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GENETICALLY ENGINEERED FOODS MAY CAUSE RISING FOOD ALLERGIES

Spilling the Beans newsletter, May 2007

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Part 1: GENETICALLY ENGINEERED SOYBEANS

The huge jump in childhood food allergies in the US is in the news often[1], but most reports fail to consider a link to a recent radical change in America's diet. Beginning in 1996, bacteria, virus and other genes have been artificially inserted to the DNA of soy, corn, cottonseed and canola plants. These unlabeled genetically modified (GM) foods carry a risk of triggering life-threatening allergic reactions, and evidence collected over the past decade now suggests that they are contributing to higher allergy rates.

Food safety tests are inadequate to protect public health

Scientists have long known that GM crops might cause allergies. But there are no tests to prove in advance that a GM crop is safe.[2] That's because people aren't usually allergic to a food until they have eaten it several times. "The only definitive test for allergies," according to former FDA microbiologist Louis Pribyl, "is human consumption by affected peoples, which can have ethical considerations." [3] And it is the ethical considerations of feeding unlabeled, high-risk GM crops to unknowing consumers that has many people up in arms.

The UK is one of the few countries that conducts a yearly evaluation of food allergies. In March 1999, researchers at the York Laboratory were alarmed to discover that reactions to soy had skyrocketed by 50% over the previous year. Genetically modified soy had recently entered the UK from US imports and the soy used in the study was largely GM. John Graham, spokesman for the York laboratory, said, "We believe this raises serious new questions about the safety of GM foods." [4]

Critics of GM foods often say that the US population is being used as guinea pigs in an experiment. But experiments have the benefit of controls and measurement. In this case, there is neither. GM food safety experts point out that even if a someone tried to collect data about allergic reactions to GM foods, they would not likely be successful. "The potential allergen is rarely identified. The number of allergy-related medical visits is not tabulated. Even repeated visits due to well-known allergens are not counted as part of any established surveillance system." [5] Indeed, after the Canadian government announced in 2002 that they would "keep a careful eye on the health of Canadians" [6] to see if GM foods had any adverse reactions, they abandoned their plans within a year, saying that such a study was too difficult.

Genetic engineering may provoke increased allergies to soy

The classical understanding of why a GM crop might create new allergies is that the imported genes produce a new protein, which has never before been present. The novel protein may trigger reactions. This was demonstrated in the mid 1990s when soybeans were outfitted with a gene from the Brazil nut. While the scientists had attempted to produce a healthier soybean, they ended up with a potentially deadly one. Blood tests from people who were allergic to Brazil nuts showed reactions to the beans. [7] It was fortunately never put on the market.

The GM variety that is planted in 89% of US soy acres gets its foreign gene from bacteria (with parts of virus and petunia DNA as well). We don't know in advance if the protein produced by bacteria, which has never been part of the human food supply, will provoke a reaction. As a precaution, scientists compare this new protein with a database of proteins known to cause allergies. The database lists the proteins' amino acid sequences that have been shown to trigger immune responses. If the new GM protein is found to contain sequences that are found in the allergen database, according to criteria recommended by the World Health Organization (WHO) and others, the GM crop should either not be commercialized or additional testing should be done. Sections of the protein produced in GM soy are identical to known allergens, but the soybean was introduced before the WHO criteria were established and the recommended additional tests were not conducted.

If this protein in GM soybeans is causing allergies, then the situation may be made much worse by something called horizontal gene transfer (HGT). That's when genes spontaneously transfer from one species' DNA to another. While this happens often among bacteria, it is rare in plants and mammals. But the method used to construct and insert foreign genes into GM crops eliminates many of the natural barriers that stop HGT from occurring. Indeed, the only published human feeding study on GM foods ever conducted verified that portions of the gene inserted into GM soy ended up transferring into the DNA of human gut bacteria. Furthermore, the gene was stably integrated and it appeared to be producing its potentially allergenic protein. This means that years after people stop eating GM soy, they may still be exposed to its risky protein, which is being continuously produced within their intestines.

Genetic engineering damaged soy DNA, creating new (or more) allergens

Although biotech advocates describe the process of genetic engineering as precise, in which genes-like Legos-cleanly snap into place, this is false. The process of creating a GM crop can produce massive changes in the natural functioning of the plant's DNA. Native genes can be mutated, deleted, permanently turned on or off, and hundreds may change their levels of protein expression. This collateral damage may result in increasing the levels of an existing allergen, or even producing a completely new, unknown allergen within the crop. Both appear to have happened in GM soy.

Levels of one known soy allergen, trypsin inhibitor, were up to 27% higher in raw GM soy. In addition, although cooking soybeans normally reduces the amount of this protein, the trypsin inhibitor in GM varieties appears to be more heat resistant. Levels in cooked GM soy were nearly as high as those found in raw soy, and up to seven times higher when compared to cooked non-GM soy. [8] This suggests that this allergen in GM soy may be more likely to provoke reactions than when consumed in natural varieties.

Another study verified that GM soybeans contain a unique, unexpected protein, not found in non-GM soy controls. Moreover, scientist tested the protein and determined that it reacted with the antibody called IgE. This antibody in human blood plays a key role in a large proportion of allergic reactions, including those that involve life-threatening anaphylactic shock. The fact that the unique protein created by GM soy interacted with IgE suggests that it might also trigger allergies.

The same researchers measured the immune response of human subjects to soybeans using a skin-prick test—an evaluation used often by allergy doctors. Eight subjects showed a reaction to GM soy; but one of these did not also react to non-GM soy. Although the sample size is small, the implication that certain people react only to GM soy is huge, and might account for the increase in soy allergies in the UK.

Increased herbicides on GM crops may cause reactions

By 2004, farmers used an estimated 86% more herbicide on GM soy fields compared to non-GM. [9] The higher levels of herbicide residue in GM soy might cause health problems. In fact, many of the symptoms identified in the UK soy allergy study are among those related to glyphosate exposure. [The allergy study identified irritable bowel syndrome, digestion problems, chronic fatigue, headaches, lethargy, and skin complaints, including acne and eczema, all related to soy consumption. Symptoms of glyphosate exposure include nausea, headaches, lethargy, skin rashes, and burning or itchy skin. It is also possible that glyphosate's breakdown product AMPA, which accumulates in GM soybeans after each spray, might contribute to allergies.]

GM soy might impede digestion, leading to allergies

If proteins survive longer in the digestive tract, they have more time to provoke an allergic reaction. Mice fed GM soy showed dramatically reduced levels of pancreatic enzymes. If protein-digesting enzymes are less available, then food proteins may last longer in the gut, allowing more time for an allergic reaction to take place. Such a reduction in protein digestion due to GM soy consumption could therefore promote allergic reactions to a wide range of proteins, not just to the soy. No human studies of protein digestion related to GM soy have been conducted.

Soy linked to peanut allergies

There is at least one protein in natural soybeans that has cross-reactivity with peanut allergies. [10] That means that for some people who are allergic to peanuts, consuming soybeans may trigger a reaction. While it is certainly possible that the unpredicted side effects from genetic engineering soybeans might increase the incidence of this cross-reactivity, it is unlikely that any research has been conducted to investigate this. GM soy was introduced into the US food supply in late 1996. We are left only to wonder whether this had an influence on the doubling of US peanut allergies from 1997 to 2002.

Eating GM foods is gambling with our health

The introduction of genetically engineered foods into our diet was done quietly and without the mandatory labeling that is required in most other industrialized countries. Without knowing that GM foods might increase the risk of allergies, and without knowing which foods contain GM ingredients, the biotech industry is gambling with our health for their profit. This risk is not lost on everyone. In fact, millions of shoppers are now seeking foods that are free from any GM ingredients. Ohio-based allergy specialist John Boyles, MD, says, "I used to test for soy allergies all the time, but now that soy is genetically engineered, it is so dangerous that I tell people never to eat it-unless it says organic." [11]

Organic foods are not allowed to contain GM ingredients. Buying products that are certified organic or that say non-GMO are two ways to limit your family's risk from GM foods. Another is to avoid products containing any ingredients from the seven food crops that have been genetically engineered: soy, corn, cottonseed, canola, Hawaiian papaya and a little bit of zucchini and crook neck squash. This means avoiding soy lecithin in chocolate, corn syrup in candies, and cottonseed or canola oil in snack foods.

Fortunately, the Campaign for Healthier Eating in America will soon make your shopping easier. This Consumer Non-GMO Education Campaign is orchestrating the clean out of GM ingredients from foods and the natural products industry. The campaign will circulate helpful non-GMO shopping guides to organic and natural food stores nationwide. The Campaign will provide consumers with regular GM food safety updates that explain the latest discoveries about why, Healthy Eating Means No GMOs.

Safe eating.

This article is limited to the discussion of allergic reactions from GM soybeans. The evidence that GM corn is triggering allergies is far more extensive and will be covered in part 2 of this series.

Jeffrey M. Smith is the author of the new publication Genetic Roulette: The Documented Health Risks of Genetically Engineered Foods, which presents 65 risks in easy-to-read two-page spreads. His first book, Seeds of Deception, is the top rated and #1 selling book on GM foods in the world. He is the Executive Director of the Institute for Responsible Technology, which is spearheading the Campaign for Healthier Eating in America. Go to www.seedsofdeception.com to learn more about how to avoid GM foods.

[1] See for example, Charles Sheehan, "Scientists see spike in kids' food allergies," Chicago Tribune, 9 June 2006, <http://www.montereyherald.com/mld/montereyherald/living/health/>

[2] See for example, Carl B. Johnson, Memo on the "draft statement of policy 12/12/91," January 8, 1992. Johnson wrote: "Are we asking the crop developer to prove that food from his crop is non-allergenic? This seems like an impossible task."

[3] Louis J. Pribyl, "Biotechnology Draft Document, 2/27/92," March 6, 1992, <http://www.biointegrity.org>

[4] Ibid.

[5] Traavik and Heinemann, "Genetic Engineering and Omitted Health Research"

[6] "Genetically modified foods, who knows how safe they are?" CBC News and Current Affairs, September 25, 2006.

[7] J. Ordlee, et al, "Identification of a Brazil-Nut Allergen in Transgenic Soybeans," The New England Journal of Medicine, March 14, 1996.

[8] Stephen R. Padgett et al, "The Composition of Glyphosate-Tolerant Soybean Seeds Is Equivalent to That of Conventional Soybeans," The Journal of Nutrition 126, no. 4, (April 1996); including data in the journal archives from the same study.

[9] Charles Benbrook, "Genetically Engineered Crops and Pesticide Use in the United States: The First Nine Years"; BioTech InfoNet, Technical Paper Number 7, October 2004.

[10] See for example, Scott H. Sicherer et al., "Prevalence of peanut and tree nut allergy in the United States determined by means of a random digit dial telephone survey: A 5-year follow-up study," Journal of allergy and clinical immunology, March 2003, vol. 112, n 6, 1203-1207; and Ricki Helm et al., "Hypoallergenic Foods: Soybeans and Peanuts," Information Systems for Biotechnology News Report, October 1, 2002.

[11] John Boyles, MD, personal communication, 2007.

Spilling the Beans is a monthly column available at <http://www.responsibletechnology.org>. The website also offers eater-friendly tips for avoiding GMOs at home and in restaurants.

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