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## The Hazards of Genetically Engineered Foods

“Genetically Modified Foods: Breeding Uncertainty” (Schmidt 2005) overlooked many serious concerns about the environmental and health risks of this new technology. Potential problems from antibiotic-resistant genes used in gene-altered crops, risks from unintended effects of the genetic engineering process, the increases in pesticide use stemming from widespread planting of gene-spliced varieties—these and several other concerns were ignored or hardly mentioned in the lengthy article. Additional information on this topic is available from the Center for Food Safety (CFS 2000, 2004).

Instead, Schmidt’s article states that “GM agriculture is here to stay” (Schmidt 2005) and gives readers the false impression that safety and regulatory issues have been adequately addressed by industry and government. Nothing could be further from the truth. For example, regarding the risk of allergies from gene-altered foods, Schmidt stated that biotech companies avoid allergy problems by avoiding genes from the most common allergens. However, in an editorial in the *New England Journal of Medicine*, Nestle (1996) pointed out that this approach leaves many uncertainties:

Most biotechnology companies use microorganisms rather than food plants as gene donors, even though the allergenic potential of these newly introduced microbial proteins is uncertain, unpredictable, and untestable .... Because FDA requirements do not apply to foods that are rarely allergenic or to donor organisms of unknown allergenicity, the policy would appear to favor industry over consumer protection.

Schmidt (2005) went on to assert that after a 1993 study alerted them to the possibility of introducing allergens, biotech companies developed better screens and learned to abandon varieties that could not be deemed allergen-free. Far from abandoning a risky new variety 5 years after this study, industry marketed a new genetically engineered corn variety, despite warning signs that it might trigger allergies in people. Although it was registered only for nonfood uses, the altered corn, called StarLink, contaminated hundreds of food products sold in supermarkets nationwide and cost industry and farmers hundreds of millions of dollars to clean up. Aventis paid \$110 million to compensate farmers for lost markets due to StarLink contamination, and analysts estimated that the company spent an additional \$500 million to pay for losses to

farmers, food processors, and grain handlers (Harl 2003; Jacobs 2003). Despite this and other troubling contamination episodes, such as those described by Gillis (2002), Nichols (2002), and Greenpeace (2005), the biotech industry continues to grow open fields of genetically engineered pharmaceutical crops (crops altered to produce experimental drugs or industrial proteins) that have never been assessed for their allergenic potential or other food safety issues.

Schmidt also ignored scientific concerns about the Food and Drug Administration’s (FDA) approach to gene-altered foods. Millstone et al. (1999) criticized the idea of “substantial equivalence” that the FDA uses to evaluate genetically engineered foods, calling the concept “inherently anti-scientific because it was created to provide an excuse for not requiring biochemical and toxicological tests.” In a letter published in *Nature Biotechnology*, Schenkelaars (2002) also derided the concept and noted that more appropriate testing methods would “systematically detect unintended changes in the composition of GM crops ... as such changes may be of toxicological, immunological, or nutritional concern.” A lawsuit the CFS brought against the FDA exposed documents from top level scientists throughout the agency, who warned that the FDA’s equivalence-based policy was inadequate to protect against these kinds of unintended changes in gene-altered food (Alliance for Biointegrity 2004).

The purported benefits of gene-modified varieties should be examined against other agricultural approaches that have shown documented gains for food production and the environment. Schmidt (2005) cited a study of recent field trials of gene-altered rice in China that looked at a few dozen farms (Huang 2005). However, in one of the largest-ever studies of commercial rice growing, researchers found that thousands of Chinese farmers using agroecologic techniques saw yield increases of 89% while completely eliminating some of their most common pesticides (Zhu 2000). Other large-scale projects have shown that thousands of Chinese farmers using ecologic techniques significantly reduced pesticide use without expensive, patented gene-modified seeds (Yanqing 2002).

Finally, Schmidt (2005) claimed he could get no answer to his questions about industry’s plans for protecting their patented seeds in the developing world. However, that answer came in 1998, when family farm advocates exposed the biotech industry’s

“terminator genes” that instill seed sterility in gene-altered varieties (Rural Advancement Foundation International 1998). This terminator technology was developed to ensure that farmers in the developing world could not reuse genetically engineered seed (ETC Group 2002). Advocates have uncovered over two dozen similar industry patents for seed sterility engineering (Rural Advancement Foundation International 1999). This technology threatens the lives of over 1.4 billion people who rely on saved seed for their daily nutritional needs, yet it is being brought to market by a genetic engineering industry that perversely promises to “feed the world.”

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## Credibility of Scientists: Industry versus Public Interest

In their article "Assessing the Reliability and Credibility of Industry Science and Scientists," Barrow and Conrad (2006) demonstrated a sophisticated understanding of the nuances of the Federal Advisory Committee Act (1972). They accurately pointed out that the act draws a distinction between conflicts of interest, which hinge on financial self-interest, and bias, which may exist for a host of reasons including research funding sources.

Alas, in their haste to condemn public interest groups who wish the government would adhere to the letter and spirit of that law, Barrow and Conrad (2006) incorrectly characterized objections by the Center for Science in the Public Interest (CSPI) and the Environmental Working Group (EWG) to two scientists nominated in December 2004 to sit on a U.S. Environmental Protection Agency (EPA) advisory panel evaluating the risk of perfluorooctanoic acid (PFOA) (EWG and CSPI 2004). This misrepresentation may have helped prove their thesis, but it in no way reflects what is actually going on at the U.S. EPA, the National Academies, and other agencies that routinely form advisory panels.

Barrow and Conrad (2006) suggested that the CSPI and the EWG challenged two scientists because they were "funded by industry." In fact, there were nine industry-funded scientists listed as potential candidates for this panel. The two scientists singled out by the CSPI and the EWG currently or previously worked for DuPont or 3M, which have a direct financial stake in the outcome of the committee's deliberations (EWG and CSPI 2004). Thus, these scientists were covered by the conflict of interest standard, not the bias standard.

The Federal Advisory Committee Act (1972) states that scientists with conflicts of

interest cannot serve on federal advisory committees unless their expertise cannot be recruited elsewhere. The EWG and CSPI (2004) suggested that there were other scientists available with the requisite expertise. The U.S. EPA must have agreed with this analysis, because the final panel announced in February 2005 (U.S. EPA 2005) did not include either scientist, although it did include two others with prior industry ties to whom the groups did not object. By contrast, only one scientist on the panel can be said to be "environmental" in orientation.

Barrow and Conrad (2006) saw this panel as proof that public interest and environmental groups are seeking to tilt the playing field against industry. In fact, industry-funded scientists often play a dominant role on committees established under the Federal Advisory Committee Act (1972). And, as in the PFOA panel case, those with financial support from industry usually outnumber by a two- or three-to-one margin those whose writings suggest they may be sympathetic to environmental or consumer interests (CSPI, in press).

Barrow and Conrad (2006) concluded that industry scientists should be allowed to serve on advisory panels because "they can provide unique knowledge and insight concerning the chemical in question." No doubt such scientists should be encouraged to present their data to a panel evaluating the health risks of a particular chemical. However, if they work full- or part-time for a company that makes, uses, or competes against the chemical, then allowing those scientists to sit on the panel would be the equivalent of allowing one side in a court case to name the jurors.

*The author declares he has no competing financial interests.*

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## Credibility of Scientists: Conflict of Interest and Bias

In their commentary, Barrow and Conrad (2006), both employed by the chemical industry, argued that industry-funded science and scientists are high quality and unbiased, and this is enforced through policies and practices such as disclosure of funding sources in scientific journals, guidelines for Good Laboratory Practices, peer review, the scientific process of independent repeatability, various federal laws, and the prospect of tort liability. Ironically, these same mechanisms have publicly revealed the often successful efforts by industry to weaken the regulation of their products.

The current checks and balances cited by Barrow and Conrad (2006) are not always effective guards against biased or even bad science. Numerous examples of biased industry science have been reported in the scientific literature:

- In an article co-authored by U.S. Environmental Protection Agency (EPA) scientists, Dearfield et al. (1993) compared the results from registrant-submitted mutagenicity studies to the U.S. EPA Office of Pesticide Programs with those from the published literature. The authors reported a selection bias, in which registrant-submitted studies on atrazine mutagenicity were all negative (no mutagenic activity), whereas over a dozen studies in the published literature reported mutagenic activity.
- In an analysis of studies submitted to the U.S. EPA on the effects of atrazine on frog reproductive development, Hayes (2004) reported that financial sponsorship was a strong predictor of study outcome ( $p = 0.009$ ). Funding sources varied for studies reporting adverse effects (including government and industry funding), whereas all of the studies that failed to detect adverse effects were funded by the manufacturer of atrazine.
- In an analysis of 115 published studies on low-dose effects of the plastics-component bisphenol A, vom Saal and Hughes (2005) reported that > 90% of government-funded studies found significant low-dose effects, whereas none of the industry-funded studies did. More specifically, the authors found that  
Some industry-funded studies have ignored the results of positive controls, and many studies reporting no significant effects used a strain of rat that is inappropriate for the study of estrogenic responses. (vom Saal and Hughes 2005)
- Studies of documents from the tobacco industry archives have revealed evidence of concerted industry efforts to obscure the contribution of secondhand smoke and other environmental toxics to disease

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