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Authors

William K. Hallman and Helen L. Aquino

**Food Policy Institute
Rutgers University**



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Abstract

Phone surveys were conducted with 1200 American adults in 2001 and in 2003 designed to track the strength, extent and persistence of consumers' attitudes toward genetically modified food. The results suggest that most Americans remain largely uninformed about GM foods and the topic is not often the subject of social discourse. Only 20% of Americans report having had more than one or two conversations about genetically modified foods. However, the results also suggest that support for GM foods has slipped between 2001 and 2003. In 2001, 59% of Americans said they thought GM would make their lives better. Only 39% had a similar response in 2003.

Key Words: public perception, genetically modified food, food biotechnology, consumer perception, agricultural biotechnology

INTRODUCTION

Agricultural biotechnology continues to be a powerful, but controversial technology. While farmers continue to adopt genetically modified (GM) crops on a broad scale, it is also clear that the ultimate success or failure of agricultural biotechnology will necessarily be influenced by public opinion.

There have been of course, a large number of publically and privately funded studies that have examined public opinions about food biotechnology [For reviews, see for example: Durant, 1992; Hamstra, 1998;]. Yet, we still don't have a very comprehensive picture of what consumers think about genetically modified foods or how those opinions may be changing over time. Unfortunately, it is difficult to compare the results of most publicly-funded studies because they have most often been conducted by different researchers at different times, in different countries, with different objectives, and with different methods, sampling procedures, and questions. Given the shortcomings in the available literature, it is often impossible to conclude how public opinion is changing over time, how opinions differ around the world, or what the bases for these opinions really are.

Consequently, the existing literature on public perceptions of biotechnology represents more of a collection of individual studies than an integrated body of

knowledge. As a result, the biotechnology and food industries, consumers, and policy makers are often left making decisions about the likely future of GM agricultural products without consistent, competent data. This study is designed to partially address the deficiencies of the existing literature on consumer perceptions of agricultural biotechnology by providing direct comparative longitudinal data concerning public awareness, knowledge, discourse and optimism related to genetically modified foods.

METHODS

Questionnaire development

The Food Policy Institute (FPI) solicited input from more than fifty representatives in academia, food and agricultural companies, government, industry organizations and consumer groups to determine what should be asked of a national panel of consumers. These key stakeholders were interviewed to help generate a list of important topics, questions and issues of interest. The questionnaire was also designed to ensure direct comparability with our earlier 2001 survey of consumer perceptions of genetically modified foods (Hallman, Schilling, Adelaja & Lang, 2002) as well as with specific questions drawn from the 1999 and 2003 Eurobarometer¹ surveys of European consumer perceptions of biotechnology.

Significant effort went into the wording and order of the questions in the survey and the selection of appropriate terminology to describe the application of recombinant DNA technologies to create new varieties of plants and animals. The term ‘genetic modification’ was used as the primary descriptor in both our 2001 and 2003 surveys for several reasons. The term ‘genetic modification’ is increasingly being used by a variety of organizations, and governmental institutions (especially in Europe) to specifically refer to agricultural products produced through recombinant DNA. The term ‘genetically modified’ has often been shortened to its initials ‘GM,’ creating a new adjective used in

¹ The Eurobarometer (INRA Europe, 2000; Gaskell, Allum, & Stares, 2003) is a broad-based public opinion poll managed by the public opinion analysis unit of the European Commission’s Directorate-General for Education and Culture. The survey was administered within 15 Member States (Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, Netherlands, Austria, Portugal, Finland, Sweden, and United Kingdom). Of specific interest to this study is the Eurobarometer’s focus on European knowledge, attitudes, and expectations of issues related to biotechnology. The survey was administered to 16,082 respondents in 1999 and 16,067 respondents in 2002.

conjunction with specific crops or products. Thus, it isn't unusual for people to refer to 'GM corn,' 'GM cotton,' 'GM soybeans,' or simply 'GM food.' Proposed labeling laws in several countries also specify "Genetic Modification" as the required term.

In addition, the Eurobarometer survey of European public attitudes toward biotechnology also uses the term 'genetic modification' or GM as the descriptor of recombinant DNA technology in its own surveys. To allow for comparisons between the beliefs and attitudes of the American and the European public, genetic modification was adopted as the term of choice for the 2001 and 2003 FPI surveys. However, the term biotechnology was also used in a few questions to maintain comparability with other surveys².

Sample selection

The targeted sample frame for both the 2001 and 2003 FPI surveys was the non-institutionalized United States adult (eighteen years and older) civilian population. The target sample was selected using a random proportional probability sample drawn from the more than 97 million telephone households in the United States allowing a sampling error rate of $\pm 3\%$. To reach people who were infrequently at home, each working telephone number was called a minimum of twelve times, at different times of the week. Quotas were set up to ensure that representative numbers of males and females were interviewed. Random selection of which adult in the household was to be interviewed was accomplished by asking to interview the person aged 18 or over whose birthday had occurred most recently. The geographic coverage of the survey was commensurate with state population estimates published by the U.S. Census Bureau.

Data Collection

Using a computer-assisted telephone interviews (CATI) system, a professional research firm completed a total of 1203 phone surveys between March 15, and April 4,

² Though the word 'biotechnology' actually encompasses a broad range of technologies, the terms biotechnology, genetic engineering, and genetic modification are all frequently used to describe the development of new hybrid organisms through recombinant DNA technologies. 'Biotechnology' was felt to be too broad a term to be used throughout the questionnaire. Some might suggest 'genetic engineering' as an appropriate substitute. However, that term has taken on a pejorative meaning and is most frequently used by the opponents of the technology.

2001. A total of 1201 phone surveys were completed between February 27, and April 1, 2003.

Data weighting

In this study, the data from both the 2001 and 2003 surveys was weighted using comparison demographic data from the 2000 Census. To better represent the population, the data was weighted to adjust for race, ethnicity, and education. As such, except for the reported sample demographics, all of the univariate results reported are estimates of the distribution of responses within the United States and so are derived from the weighted data. However, to avoid analytical errors caused by altering the variance through the weighting process, the results of all inferential statistics reported are based on analyses using the unweighted data. Demographic data for the 2001 and 2003 samples are presented in Table 1.

Table 1: Summary of Demographics of Respondents to 2001 and 2003 FPI Surveys

Demographics	2001 Data Unweighted	2001 Data Weighted	2003 Data Unweighted	2003 Data Weighted
Respondents	1203	1203	1201	1201
% Male	47.1	45.4	41.8	48.1
Age Range	18-91	18-91	18-93	18-93
Median Age	43.0	43.0	46.0	43.0
Race				
White:	76.0	75.5	80.9	75.7
African-American:	9.5	12.2	10.4	12.0
Asian/Pacific Islander:	1.6	2.5	2.1	3.4
Native American:	1.8	0.8	1.3	2.2
Other:	4.5	5.2	1.1	1.4
Other Hispanic:	--	--	1.5	2.5
Ethnicity- Hispanic				
No	88.4	87.7	92.9	87.8
Yes	6.8	10.8	5.4	10.6
Education				
Less than High School:	8.7	19.6	7.8	19.3
High School diploma:	28.1	30.8	29.5	28.3
Some College:	26.4	26.5	26.8	27.4
Four-Year College Degree:	20.8	14.6	21.7	15.0
Postgraduate:	11.7	6.9	13.7	9.6
Employment				
Employed Full-time:	52.8	50.3	55.2	53.7
Employed Part-time:	9.0	9.5	8.0	8.0
Retired:	15.2	16.5	18.5	17.6
Homemakers:	6.2	6.5	7.4	7.3
Unemployed:	4.7	6.6	3.0	3.5
Students:	4.3	5.3	3.9	5.5
Military:	0.7	0.6	0.3	0.4
Too Disabled/ Ill to Work:	3.0	3.3	3.2	3.6
Income				
Less than \$50,000	43.5	49.8	44.3	47.4
Between \$50,000 and \$99,999	31.7	29.7	33.2	31.1
\$100,000 and over	9.9	8.0	11.6	9.8
Who does the most food shopping in your house?				
Me	46.3	44.8	58.9	55.1
Somebody else	15.3	15.6	18.1	20.8
Equally divided	37.7	37.6	22.8	23.7
% of Women who say they are responsible for most shopping:	66.8	63.9	74.0	73.7
% of Men who say they are responsible for most shopping:	23.7	22.8	37.8	35.0

RESULTS

Little Consumer Awareness of Genetically Modified Food Products

Genetically modified food is not a topic that most Americans claim have heard or read much about. Respondents were first asked how much they had ‘heard’ or ‘read’ about genetic modification, genetic engineering, or biotechnology. More than four-in-ten of the respondents said that they had heard or read ‘not much’ (28%) or ‘nothing at all’ (14%). Forty-five percent said that they had ‘heard’ or ‘read’ ‘some’. Only 12% said they had heard or read ‘a great deal’ about GM, GE, or biotechnology. These low levels of awareness are consistent with those reported in our 2001 survey (See Table 1). They are also consistent with other current surveys on consumer awareness of biotechnology (Gallup 2001, IFIC 2003; PEW 2001, 2002).

Table 2: How Much Have You Heard or Read about Genetic Modification, Genetic Engineering, or Biotechnology?

	2001	2003	% change 2001 to 2003
Nothing At All	11%	14%	+3%
Not Much	29%	29%	-
Some	47%	45%	-2%
A Great Deal	13%	12%	-1%
Don’t Know or Refused	<1%	<1%	-

More Americans are Talking about Genetically Modified Foods

The respondents were asked, “Before this interview have you ever discussed biotechnology, genetic engineering, or genetic modification with anyone?” In 2003, fewer than two-in-five respondents (38%) said that they had (See Table 2). This represents a 7% increase over the number of Americans talking about genetic modification in 2001. However, the respondents who had discussed GM, GE, or biotechnology were then asked how often they had engaged in such discussions. Consistent with the findings in 2001, the results suggest that only about one-in-five Americans (20%) has ever had a conversation about biotechnology, genetic modification or genetic engineering more than once or twice. These findings suggest that the topic of

GM in the US remains one that is neither widely recognized nor is much of a topic of conversation for most people.

Table 3: Frequency of Discussion Concerning Genetic Modification

	2001	2003	% change 2001 to 2003
Have Talked About It:	31%	38%	+7%
Frequently	4%	4%	-
Occasionally	16%	16%	-
Only once or twice	11%	18%	+7%
Never Talked About It	68%	62%	- 6%
Don't Know or Refused	1%	<1%	-

Knowledge about GM Food

Consistent with the fact that few have heard or read, or discussed much about biotechnology, genetic modification, or genetic engineering, most Americans say they know little about these technologies. When prompted in 2003, over half of the respondents said they knew ‘very little’ (55%), one-in-five said ‘nothing at all’ (22%) or ‘a fair amount’ (21%). Only 2% of those surveyed said they knew ‘a great deal’ about GM food.

Looking at the 2003 data, there is a positive linear relationship between how much one has heard or read about genetic modification and how much one has discussed the technology with others ($r_{(1198)}=.49$). Similarly, there are positive correlations between how much one has heard or read about GM and self-assessed knowledge about GM ($r_{(1198)}=.63$), and between how much one has discussed GM and self-assessed knowledge about GM ($r_{(1198)}=.55$). Comparable correlations were found in the 2001 survey.

Most Americans are Unaware that They are Already Eating GM Food

This lack of awareness, knowledge of biotechnology and GM Food appears to translate directly into a general lack of recognition that food products with GM ingredients are already in abundance on supermarket shelves. Only 26% of Americans believe that they have ever eaten a genetically modified food (vs. 22% in 2001).

Moreover, only about half of Americans (52 %) are aware that genetically modified food products are currently for sale in supermarkets, up from 44% in 2001 (See Table 4)

Table 4: Awareness of GM Food

	2003 (n=1201)			2001 (n=1202)		
	Yes	No	Don't Know	Yes	No	Don't Know
Have you ever eaten any GM food?	26%	58%	15%	22%	62%	16%
Any GM foods in supermarkets now?	52%	25%	23%	44%	30%	26%

What Do Americans Really Know About Food Biotechnology?

Biotech Quiz

To test actual knowledge of relevant ‘facts’ about genetic modification we used a set of 10 true/false questions based on those originally developed for use as part of the Eurobarometer surveys of European attitudes (Gaskell, Allum & Stares, 2003) and which have been used in similar studies fielded in Canada (Einsiedel, 2003) and China (Huang, 2002). The results are presented in Table 5.

On average, in 2003, Americans were only able to answer 6.7 of the 10 questions correctly. Moreover, there seems to be only a weak relationship between what people think they know and what they actually know. The correlation between perceived knowledge about GM and the quiz scores was only .34.

Table 5: Biotechnology ‘Quiz’ Results (Percent Correct).

Question	2001 (n=1202)	2003 (n=1201)	% change
There are some bacteria which live on wastewater. (<u>True</u>)	94%	94%	-
Ordinary tomatoes do not contain genes, while genetically modified tomatoes do. (<u>False</u>)	59%	57%	-2%
By eating a genetically modified fruit, a person’s genes could also become modified. (<u>False</u>)	72%	69%	-3%
The mother’s (father’s) genes determine whether the child is a girl. (<u>False 2003</u>) (<u>True 2001</u>)	66%	73%	+7%
The yeast used to make beer contains living organisms. (<u>True</u>)	74%	76%	+2%
Genetically modified animals are always larger than ordinary animals. (<u>False</u>)	63%	57%	-6%
It is impossible to transfer animal genes into plants. (<u>False</u>)	50%	48%	-2%
The cloning of living things produces genetically identical copies. (<u>True</u>)	NA	69%	
More than half of the human genes are identical to those of chimpanzees. (<u>True</u>)	NA	55%	
Tomatoes genetically modified with genes from catfish would probably taste “fishy.” (<u>False</u>) +	71%	60%	-11%
Genetically modified foods are created using radiation to create genetic mutations. (<u>False</u>)	49%	48%	-1%

Results rounded to nearest percent

Public Acceptance of Food Biotechnology

Consistent with prior surveys, Americans express greater support for the genetic modification of plants than they do for animals (See Table 6). When asked directly, the majority of Americans either strongly approve (12%) or somewhat approve (37 %) of creating hybrid plants via genetic modification, whereas 20 percent somewhat disapprove and 19% strongly disapprove (11% were not sure).

Americans seem far less receptive to the genetic modification of animals. Only 27% of the respondents said they approve of such practices. In contrast, two-thirds of the population disapproves of the genetic modification of animals (45 percent disapprove strongly and 21 disapprove somewhat).

Support for both plant and animal-based GM foods appears to have declined somewhat between 2001 and 2003. Overall, fewer Americans also seem convinced that GM technology will improve the quality of their lives. In 2001, 59% of Americans said they thought GM would make their lives better. Only 39% had a similar response in 2003 (See Table 7).

Table 6: Approval of the Use of GM to create Plant and Animal Based Food Products

	Approval for Plant GM 2001 (n=1202)	Approval for Plant GM 2003 (n=1202)	% change in Approval for Plant GM	Approval for Animal GM 2001 (n=1202)	Approval for Animal GM 2003 (n=1201)	% change in Approval for Animal GM
Strongly Approve	17%	12%	-5%	8%	6%	-2%
Somewhat Approve	43%	37%	-6%	22%	21%	-1%
Somewhat Disapprove	18%	20%	+2%	24%	21%	-3%
Strongly Disapprove	17%	19%	+2%	41%	45%	+4%
Don't Know	6%	11%	+5%	5%	8%	+3%
Refused	0%	<1%	-	<1%	<1%	-

Table 7: Will Genetic Modification Make the Quality of Life Better or Worse for People Like You?

	2001	2003	% change 2001 to 2003
Much Better	14%	9%	-5%
Somewhat Better	45%	30%	-15%
Somewhat Worse	17%	21%	+5%
Much Worse	9%	13%	+4%
Not Sure	15%	25%	+10%

CONCLUSIONS

Tracking public opinion over time is essential to understanding how consumers are likely to perceive the risks and benefits of genetically modified foods. The findings of this tracking study continue to illustrate the uncrystallized nature of American attitudes toward biotechnology and GM food products. Most Americans have heard and read little about biotechnology, and few have talked about it more than once or twice. As such, it is not surprising that most Americans say they know little about genetically modified foods. Most Americans are also unaware that GM food products are already on supermarket shelves and despite the ubiquity of food products with GM ingredients, few know that they are currently eating them.

As such, the apparent significant decline in public optimism concerning the likelihood that the products of GM will improve the lives of Americans is difficult to explain. One possibility however, is the timing of the 2003 survey. Because the survey was conducted just prior to the start of the war in Iraq, it is possible that the results simply reflect a decline in overall public optimism. Additional research is ongoing to explore this hypothesis.

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