi: Going Places? A Review." *Phytochemistry* 67.21 (2006): 2318-331.
- 13 Monsalve-Gonzalez, A., Barbosa-Canovas, G. V., Cavaliere, R. P., McEvily, A. J., & Iyengar, R. (1993). Control of browning during storage of apple slices preserved by combined methods. 4-Hexylresorcinol as anti-browning agent. *Food Science*, 58(4), 797-800. <http://dx.doi.org/10.1111/j.1365-2621.1993.tb09361>.
- 14 Sapers, G. M., Hicks, K. B., Phillips, J. G., Garzarella, L., Pondish, D. L., & El-Atawy, Y.S. (1989). Control of enzymatic browning in apple with ascorbic acid derivatives, polyphenol oxidase inhibitors, and complexing agents. *Journal of Food Science*, 54(4), 997-1002. <http://dx.doi.org/10.1111/j.1365-2621.1989.tb07931>.
- 15 National Survey of Healthcare Consumers: Genetically Engineered Food. Thomson Reuters. Oct. 2010. Available at [http://www.factsforhealthcare.com/pressroom/NPR\\_report\\_GeneticEngineeredFood.pdf](http://www.factsforhealthcare.com/pressroom/NPR_report_GeneticEngineeredFood.pdf)
- 16 "Apples Top EWG's Dirty Dozen". (2013, April 22). Environmental Working Group. <http://www.ewg.org/release/apples-top-ewgs-dirty-dozen>
- 17 Kilman, Scott. "Pesticide Residues Taint Apples." *Wall Street Journal*. N.p., 13 June 2011. Available at <http://online.wsj.com/article/SB10001424052702303848104576381671610587348.html>
- 18 "Organophosphates & Childhood Exposure." Pesticide Action Network. <http://www.panna.org/resources/organophosphates>
- 19 Laskawy, T. "Biotech's Latest Creation: Franken-Apples Coming to a Store Near You." *Grist*. <http://grist.org/article/2010-08-12-study-kids-exposure-to-toxic-pesticides-may-be-underestimates/>
- 20 "CDC Body Burden Study Finds Widespread Pesticide Exposure." July 22, 2005. Pesticide Action Network. [http://www.panna.org/legacy/panups/panup\\_20050722.dv.html](http://www.panna.org/legacy/panups/panup_20050722.dv.html)
- 21 Mayer, Alfred M. "Polyphenol Oxidases in Plants and Fungi: Going Places? A Review." *Phytochemistry* 67.21 (2006): 2318-331.
- 22 Laskawy, Tom. (2010, August 13). "Risk to kids from toxic pesticides may be underestimated, study finds." <http://grist.org/article/2010-08-12-study-kids-exposure-to-toxic-pesticides-may-be-underestimates/>
- 23 "CDC Body Burden Study Finds Widespread Pesticide Exposure." July 22, 2005. Pesticide Action Network. [http://www.panna.org/legacy/panups/panup\\_20050722.dv.html](http://www.panna.org/legacy/panups/panup_20050722.dv.html)
- 24 Branum, Amy M., M.S.P.H., and Susan L. Lukacs, D.O., M.S.P.H. Food Allergy Among U.S. Children: Trends in Prevalence and Hospitalizations. U.S. Centers for Disease Control and Prevention, Oct. 2008. Available at <http://www.cdc.gov/nchs/data/databriefs/db10.pdf>
- 25 Okanagan Specialty Fruits (OSF). "Petition for Determination of Nonregulated Status: Arctic™ Apple (Malus x domestica) Events GD743 and GS784." February 21, 2012 at 145.
- 26 Pasquet, R. S., A. Peltier, M. B. Hufford, E. Oudin, J. Saulnier, L. Paul, J. T. Knudsen, H. R. Herren, and P. Gepts. "Long-distance Pollen Flow Assessment through Evaluation of Pollinator Foraging Range Suggests Transgene Escape Distances." *Proceedings of the National Academy of Sciences* 105.36 (2008): 13456-3461.
- 27 Okanagan Specialty Fruits (OSF). "Petition for Determination of Nonregulated Status: Arctic™ Apple (Malus x domestica) Events GD743 and GS784." February 21, 2012 at 145.
- 28 Marshall, D. W., & Andrews, P. K. (1994). "Trends in Washington State's apple industry." *HortTechnology*, 6-15.
- 29 USDA. (2012, May). U.S. apple statistics. Retrieved June 14, 2013, from USDA: Economics, Statistics, and Market Information System website: <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1825>
- 30 Pollack, A. (2012, July 12). "That fresh look, genetically buffed."



- 31 Edwards, Anna. (2013, May 30). "America facing wheat export crisis as Europe and Japan lead the way in rejecting genetically modified crops" <http://www.dailymail.co.uk/news/article-2333381/GM-wheat-crops-America-facing-wheat-export-crisis-Europe-Japan-lead-way-rejecting-genetically-modified-crops.html>
- 32 Thompson, H. (2012, September 26). "If genetically modified apples don't brown, can you tell if they're rotten?" Retrieved June 14, 2013, from NPR website: <http://www.npr.org/blogs/thesalt/2012/09/17/161295119/if-gm-apples-dont-brown-how-can-you-tell-if-theyre-rotten>
- 33 Pollack, A. (2012, July 12). "That fresh look, genetically buffed"
- 34 Pollack, A. (2012, July 12). "That fresh look, genetically buffed"