



Cooperative Extension Service
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In focus

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GM Crops and Human Health: The National Academies Report

In 2014, a committee established by the National Academies of Sciences, Engineering, and Medicine set out to compare genetically modified (GM) and conventional crops. The committee members reviewed more than 1000 scientific studies and received additional input from dozens of presentations and hundreds of comments. Their report, released earlier this year, is available for free download (nas-sites.org/ge-crops).

In the previous bulletin, we discussed the report's findings relating to agriculture and the environment. Here we will consider the committee's conclusions regarding the effects of GM crops on human health. The American public is divided over the safety of foods derived from GM crops. In 2014, the Pew Research Center found that almost 60 percent of the U.S. residents they surveyed believe that GM foods are generally unsafe to eat.

To compare the human health effects of GM crops and conventional crops, committee members reviewed animal feeding experiments, studies of nutrient composition, and assessments of whether the engineered proteins of GM plants are likely to trigger allergic reactions. They also considered whether GM foods might have contributed to recent increases in some disorders and whether GM foods might have health benefits.

The report notes many challenges in interpreting animal feeding studies in which a small number of very similar animals receive different diets—one with GM feed, the other with feed from conventional varieties of the same crop. The rodent feeding studies used to test GM crops are based on tests for assessing chemical toxicity over a wide range of concentrations. In contrast, the amount of whole food that can be added to a rodent's diet is limited, making tests with small numbers of animals less informative. Feeding experiments are also less useful when the feeds come from different crop varieties grown in different locations, rather than from GM and non-GM versions of otherwise genetically identical plants (isogenic lines) grown in under similar conditions.



A less controlled but much larger comparison has become possible as the content of livestock feed has shifted from GM-free to GM-rich. Data show that today's livestock are, if anything, healthier and more efficient at turning feed into body mass. This does not mean that GM feed is superior. Rather, livestock health and growth gains have been steady, likely due to improvements in farm practices, and GM feed has not prevented the observed rate of improvement.



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GM Comparisons



Comparisons of isogenic (nearly identical) GM and non-GM foods have sometimes shown differences in nutrient composition. However, these differences have not been considered biologically meaningful, because the differences between isogenic GM and non-GM plants are comparable to the nutritional variation found among genetically different non-GM varieties of the same crop.

The structure of each new GM protein is compared to the structures of allergens—proteins known to trigger allergic reactions. The GM protein is also digested in artificial gastric juice to assess how quickly it breaks down in the stomach. (Allergens typically resist digestion.) If the new protein is similar to a known allergen or comes from an allergy-causing plant or animal, a blood-based assay is used to test whether the protein can bind antibodies and set off an allergic reaction. GM crop development is discontinued if the GM protein is found to be a likely allergen. The committee expressed concern that digestion in acidic artificial gastric juice might not measure how well a protein is digested in the stomach of someone prescribed medication for heartburn or reflux.

Increased Diagnoses



Diagnoses for some diseases have become more common during the past two decades, coinciding with the widespread adoption of GM crops in the United States. The committee looked at whether GM foods might influence the prevalence of some cancers, obesity, digestive tract illnesses, kidney disease, autism spectrum disorders, and allergies. However, diseases have also become more common in countries where GM foods are not widely available, suggesting that increased U.S. disease rates are not the result of GM food consumption.

Positive Effects?

In considering whether GM crops might have positive health effects, the report cited Golden Rice grains engineered to make beta-carotene. Committee members concluded that Golden Rice could provide health benefits for millions of poor people whose current diets are deficient in Vitamin A. Some evidence also suggests that adoption of Bt crops may have resulted in fewer insecticide poisonings in countries where individuals applying pesticides are most likely to be harmed by pesticide exposure.



No Differences



Summarizing its examination of GE crop effects on human health, the National Academies report “found no differences that implicate a higher risk to human health from GE foods than from their non-GE counterparts.” Our next bulletin will consider the report’s conclusions regarding the social and economic effects of GM crops.