PUBLIC PERCEPTIONS OF GENETICALLY MODIFIED FOODS:
A National Study of American Knowledge and Opinion

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Executive Summary

This report presents the results from the second phase of a longitudinal study of Americans' knowledge and feelings about agricultural biotechnology and how those perceptions and attitudes have changed over time. Two independent national probability samples of 1,200 adults were interviewed by phone in the spring of 2001 and 2003. While this report focuses on the findings from 2003, longitudinal comparisons are presented where appropriate.

The report begins with an investigation of Americans' awareness of the presence of genetically modified (GM) ingredients in the foods they encounter everyday. Next, the report describes Americans' actual and perceived knowledge of science, biotechnology and food production. It then examines American opinions about GM foods in general, along with their opininos on a variety of existing and potential GM food products with direct or indirect consumer benefits. The report discusses the relationship between opinions of GM food and a variety of factors, including demographics, knowledge of biotechnology, purchasing behaviors and styles of food selection. Finally, it describes Americans' thoughts on GM food labeling. Highlights of the findings are below.

Americans pay little attention to agricultural biotechnology.

- Only half of Americans are aware that foods containing genetically modified (GM) ingredients are currently sold in stores.
- Despite the prevalence of such foods, only one-quarter of Americans believe they have eaten them.
- Little more than a third of Americans have ever discussed biotechnology.
- Awareness, although still low, has increased slightly from 2001.

Americans do not have much knowledge about agricultural biotechnology.

- Self-reported knowledge of biotechnology is low.
- Quizzes on biotechnology and food production reveal that Americans are generally uninformed about both, and this has not changed since 2001.

Opinion on the acceptability of GM foods is split.

- When asked directly, about half of Americans report that they approve of plant-based GM foods, (down from 2001) and about a quarter approve of animal-based GM foods (unchanged from 2001).
- Approximately 10% of Americans report being unsure of their opinion of GM foods.

Opinions of GM food are easily influenced.

- Approval increases when specific benefits of GM food are mentioned.
- Reactions to the technology depends on what it is called. The term *biotechnology* evokes the most positive responses, while *genetic modification* is perceived most negatively and *genetic engineering* is most often associated with cloning.

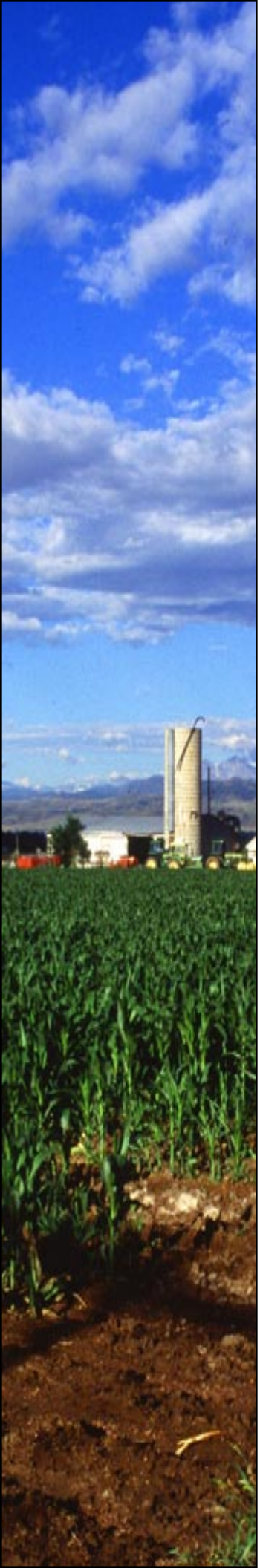
Demographics and styles of choosing food are related to acceptance of GM foods.

- Women, people over 64, and people with low levels of education are less likely to approve of GM foods.
- People who value naturalness and healthfulness in their foods are slightly less likely to approve of GM foods.
- People who have purchased organic foods in the past are less likely to approve of GM foods.

Americans' stance on labeling of GM food is unclear.

- When asked directly, the vast majority of Americans (94%) agree that GM ingredients should be labeled as such, an increase from 2001.
- However, less than 1% of respondents mentioned GM ingredients as something they would like to see on food labels when asked before GM food was mentioned.

Copies of this report are available at http://www.foodpolicyinstitute.org.



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Introduction

This report presents the results of the second in a series of national surveys examining the basis, strength and extent of what Americans know and feel about agricultural biotechnology, and how those perceptions and attitudes are changing over time. We begin by investigating American awareness of and attitudes toward plant and animal biotechnology in the broad sense. We thoroughly examine American opinions about a variety of existing genetically modified (GM) food products and gauge reactions to possible future products with direct and indirect consumer benefits. In addition, we assess Americans' actual and perceived knowledge of science, technology and food production as well as their general food attitudes and behaviors, and explore how these attitudes relate to opinions of GM food. Finally, we examine Americans' thoughts on GM food labeling and how such labeling might change their purchasing behaviors.

In releasing this report to as wide an audience as possible, we hope to focus public attention on agricultural biotechnology, help decision makers understand the current state of public knowledge and opinion about GM foods, and help lay the groundwork for programs that will increase consumer knowledge and awareness of agricultural biotechnology.

Overview of GM Food

While genetically modified foods remain a major source of controversy in many countries around the world, foods containing GM components are virtually everywhere in the United States. Though the absence of federal tracking makes it impossible to establish exact figures, most estimates suggest that between 60% and 70% of processed foods on American shelves include at least a fragment of a genetically modified crop (GEO-PIE, 2003).

This prevalence is due to the fact that majority of the soy and rapeseed (canola), and a third of the corn harvested in the United States and Canada in 2002 were GM varieties (GEO-PIE, 2003). Because these crops are the source of some of the most common ingredients used in food production, and because GM varieties of corn, soybeans and canola are often mixed with ordinary varieties, the incorporation of at least small amounts of GM ingredients in many processed foods is virtually inevitable. For example, many processed sweetened foods like sodas and baked goods often contain high-fructose corn syrup obtained from a silo storage system in which genetically modified corn is neither tracked nor treated differently than non-GM varieties.

Currently, there is little diversity among available GM products; corn, soy, cottonseed and canola account for the bulk of GM ingredients in the food supply. However, the United States Department of Agriculture (USDA) lists several products "in the pipeline" for future production. Among these are varieties of insect resistant fruits and vegetables, naturally decaffeinated coffee beans, nicotine-free tobacco, and grains with radically enhanced nutritional properties and vitamin content (Economic Research Service, 2001).

As these and other new GM products arrive on shelves with benefits marketed directly to consumers, Americans are likely to become much more aware of agricultural biotechnology. For now, however, it remains a topic that the average American consumer knows little to nothing about. Attempts by government, media and industry to inform the public of GM foods have gone largely unnoticed by most Americans (Hallman, Adelaja, Schilling & Lang, 2002).

Questionnaire Design

To enable longitudinal tracking of changes in attitude, the questionnaire design provides direct correspondence with components of the Food Policy Institute's 2001 national survey of American consumers (Hallman, et al., 2002)[1]. The instrument also included questions originally developed for the Eurobarometer study of European attitudes toward biotechnology, which facilitates comparisons among the United States, the European Union (Gaskell, Allum, and Stares, 2003) and Canada (Einsiedel, 2003). In addition, investigators in China (Huang, 2002) and Korea (Jang, 2003) translated and administered many questions from this survey, permitting comparisons between consumers in the United States and consumers in their respective nations. These comparisons will be explored in future publications.

While many questions were retained from our efforts in 2001, a significant number of new questions were introduced in this survey. These questions were designed to elicit the "food attitudes and behaviors" of respondents. Another set of questions was added to test respondent knowledge of how food is grown and produced. These new questions were created to give an overall depth of understanding to consumer acceptance of GM food.

As with our previous study, the research team devoted significant attention to question wording and order to reduce the impact of these on responses. However, readers should take careful note when reviewing this or any other questionnaire that both wording and question order often influence the way respondents interpret or answer survey questions (Consult Appendix A for the full questionnaire).

[1] *Research was conducted in 2001, the report was published in 2002. Data referenced as 2001.*

Introduction

To provide comparability with both our previous study (Hallman, et al., 2002) and the Eurobarometer (Gaskell, et al., 2003), we most often used the term 'genetic modification,' and its acronym, 'GM,' to refer to the recombinant DNA technology that is the subject of this study. We also chose to use this term because many governmental and non-governmental institutions (especially in Europe) commonly use it to refer to transgenic technology; it is also the descriptive term proposed for required labeling in the European union and in other parts of the world, and it is the term most often used by the media to describe foods produced through agricultural biotechnology. However, the terms biotechnology and genetic engineering were also used occasionally to help respondents recognize the subject matter and, in a few cases, to ensure direct comparability with questions on other surveys.

Many researchers studying public perceptions of agricultural biotechnology typically ask consumers how they feel about the technology in an abstract sense, without endeavoring to help the respondent understand what GM food is. However, our recent research suggests that many American respondents are likely to have heard little or nothing about the technology. As such, we felt the opinions expressed would be more accurate and representative if the interviewer supplied a brief primer.

Survey participants were informed when first answering the phone that the survey would be about food, health, and technology. The topic of GM was only introduced midway through the interview, following numerous attitude and opinion questions pertaining to food in general (See Appendix A). Later in the survey, respondents were asked a series of questions to examine awareness, perceived knowledge, and acceptance of GM. The topic of GM was introduced with the following preamble:

> "Now I would like to ask you a question concerning another food production method. Genetic modification involves new methods that make it possible for scientists to create new plants and animals by taking parts of the genes of one plant or animal and inserting them into the cells of another plant or animal. This is sometimes called genetic engineering or biotechnology…"

To limit the length of the survey and minimize fatigue on the part of respondents, two versions of the survey were created and given to two identically drawn split samples. While the majority of the questions were administered to the entire sample, certain questions within each of the two versions were unique and only posed to half the sample. Version A had an average interview length of 24.8 minutes, while Version B averaged 26.4 minutes. Readers can view the appended questionnaire to see exactly how the survey differed between versions (Appendix A). Questions drawn from the split sample are clearly noted in the results that follow and readers should take note of the sample size (n) when interpreting the results.

Interview Methods

The Food Policy Institute (FPI) contracted with a private market research firm, Schulman, Ronca, & Bucuvalas, Inc. (SRBI) to conduct telephone interviews. Computer Assisted Telephone Interview (CATI) software guided the interviewers and automatically prompted appropriate follow-up questions or skip-patterns. FPI trained and tested all personnel before the actual interviews to promote familiarity with the survey and subject matter. Supervisors monitored interviewers constantly at a rate no greater than 10 interviewers per supervisor at any given time.

Sample Selection

Non-institutionalized United States adults (18 years and older) were selected from more than 97 million telephone households in the contiguous 48 United States, using random proportional probability dialing. A total of 1,201 interviews were completed between February 27, 2003 and April 1, 2003. The CATI program guided a random but balanced selection process to ensure that representative numbers of males and females were interviewed. U.S. Census Bureau population estimates determined the distribution necessary for proportionate geographic coverage.

The sampling design accounts for the possibility that people who answer the telephone immediately are different from those who are rarely at home. To maximize generalizability, we employed a 12-call design with attempts to contact an elusive individual made at different times and days throughout the week. Interviewers left a voice mail message on the second, fifth and ninth attempt, explaining the study and the purpose for calling. The CATI software maintained callback appointments and prompted the interviewers to leave an answering-machine message when necessary.

Many of the telephone numbers originally selected as part of the sampling frame were excluded as non-residential or non-working numbers. Only 38% of the phone numbers selected at random yielded completed interviews. However, calls to 56% of the working residential numbers resulted in completed interviews. Moreover, 65% of those who were available and eligible to participate agreed to complete the study. These response rates did not

significantly differ between the two versions of the questionnaire.

The 1,201 completed interviews yield a sampling error rate of ±3%.[2] Questions asked in a split-ballot format yielded a sampling error rate of ±4%.

SAMPLE DEMOGRAPHICS

A summary of the sample demographics[3] is provided in Figure 1. The sample was 41.8% male and 58.2% female. Respondent ages ranged from 18 to 93 with a median age of 46.

Using standard U.S. Census categories, 78.3% of the respondents identified themselves as non-Hispanic whites, 9.8% identified themselves as non-Hispanic blacks, 5.4% as Hispanic, 1.9% as Asian or Pacific Islander, 1.2% as Native American, and less than 1% as "other", while 2.6% refused to answer this question.

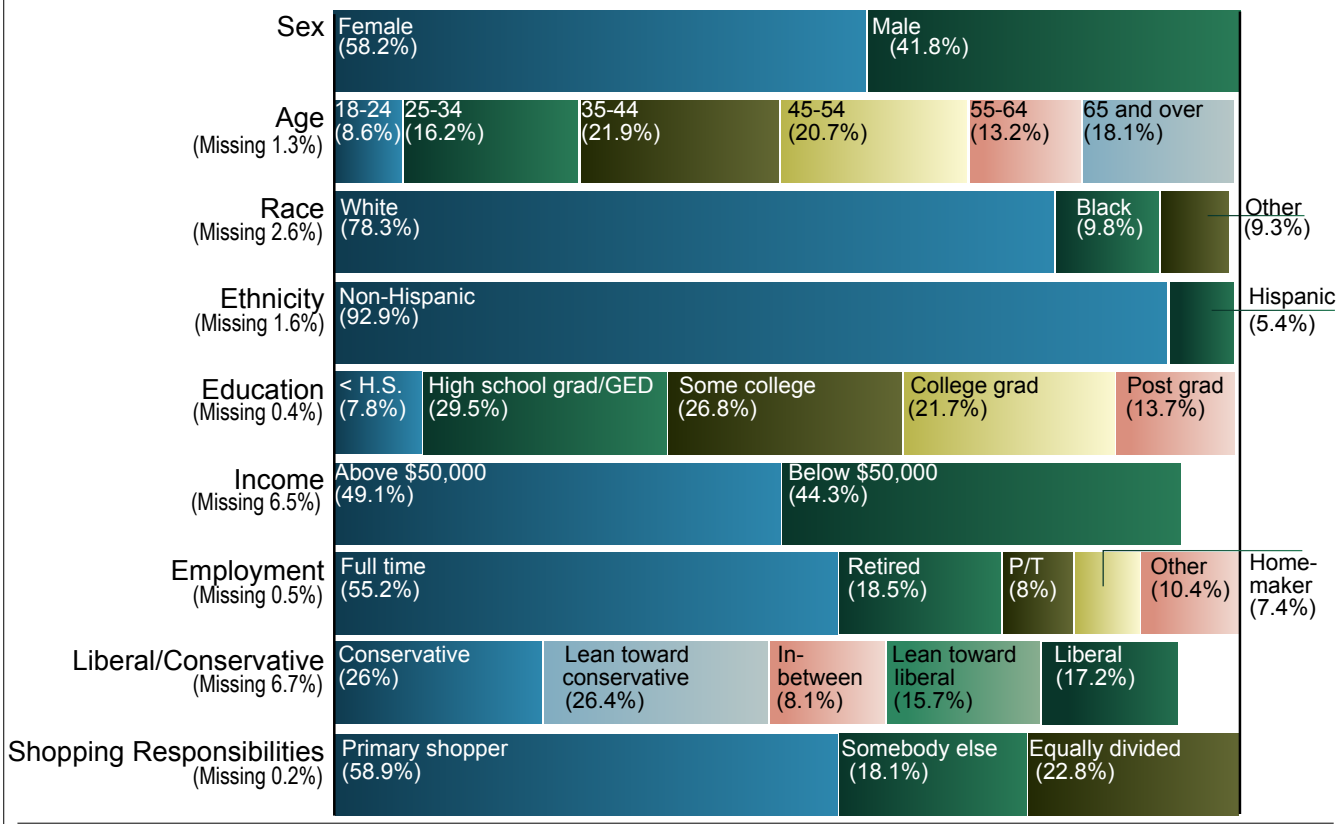
Most respondents (91.8%) had completed high school. High school was the highest level of formal education for more than a quarter of the sample (29.5%). About a quarter (26.8%) had some college education or an associates degree, 21.7% of the sample had completed a four-year college degree and 13.7% had earned post-graduate degrees. The remainder (7.8%) had less than a high school diploma.

More than half of the respondents (55.2%) said they were employed full-time, 18.5% were retired, and 8% said they were employed part-time. The remaining respondents said they were homemakers (7.4%), students (3.9%), too disabled or ill to work (3.2 %), unemployed (3.0%), or in the military (0.3%). A little less than half (49.1%) had incomes above $50,000, 44.3% had incomes below $50,000 while the remainder (6.5%) refused to answer.

A little more than a quarter (26.0%) considered themselves to be conservative, while 26.4% said they leaned in the direction of conservativism. Only 17.2% considered themselves to be liberal, while 15.7% reported that they leaned in the direction of liberalism. Eight percent considered themselves somewhere in-between and the remainder (6.8%) refused to answer.

More than half (58.9%) said they do most of the food shopping, 18.1% said somebody else does most of the food shopping, and 22.8% said the task is equally divided.

FIGURE 1: Demographics[3] (n = 1201)



[2]The sampling error is the difference between the population percentage and its estimate. The sampling error associated with a nationwide sample of 1,200 people is approximately ±3 percent with a 95 percent confidence interval. This means that if 50 percent of the sample gave a particular response, the entire US adult population will be between 47 percent and 53 percent, 95 out of 100 times. This should be kept in mind when comparing smaller groups within the sample or when comparing surveys with different sample sizes, as sampling error is greater for smaller samples.

[3]Due to rounding and non-reported missing data (refusals), numbers do not always add to 100%.

WEIGHTING

Using comparison data from the 2000 U.S. Census, researchers weighted the sample to more accurately reflect the racial, ethnic and educational makeup of the entire national population. These weighting adjustments are illustrated in Table 1. Ideally, the sample population in any survey should have the same characteristics of the wide population they are intended to represent. When the number of respondents interviewed in a particular demographic category does not match the number one would have expected to interview based on census data, the group's responses are weighted by a factor that compensates for the difference. For example, if census figures show that 39 percent of Americans aged 18 and older have a high school education, and only 32 percent of those interviewed have a high school education, each of these respondents counts as 1.21 persons to adjust for the difference.

Except for the reported sample demographics, all of the descriptive results reported are estimates of the distribution of responses within the United States and are derived from the weighted data. Comparison data presented from the 2001 survey were similarly weighted. However, to avoid analytical errors caused by altering the variance and apparent degrees of freedom through the weighting process, the results of all inferential statistics (like correlations) reported are based on analysis using the unweighted data.

TABLE 1: Weight Adjustments (percentage based on valid responses).

	Unweighted %	Weighted %	US Census %
Males			
18 - 24	**3.44**	**6.65**	**6.63**
25 - 34	**7.30**	**9.60**	**9.62**
35 - 44	**10.05**	**10.72**	**10.73**
45 - 54	**9.28**	**8.84**	**8.84**
55 - 64	**5.07**	**5.58**	**5.57**
65+	**6.70**	**6.91**	**6.89**
Females			
18 - 24	**5.24**	**6.36**	**6.35**
25 - 34	**9.19**	**9.44**	**9.45**
35 - 44	**12.03**	**10.83**	**10.85**
45 - 54	**11.43**	**9.17**	**9.17**
55 - 64	**8.33**	**6.04**	**6.04**
65+	**11.94**	**9.87**	**9.84**
Race/Ethnicity			
White (non-Hispanic)	**80.33**	**71.97**	**71.98**
Black (non-Hispanic)	**10.05**	**11.15**	**11.16**
Hispanic	**5.67**	**10.99**	**10.98**
Other (non-Hispanic)	**3.95**	**5.89**	**5.88**
Education			
Less than high school	**7.82**	**19.60**	**19.60**
High school grad/GED	**29.81**	**28.63**	**28.63**
Some college	**26.72**	**27.37**	**27.37**
College grad or more	**35.65**	**24.40**	**24.40**
Region			
Northeast	**16.49**	**19.39**	**19.39**
Midwest	**25.26**	**22.82**	**22.83**
South	**35.14**	**35.73**	**35.71**
West	**23.11**	**22.06**	**22.08**

Findings

What Do Consumers Know About GM Food?

While most Americans are likely to consume GM food every day, they know very little about it. As described below, few claim to have heard or read much about it, few are aware of the presence of GM ingredients in supermarkets or in their own diets, and few have ever discussed the topic with anyone else.

However, Americans are realistic in their assessment of their own personal knowledge of GM food; most report knowing little or nothing about the technology. Basic quizzes on biotechnology and food production reveal that Americans are generally uninformed about both. These results are presented below.

General Awareness of GM Remains Low

Forty-three percent had heard or read "not much" or "nothing at all" about genetic engineering or biotechnology, while 45% had heard or read "some." Only 12% had heard or read a "great deal" about it (Figure 2).

There has been only a slight decrease in how much people have heard or read about GM foods since 2001. For example, 3% fewer respondents reported having heard "some" or "a lot" and 3% more respondents reported having heard "nothing at all."

Only 19% of the sample reported that they could remember any events or news stories related to genetically modified food. When pressed further, fewer than 1% of the total sample could recall specific details of a story or event related to the topic. Most respondents who answered this question gave vague responses like, "something about corn," or, "pros and cons." This, despite the fact that almost every respondent reported exposure to at least one news source often (13%) or everyday (86%) in the week prior to the survey (Figure 3).

Figure 2: Amount Heard or Read About GM (n = 1200)

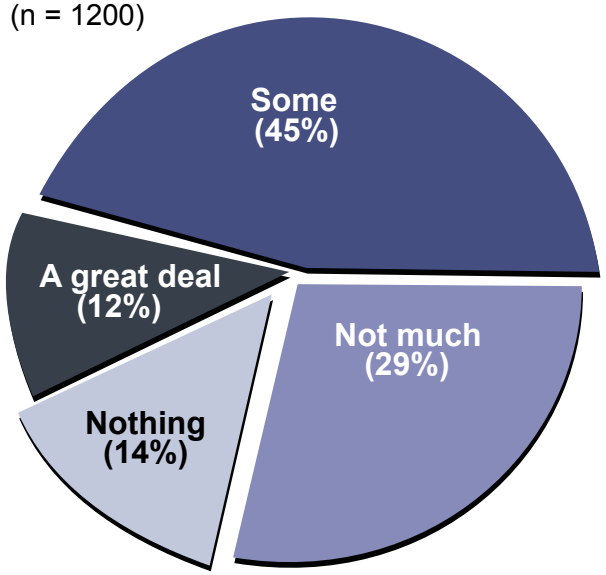
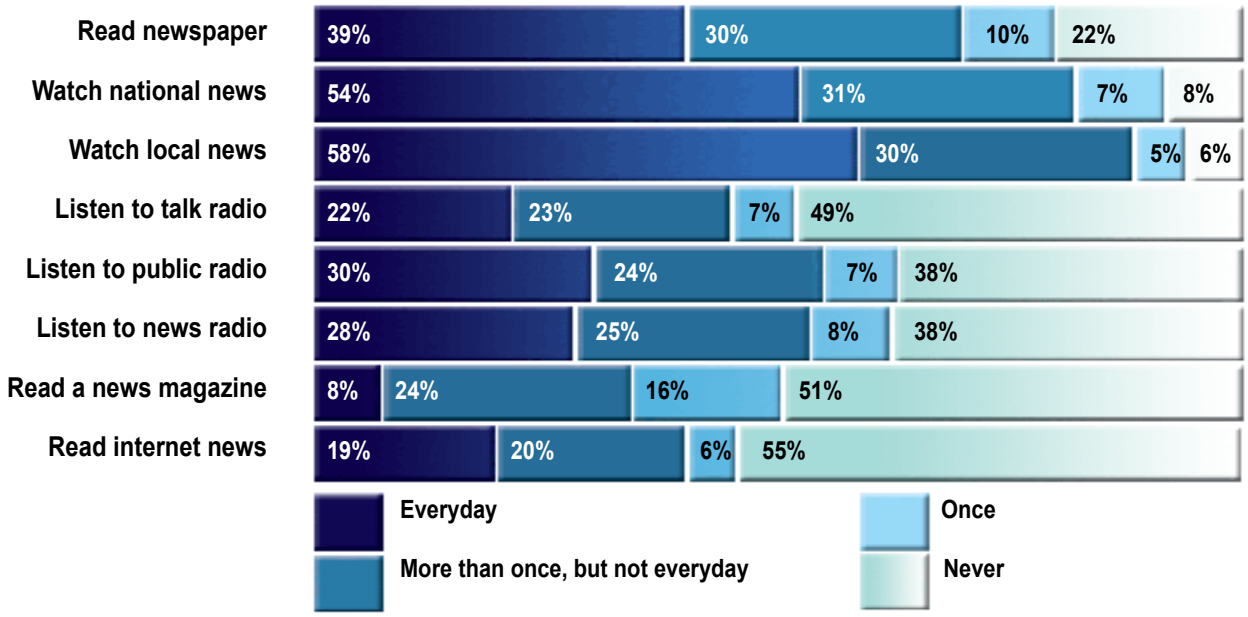


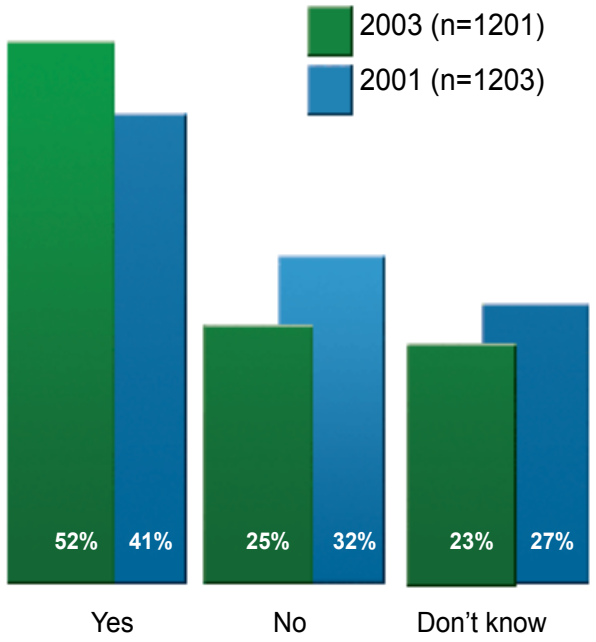
Figure 3: Use of News Sources in the Past Week (n = 601)



PREVALENCE OF GM FOODS REMAINS UNNOTICED

Despite the abundance of products with genetically modified ingredients in the marketplace today, only half of the respondents (52%) were aware that genetically modified food products are currently for sale in supermarkets (Figure 4). A quarter of the respondents (25%) did not believe such products were available in supermarkets, while almost a quarter (23%) were not sure. Although this indicates a continued lack of awareness about the prevalence of GM food, it represents an increase in awareness since 2001, when only 41% of respondents knew that GM foods were available in supermarkets.

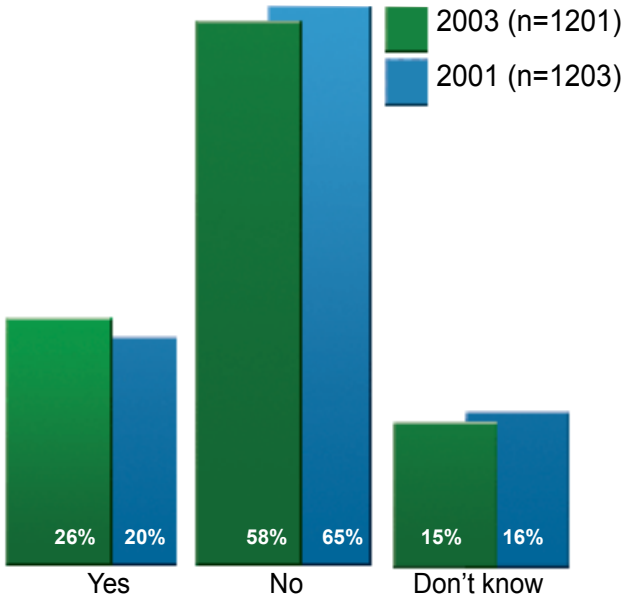
FIGURE 4: Awareness of GM Food In Supermarkets



Estimates suggest that between 60% and 70% of processed foods contain some form of genetically modified ingredient, most often processed corn or soy, making it very likely that most Americans are eating foods with components derived at least in part from genetically modified crops (GEO-PIE, 2003). Nevertheless, only a quarter of respondents (26%) said that they had consumed food containing genetically modified ingredients, 58% said they had not, and 15% were not sure. This also represents a slight increase in awareness from 2001, where only 20% believed they had eaten food with GM ingredients (Figure 5).

Although awareness appears to be growing, these measures illustrate that Americans remain generally unaware of agricultural biotechnology and its prevalence in their lives.

FIGURE 5: Awareness of Eating GM Food

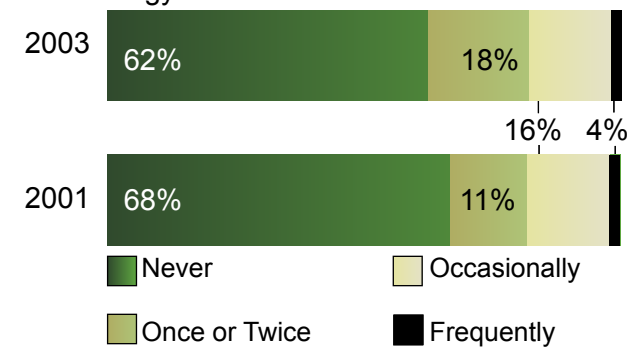


GM FOODS ARE NOT A FREQUENT TOPIC OF CONVERSATION

Americans are not spending a lot of time talking about GM foods. When asked how often they discuss the topic of biotechnology or genetic modification, almost two-thirds (62%) of the respondents reported that they had never discussed it at all. Of the 38% who reported having at least one conversation about biotechnology, 89% had discussed it "occasionally" or "only once or twice," while only 11% of this group had discussed it "frequently." Overall, only 20% of the entire sample had a conversation about the topic more than once or twice (see Figure 6).

Americans report talking about GM foods slightly more than they did in 2001, as 7% more 2003 respondents said that they had discussed genetic modification "once or twice" and 6% fewer respondents report never having talked about it. However, the majority of Americans still have not discussed the topic with anyone, and this has not changed dramatically over the past two years.

FIGURE 6: Frequency of Discussion of Biotechnology



MOST AMERICANS THINK THEY KNOW LITTLE ABOUT SCIENCE AND BIOTECHNOLOGY...

In separate questions we asked people to rate their understanding of "science and technology" and "biotechnology, genetic engineering, or genetic modification." More than half of the respondents (63%) rated their knowledge of science and technology as "fair" or "poor," about a quarter (22%) rated it as "good," and 14% thought their understanding of the topic was "very good" or "excellent" (Figure 7)."

Similarly, most respondents said they don't know much about biotechnology, genetic engineering, or genetic modification. The majority of Americans claim to know "very little" (55%) or "nothing at all" (22%) about biotechnology. In contrast, 21% of the respondents said they know "a fair amount," while only 2% said they know "a great deal" about the subject (Figure 8). This has not changed since 2001.

FIGURE 7: Self-rated Knoweldge of Science and Technology
(n = 1201)

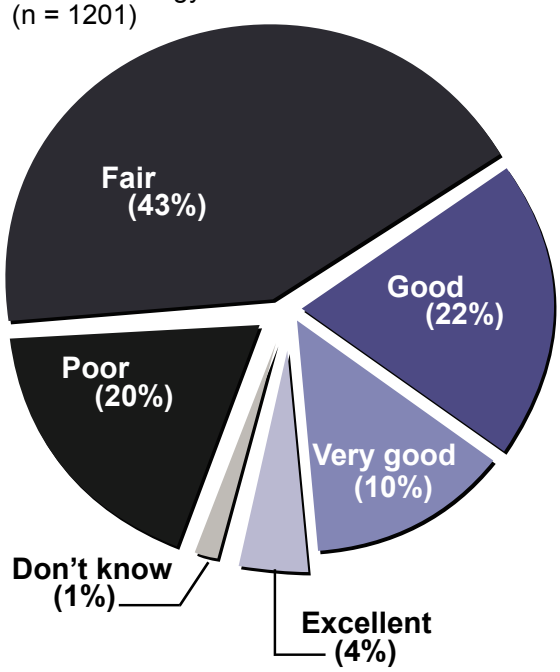
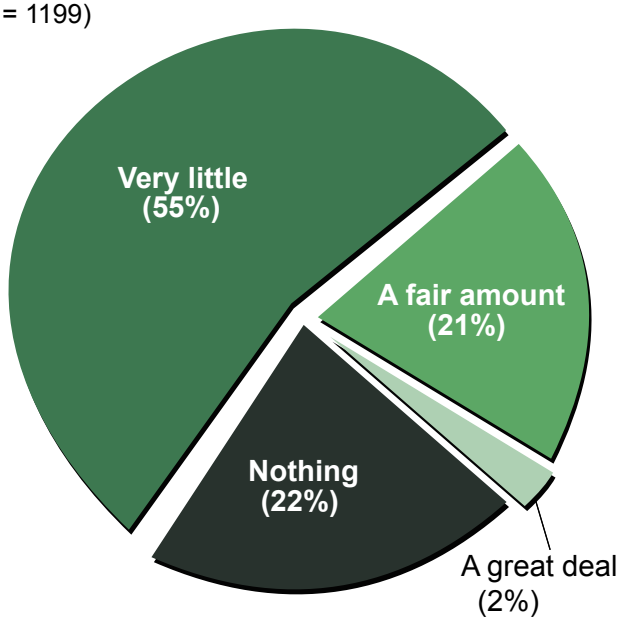


FIGURE 8: Self-Rated Knowledge of Biotechnology, Genetic Engineering or Genetic Modification
(n = 1199)



Findings

...And They Are Right

Considering that Americans have not heard or read much about biotechnology, genetic engineering or genetic modification, and considering it is not a frequent topic of conversation, it is not surprising that a quiz on actual knowledge revealed a lack of familiarity with the subject.

To assess respondents' actual knowledge of science and genetic modification, we used a set of 11 true/false questions based on those originally developed for use in the Eurobarometer surveys of European attitudes toward GM foods (Gaskell, et al., 2003). More than half of the respondents (52%) received a failing grade of less than 70% correct. Only 4% of the sample answered all quiz questions correctly. The mean score for the quiz was 64%.

While most Americans do poorly on this test, and their overall performance has not changed much since 2001, they do score better than their European counterparts (Table 2). Americans outperform Europeans on every question, with differences in accuracy ranging from 3% to 22%.

Interestingly, there is only a moderate relationship between what Americans think they know about science and objective measures of their actual knowledge. The correlation between self-assessed knowledge of science and technology and quiz scores is .38[4]. The correlation between self-assessed knowledge of genetic modification and the quiz scores is .35.

Americans Overestimate their Understanding of Food Production

Compared to their assessments of their own knowledge about biotechnology and science, Americans were much more optimistic about their understanding of how food is grown and produced. Three-quarters of the 600 respondents queried said their knowledge was at least "good."

However, on a seven question true/false quiz concerning basic farming and food production topics, almost half (43%) received a failing grade (less than 70% correct). Only 5% of the sample answered all seven questions correctly, and the mean test score was 66%. Similar to the relationships between self-assessed and actual knowledge of biotechnology and science and technology, there was a weak correlation between self-rated knowledge and scores on the food production quiz (r = .19; Table 3).

[4]Two variables are positively correlated if high values of one are likely to be associated with high values of the other and negatively correlated if high values of one are likely to be associated with low values of the other. If two variables have a correlation coefficient of 0, they are considered to have no statistical correlation and thus to be unrelated. A correlation coefficient of +1 or -1 represents a perfect correlation, where every increase in one variable is related to an increase (or decrease) in the other. A value of .8 is considered quite strong; a value of .2 is considered quite weak but nevertheless slightly correlated. In this report, all correlation coefficients presented are statistically significant at the p = .001 level.

Table 2: Knowledge of Science and Genetic Modification.

	% correct	
	U.S.	Europe
There are some bacteria which live on wastewater. (True)	94%	84%
Ordinary tomatoes do not contain genes, while genetically modified tomatoes do. (False)	57%	36%
By eating a genetically modified fruit,a person's genes could also become modified. (False)	68%	49%
The mother's genes determine whether the child is a girl. (False)	73%	53%
The yeast used to make beer contains living organisms.(True)	76%	63%
Genetically modified animals are always larger than ordinary animals. (False)	57%	38%
It is impossible to transfer animal genes into plants. (False)	48%	26%
The cloning of living things produces genetically identical copies. (True)	69%	66%
More than half the human genes are identical to those of chimpanzees. (True)	55%	52%
Tomatoes genetically modified with genes from catfish would probably taste "fishy." (False)	60%	NA
Genetically modified foods are created using radiation to create genetic mutations. (False)	48%	NA

European data taken from Eurobarometer (Gaskell, Allum, & Stares, 2003)

Table 3: Knowledge of Food Production (n=600)

	% correct
Most of the food in the U.S. is produced on small family farms. (False)	72%
Most of the farmers in the U.S. work off the farm to supplement their income. (True)	58%
There is enough food produced in the U.S. to feed all the people in this country. (True)	69%
Most of the bananas sold in U.S. supermarkets are grown in this country. (False)	84%
Most of the corn grown in the U.S. is used to feed animals such as cows. (True)	55%
Peanuts grow on trees. (False)	84%
The sweetener used in most foods comes from sugarcane. (False)	46%

What Americans Think About When They Think About GM Foods

The public's knowledge of biotechnology, food production and GM foods is low, most people do not perceive themselves as knowledgeable about these topics and GM foods are not a common topic of conversation. Thus, it seems unlikely that most Americans' opinions about GM foods are based on extensive knowledge or forethought about this topic but rather are based on their impressions of the technology.

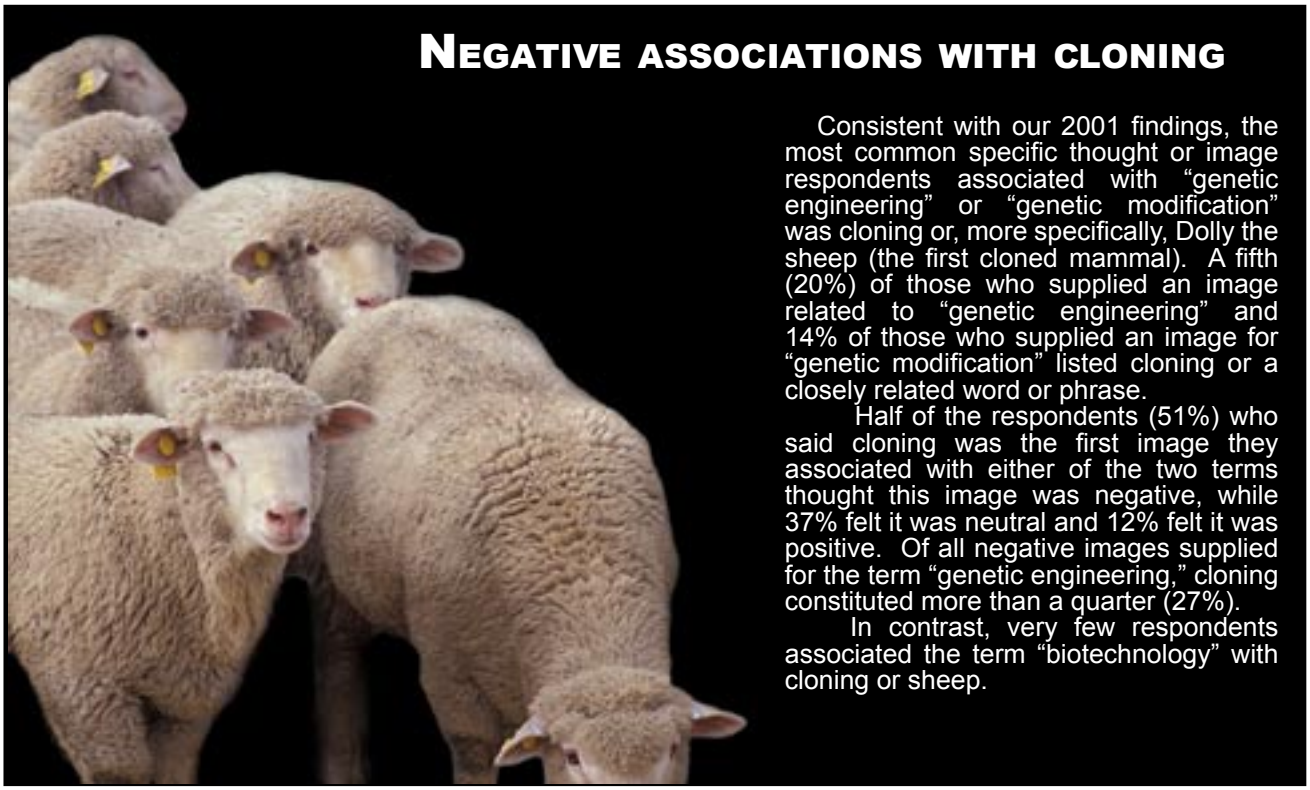
Previous research, including our own 2001 study, has suggested that respondents have different first impressions of the words "biotechnology," "genetic engineering" and "genetic modification." To follow-up on this work, the respondents supplied the first thought or image they associated with these three terms; they were asked to do this before interviewers revealed the topic of the study or mentioned anything about agricultural biotechnology or transgenics. The sample was divided into thirds, and each respondent was presented with only one of the three words. Respondents reported the first thought or image that came to mind and rated that thought or image on a scale from 1 to 5, where 1 is "extremely negative" and 5 is "extremely positive." These thoughts or images were then coded into a set of 53 specific categories, which were then collapsed into a set of 13 broad groups (See Appendix B).

Table 4: First Thought or Image Related to Genetic Engineering (GE), Genetic Modification (GM) or Biotechnology

	GE	GM	Biotech	Avg.
Don't Know	31%	32%	29%	31%
Science	12%	8%	23%	14%
Negative	13%	21%	11%	15%
Positive	5%	4%	10%	6%
Sheep	<1%	<1%		<1%
Other Animals	2%	3%	1%	2%
People	2%	2%	<1%	1%
Changing Things	1%	1%		<1%
Plants	7%	7%	3%	6%
Science Fiction	3%	<1%	4%	2%
Farming	<1%	1%	3%	1%
Cloning	14%	9%	2%	9%
Business/Industry	2%	<1%	4%	2%
Other	7%	9%	11%	9%

Consistent with the fact that many Americans admit knowing little about biotechnology, genetic modification and genetic engineering, nearly a third (31%) could not produce a single thought or image related to these words (see Table 4).

The term genetic modification seemed to evoke the largest percentage of negative responses, including thoughts or images such as "monsters," "danger," "wrong," "unnatural" and "tampering," and other ideas suggesting negative consequences.



Negative associations with cloning

Consistent with our 2001 findings, the most common specific thought or image respondents associated with "genetic engineering" or "genetic modification" was cloning or, more specifically, Dolly the sheep (the first cloned mammal). A fifth (20%) of those who supplied an image related to "genetic engineering" and 14% of those who supplied an image for "genetic modification" listed cloning or a closely related word or phrase.

Half of the respondents (51%) who said cloning was the first image they associated with either of the two terms thought this image was negative, while 37% felt it was neutral and 12% felt it was positive. Of all negative images supplied for the term "genetic engineering," cloning constituted more than a quarter (27%).

In contrast, very few respondents associated the term "biotechnology" with cloning or sheep.

In contrast, the term biotechnology seemed to evoke the most thoughts or images related to science, including those related to DNA, genes, laboratories, biology and hybridization. The term biotechnology also elicited the most positive responses including thoughts or images related to progress, improvements, better medicines and the future, and the term itself received the most neutral response distribution. The term genetic engineering was most often associated with the idea of cloning.

Those who could not conjure an image related to the terms received a follow-up question that asked them to rate the term itself on a scale from 1 to 5 where 1 is 'extremely negative' and 5 is 'extremely positive.' Results from both rating questions can be seen in Figure 9. The term biotechnology is rated most positively, with a mean rating of 2.94, followed by genetic engineering with a mean rating of 2.77 and genetic modification with a mean rating of 2.54.

The fact that different terms can evoke quite different associations suggests that what one calls the technology may have a significant impact on how people are likely to perceive it. One should also be cognizant of this fact when interpreting and comparing the results of this and other surveys that use different terms for the technology.

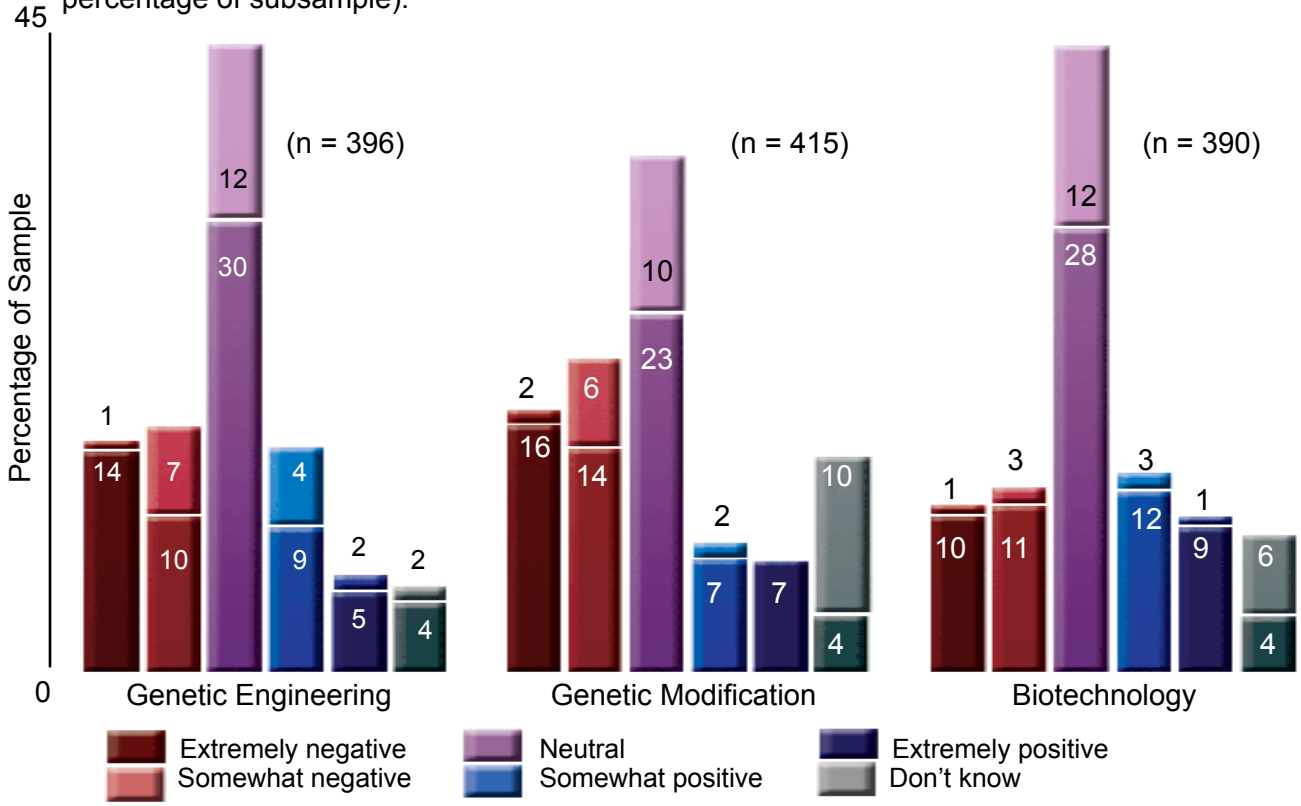
HOW DO AMERICANS FEEL ABOUT GM FOODS?

Our 2003 survey indicates that American opinions about GM foods are divided, much as they were in 2001. However, the American public appears slightly less positive about GM foods than they were two years ago. As Table 5 illustrates, in 2003, about half of the respondents approved of plant-based GM foods (49%), whereas, in 2001, the approval rate was 9% higher, at 58%. Approval ratings of animal-based GM foods remained essentially the same, moving from 28% to 27% in 2003. Disapproval for both plant- and animal-based GM have not changed much since 2001 (2% increases for both), and the

TABLE 5: Percentage Approval of GM Products

	Plant-based			Animal-based		
	2001	2003	Δ	2001	2003	Δ
Strongly Approve	16	12	-4	7	6	-1
Somewhat Approve	42	37	-5	21	21	0
Somewhat Disapprove	19	20	+1	25	21	-4
Strongly Disapprove	18	19	+1	43	45	+2
Don't Know	6	11	+5	5	8	+3

FIGURE 9: Evaluation of First Thought or Image Related to GE, GM or Biotech (Displayed as percentage of subsample).



Lighter portions represent those respondents who could not produce a thought or image related to the term, but were asked to rate the term itself as positive, negative or neutral.

percentages of respondents who report not knowing what they think of these plant- and animal-based technologies have increased (5% and 3% increases, respectively)[5].

That Americans express greater support for the genetic modification of plants than they do for animals is consistent with prior studies (Hallman et al., 2002; Davison, Barns, & Schibeci, 1997), and has not changed over time. Americans are much less receptive to the use of genetic modification to create animal-based products; in 2003, 22% fewer respondents reported approval of animal-based compared to plant-based products, and the majority of the public disapproves of animal-based GM foods (45% disapprove strongly and 21% disapprove somewhat).

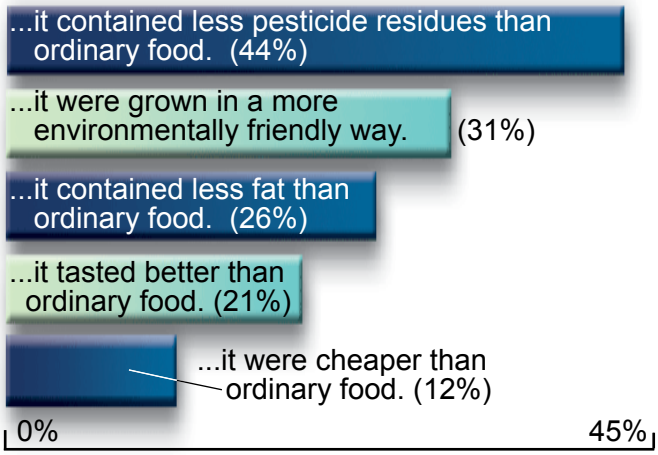
Opinions about animal-based GM foods were more negative and fewer respondents expressed uncertainty about their positions. Only 8% of the respondents were unsure of their opinions about animal-based GM and over half of the respondents considered their opinions to be "strong." In comparison, 11% said they were unsure of their opinions about plant-based GM and only 31% of respondents considered their opinions about this "strong." It should be noted that a "neutral" response option was not provided, and respondents had to volunteer that they were not sure of their opinion.

Highlighting Product Benefits Increases Acceptability

For many Americans, GM technology remains an unfamiliar and abstract concept that, on its own, seems to evoke negative associations. However, people are much more likely to respond favorably when asked about genetically modified products with specific benefits than they are to the general idea of food biotechnology (Figure 10). For example, of those who disapproved of plant-based GM food products, 26% said they would purchase a GM product if it contained less fat and 21% if it tasted better than ordinary food.

GM foods that confer environmental benefits are also looked on favorably. For instance, slightly less than a third (31%) of those who initially disapproved of creating plant-based GM food products said they would be willing to buy a GM product grown in a more environmentally friendly way than ordinary food. Almost half (44%) of those who initially disapproved of plant-based GM food products said they would be willing to purchase them if they contained less pesticide residue than ordinary food. The latter finding is especially interesting considering that reduction in pesticide use is the main benefit conferred by existing GM crops. However, this benefit is indirect and hard to convey to consumers.

Figure 10: Percentage of those who disapproved of plant-based GM technology (n = 470) that would buy GM food if...



Price reductions do not appear to influence consumers as much as other benefits. Only 12% of those who initially disapproved of plant-based GM technology said they would buy GM foods if they were cheaper than ordinary foods. Future research will evaluate this response more rigorously.

The fact that many who initially disapproved of genetic modification in the abstract later indicated that they would buy GM food that conferred a benefit is further evidence that opinions about GM foods are malleable. This is not surprising given that the public's knowledge of biotechnology, food production and GM foods is low, most people do not consider themselves knowledgeable about these topics, and GM foods are not a common topic of conversation. It also suggests that, as Americans learn about potential costs and benefits of biotechnology, their approval ratings are likely to change.

Concerns Associated with GM Foods

Americans report concerns about potential risks to human health associated with GM food. Less than half (45%) believe it is safe to consume GM foods (another 18% say they don't know), and in a separate question, only 44% *disagreed* that eating GM foods would be harmful to their health.

However, they also seem concerned about other potential unintended consequences related to the technology. Almost two-thirds (62%) feel "serious accidents involving GM foods are bound to happen" and 54% feel "GM food threatens the natural order

[5] *The wording for these questions changed slightly between 2001 and 2003. In 2001, the survey asked if respondents approved of "hybrid animals" and "hybrid plants" created using genetic modification. In 2003, the survey asked if respondents approved of using genetic modification to create "plant-based food products" and "animal-based food products."*

of things." Only a quarter (24%) agreed with the statement, "genetically modified food presents no danger for future generations," while half (50%) disagreed and another quarter (25%) was unsure.

These results suggest that while most Americans say they know little about genetic modification, many may be uneasy about the potential long-term consequences of GM foods, or are at least willing to express some skepticism about its long-term safety.

Additional measures suggest that Americans are less positive about genetic modification in general than they were in 2001. Thirty-nine percent of the 2003 sample stated that they thought genetic modification would improve their quality of life, compared to 59% of the 2001 sample. In 2003, a third (35%) felt it would make their quality of life worse, and a quarter (25%) were not sure how genetic modification would affect their lives. Compared to 2001, 19% fewer people thought genetic modification would improve their quality of life, 8% more people thought genetic modification would make their quality of life worse, and 10% more people were unsure (Table 6).

TABLE 6: How Respondents Think GM food Will Affect Their Quality of Life

	2001	2003	% change
Much Better	14%	9%	-5
Somewhat Better	45%	31%	-14
Somewhat Worse	17%	22%	+5
Much Worse	9%	13%	+4
Not Sure	15%	25%	+10

BELIEFS ABOUT THE ACCEPTABILITY OF GM EASILY INFLUENCED

American opinions about GM food appear so unstructured and malleable that the way a question is worded drastically affects response. Two opinion questions with similar meanings but slightly different wording rendered strikingly different results.

The first question asked half of the sample to agree or disagree with the statement, "I would be unhappy if I were served genetically modified food in a restaurant without knowing it." More than two-thirds (65%) agreed, less than a third (31%) disagreed, and 4% did not know how they felt about the statement.

The second question asked the other half of the sample to agree or disagree with the statement, "If food I was eating in a restaurant contained genetically modified food, I would not mind." Less than half (45%) agreed, around the same number (44%) disagreed, and 10% did not know how they felt about the statement.

This set of questions suggests that Americans have not made up their minds about genetically modified food. It is unlikely that such a change in phrasing would alter results as significantly if respondents had already formed strong attitudes prior to taking the survey.

IMPORTANCE OF AVOIDING GM IN DECIDING WHAT TO EAT

Early in the survey, participants rated the importance of a variety of food characteristics in deciding what to eat.

Participants rated, on a scale of 1 to 10, how important it is that the food they purchase does not contain GM ingredients. More than half (53%) gave a rating of six or higher and a quarter (25%) gave a rating of 10 (extremely important). The remaining 47 percent gave a rating of five or lower, with 14 percent giving a rating of one (not at all important). People who thought there were no GM foods currently available in supermarkets placed greater importance on avoiding GM ingredients than did the general population, 63 percent rating it six or above and 34 percent rating it as 10 (extremely important).

Figure 11 shows that avoidance of GM foods received a similar rating to such things as "no artificial colors" or "no artificial flavor."

WHAT IS RELATED TO APPROVAL OF GM?

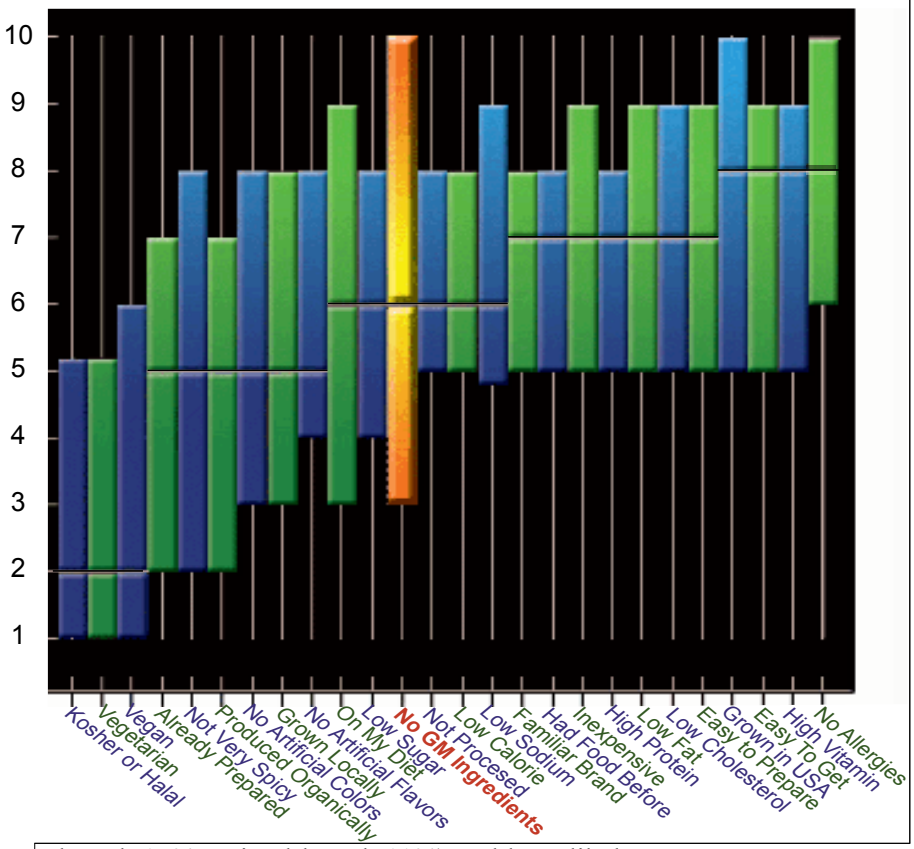
An important goal of this study is to identify what is driving opinions of food biotechnology. For example, are certain demographic groups more likely to approve GM foods? Or, are people with certain attitudes about foods or certain food purchasing histories more likely to accept GM foods? This section represents an initial investigation into factors that are related to approval of GM food.

DIFFERENCES IN APPROVAL BY DEMOGRAPHIC GROUPS

Age, education and sex are all significantly related to approval of GM foods. Americans over 64 feel differently about GM foods than do younger Americans (Appendix C). Respondents over 64 reported less approval for GM foods compared to those in other age groups. They were also less likely to have an opinion of GM foods, as over one quarter of respondents over 64 (27%) said that they did not know if they approve of plant-based GM food, and 19% said that they did not know if they approved of animal-based GM foods.

Respondents whose education did not extend beyond high school were most likely to say that they did not know what they thought of GM foods (plant-

FIGURE 11: Importance of Avoiding GM When Deciding What to Eat Compared to Other Factors (horizontal lines represent median rating).



based: 15%; animal-based: 11%) and least likely to approve of plant-based GM. Respondents with post-graduate degrees were most likely to approve of both plant- and animal-based GM.

There is also a relationship between sex and opinions of GM foods. Men were much more likely to approve of both plant- and animal-based GM (16% more likely for both). Women were slightly more likely to say that they do not know what they think of plant- and animal-based GM foods (5% and 3% more likely, respectively).

There are additional demographic variables that are related to opinions, but that are not independent of those presented here. For example, income and employment are related to acceptance, but are not independent of education levels. Later publications will focus on understanding the relationships among these variables and the roles they play in acceptance.

Increased Knowledge is Related to Increased Approval

As outlined earlier, both perceived and actual knowledge about GM food are quite low. However, even people with the lowest level of knowledge expressed opinions about GM food. Eighty percent of those who reported that they knew "nothing at all" and 89% of those who said they knew "very little" about genetic modification gave an opinion about its use to create plant-based food products. The absence of a "neutral" option in these questions was probably partly responsible for this.

Perceived knowledge about GM foods had a weak positive relationship with approval of plant-based GM ($r = .14$) and animal-based GM products ($r = .14$). Similarly, actual knowledge of biotechnology (as measured by scores on the biotechnology quiz) was weakly related to approval of plant-based GM ($r = .22$) and animal-based GM products ($r = .14$).

Thus, the more knowledgeable one is (or perceives oneself to be) the more likely one is to approve of GM foods, but the relationship is weak.

It is interesting to note that the initial reaction of those who report knowing "nothing at all" about GM foods is largely negative. Of those who say they know nothing about GM foods, 46% disapprove of the use of GM to create plant-based foods and an even larger percentage disapproves of animal-based GM (66%), and those who know "nothing at all" about GM foods are less likely to be undecided about animal-based compared to plant-based GM foods (14% and 20%, respectively).

Respondents with Certain Food Preference Styles Are Less Likely to Accept GM Food

People have different styles that influence what they choose to eat. One style is having a preference for "naturalness" in foods. This was measured with ratings of the importance that foods not contain artificial colors or flavors and that foods are not processed, are produced locally and are organic. A second style is a preference for "healthfulness" in foods, and was measured with ratings of the importance of food being low on calories, fat, cholesterol, sugar, and sodium, high in vitamins, and "on my diet." A third, "restricted" style was measured with ratings of the importance that foods meet three types of dietary restrictions: vegetarian, vegan, and Kosher. Only half of the sample was asked to rate these attributes, and a ten-point response scale was used for all items, where 1 was "not at all important" and 10 was "extremely important" in deciding what to eat (Figure 11).

These three scales are weakly but significantly negatively correlated to acceptance of GM foods. Not surprisingly, people who rated the naturalness

of their food as important were less likely to approve of GM foods (plant-based: r = -.28; animal-based: r = -.25). Similarly, a negative relationship between healthfulness and approval of GM was found (plant-based: r = -.15; animal-based: r = -.13), such that people who rated healthfulness as important were less likely to approve of GM foods. Finally, those following strict vegan, vegetarian or Kosher diets were less likely to approve of GM foods (plant-based: r = -.27; animal-based: r = -.16).

Organic Food Consumers Are Less Likely to Approve of GM

More than one in ten respondents (11.8%) reported that they purchase organic food products frequently or exclusively, and this group was less accepting of GM food than the general population. There were small but significant negative relationships between having purchased organic food and approval of plant-based GM food (r = -.12) and approval of animal-based GM food (r = -.10). Organic purchasers had an approval rate of 36% for GM plant products (compared to 52% of non-organic purchasers) and an approval rate of only 13% for GM animal products (compared with 29% of non-organic purchasers). Over half (55%) said GM technology would make their quality of life worse, compared to only 32% of non-organic purchasers.

Consumers of certified organic also seem to have more contact with information concerning genetically modified food. While 54% of the non-organic consumers claimed to have heard or read "some" or "a great deal" about genetic modification, 78% of frequent organic consumers made the same claim. These respondents also said they know more about genetic modification, with 39% reporting that they know "some" or a "great deal" about it (compared to 22% of non-organic consumers). They were also more likely to have had a conversation about the technology, as 53% said they had had at least one discussion about the topic prior to the interview (compared to 36% of non-organic consumers).

Food Allergies Not Related to Acceptance

One of the issues raised by opponents of GM technology is the potential for the unintentional transfer of allergens to formerly hypoallergenic foods (Centers for Disease Control and Prevention, 2001). Although such transfers are not known to have occurred in commercially available GM foods, some have suggested that those with food allergies should be especially concerned about genetically modified foods. Thus it is interesting that the results of this study suggest that allergic individuals, who represented more than 11% of the sample, are no less accepting of GM than the rest of the population. In fact, food-allergic people had a slightly higher acceptance rate of plant-based GM compared to those with no food allergies (51% and 49%, respectively). When respondents who reported disapproval of GM foods were asked to say in their own words why they found GM foods unacceptable, only one respondent mentioned food allergies as a reason.

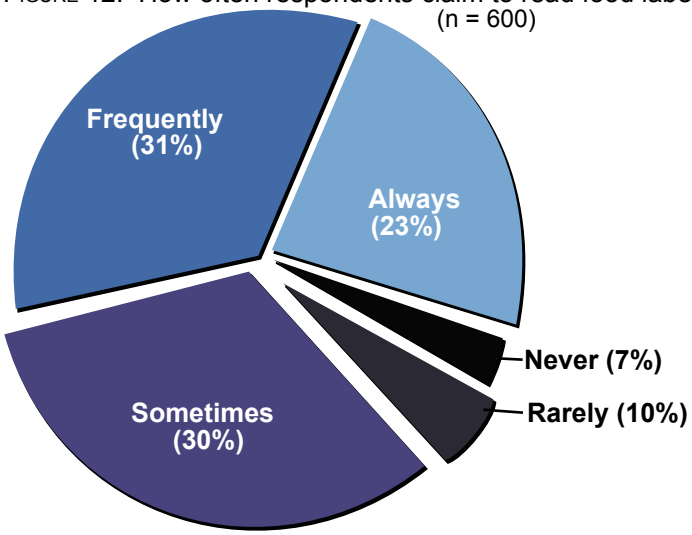
Food allergic respondents were slightly more knowledgeable about GM foods than non-allergic respondents. Almost 62% were aware that GM foods are available in supermarkets, compared with 51% of non-allergic individuals. A little more than a third (37%) of non-allergic individuals said they had had at least one conversation about GM foods, compared with half of the allergic respondents (50%) who said the same. Two-thirds of allergic individuals (66%) and over half (56%) of the entire sample had heard or read "some" or "a great deal" about the topic.

Do People Want to Know If They Are Eating GM Products?

The issue of mandatory labels for GM foods is a contentious one. Proponents of such labels maintain that they are essential if consumers are to retain the "right to know" about the foods they eat. Critics of mandatory labels argue that such labeling schemes would require difficult and expensive efforts to segregate GM and non-GM ingredients. They also argue that it is likely that most consumers would not use the information.

Respondents were asked how often they typically read food labels. This question was asked prior to any mention of GM foods. More than half of the respondents (54%) said they read them "frequently" or "always," 30% said they "sometimes" read food labels, and 17% said they "rarely" or "never" read food labels (Figure 12).

FIGURE 12: How often respondents claim to read food labels (n = 600)

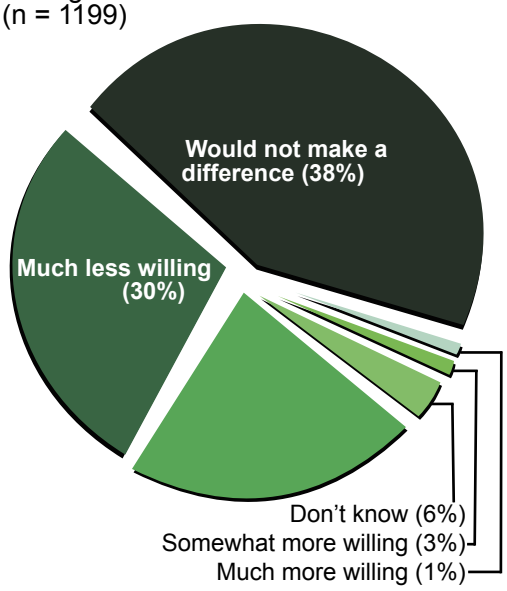


When asked, more than three quarters (78%) of the respondents said that there was no additional information they were interested in seeing on food labels. Of those who said there was additional information they wished to see on labels, only six respondents (less than 1%) said they would like the label to indicate whether or not the product contained genetically modified ingredients.

In contrast, after the issue of GM foods was introduced, the respondents were asked directly whether or not they would like to see GM foods labeled as such. In response, 94% said yes, a slight increase from 2001 when only 90% of respondents stated that they would like to see GM foods labeled. Even among the respondents who said they never pay attention to food labels, 95% said they wanted this information.

When asked how a GM food label would affect their purchasing decisions, 38% said it would make no difference while 52% said it would make them less willing to purchase the product. Only 4% of the sample said they would be more willing to buy a product labeled as genetically modified, and 6% did not know (Figure 13). More than three quarters (67%) of the entire sample said they would take the time to read food labels if this information was present, including 44% of those who said they rarely or never read food labels.

FIGURE 13: Effect of GM Ingredient Label on Willingness to Purchase Food Products (n = 1199)



CONCLUSIONS

Continuing advancements in biotechnology will significantly impact the future of food and agriculture, and in coming years important policy decisions will determine the direction of these developments. These decisions will, of course, require a careful and balanced analysis of the scientific evidence concerning potential risks, costs, and benefits of these technologies. However, because of the potential economic, social and environmental consequences of such policy decisions, public perceptions of the technologies should also play a key role.

The data presented here, from the second in a series of national telephone surveys, permit examination of the basis, strength, and persistence of consumer attitudes about agricultural biotechnology in the United States. The results indicate that Americans are generally unaware of GM foods. About half of Americans do not know that GM foods are currently available in supermarkets, only a quarter believe that they have ever eaten GM foods, and the topic is rarely discussed. Awareness has increased slightly over the past two years, but Americans' knowledge of biotechnology remains as low at it was in 2001.

American opinion of the acceptability of GM foods is split. Half of the public approves of plant-based GM foods, while only about a quarter approves of animal-based GM foods. Approval of GM food has declined somewhat in the past two years and more people are uncertain what they think of these products.

These opinions are sensitive to question wording. Americans become much more positive when the potential benefits of GM foods, such as decreased use of pesticides, are mentioned. Two similar but differently worded questions asked about how people would feel if they were served GM foods in a restaurant ("I would be unhappy if…" vs. "I wouldn't mind if…") and resulted in a 21% difference in the reports of how people would feel. In addition, a recent study by the Pew Initiative on Food and Biotechnology (2003) found that only one quarter of Americans favor "the introduction of genetically modified foods into the US food supply" and 58% oppose it. The Pew survey (Pew Initiative on Food and Biotechnology, 2003) did not differentiate between different uses of the technology (e.g., plant-based or animal-based), and their results are similar to the results of our question on approval of animal-based GM food but quite different from our question about approval of plant-based GM food. Taken together, these findings indicate that public opinion of GM foods is sensitive to question

CONCLUSIONS

wording and they provide further evidence that opinions of GM foods are not easily summarized by responses to a single question.

Demographics and food choice are somewhat related to acceptance of GM foods. Women, people over 64, and those with low levels of education are somewhat less likely to approve of GM foods. People who report that naturalness and healthfulness are important attributes of the food they choose, in addition to people who have a history of purchasing organic food, are less likely to approve of GM foods.

Most Americans do not mention genetic modification when asked what information they would like to see on food packaging, but almost all Americans report that they believe GM foods should be labeled as such when asked directly.

In conclusion, most Americans have yet to firmly make up their minds about GM foods. This has not changed from two years ago. Until we see significant increases in the public's awareness and knowledge of GM foods, it is unlikely that the strength of their opinions will increase.

This report was designed to contribute to a more complete understanding of how Americans' opinions are changing over time and how key forces influence these opinions. Our goal is to increase the specificity, availability, comparability and balance of literature dealing with public perception of genetically modified food. The Food Policy Institute will continue to track public perceptions using similar survey instruments over the next few years.

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APPENDIX A: 2003 QUESTIONNAIRE

Hello, I'm (first and last name) calling for the Food Policy Institute at Rutgers University. We're conducting a survey on food, health and technology for the U.S. Department of Agriculture. We're interested in your opinions. All of your answers during the phone survey will remain confidential. Because we must interview an equal number of males and females, may I please speak: **[CATI ROTATE RESPONDENT SELECTION CHOICE "A" AND "B"]**

A. …with a male, 18 years of age or older who had the most recent birthday in your household? **[IF MALE NOT AVAILABLE ARRANGE CALLBACK. IF NO MALES EXIST, ASK:]** May I speak to the female who is 18 years or older who had the most recent birthday?

B. …with a female, 18 years of age or older who had the most recent birthday in your household? **[IF FEMALE NOT AVAILABLE ARRANGE CALLBACK. IF NO FEMALES EXIST, ASK:]** May I speak to the male who is 18 years or older who had the most recent birthday?

INTERVIEWER RECORD SEX OF RESPONDENT: 1 – Male 2 – Female

1. Would you say that you do most of the food shopping for your household, that someone else does most of the food shopping, or would you say that the task is equally divided?

   1 – Yes, I do most of the food shopping
   2 – Someone else does most of the shopping
   3 – Equally divided
   8 – Don't know
   9 – Refused

2. On average, how many times a week do you prepare, or help to prepare, your main meal of the day? Would you say: **(READ LIST)**

   1 – Never,
   2 – Rarely,
   3 – Sometimes,
   4 – Frequently, or
   5 – Always?
   8 – (vol) Don't know
   9 – (vol) Refused

3. Would you rate your own basic understanding of how food is grown and produced as: **(READ LIST AND LIMIT TO ONE RESPONSE)**

   1 – Poor,
   2 – Fair,
   3 – Good,
   4 – Very good, or
   5 – Excellent?
   8 – (vol) Don't know
   9 – (vol) Refused

4. My next question involves word association. For example, when I mention the word *baseball*, you might think of the World Series, Babe Ruth, or summertime.

When you think about (insert one of the four terms), what is the first thought or image that comes to mind? **[RECORD VERBATIM]**

[CATI INSERT ONLY ONE OF THE FOUR WORDS IN EACH, SO THAT EACH WORD IS ASKED 25% OF THE TOTAL SAMPLE]

a. **Organic?**

b. **Natural?**

c. **Farming?**

d. **Nature?**

5. Would you say this thought or image is positive, negative, or neutral? **[IF RESP. ANSWERS "POS" OR "NEG" ASK: Is that extremely or somewhat (positive/negative?)**

1 – Extremely negative,
2 – Somewhat negative,
3 – Neutral,
4 – Somewhat positive, or
5 – Extremely positive?
8 – (vol) DK
9 – (vol) REF

6. Now I'd like you to think about the role of food in your life. Please tell me whether you agree or disagree with the following statements about food. **[CATI RANDOMIZE ORDER OF STATEMENTS]**

a. I think about food a lot?
b. I consider eating one of life's great pleasures?
c. Food is an important part of my family traditions?
d. I eat primarily to stay healthy?
e. I think that cooking is an expression of love?
f. I like to cook?
g. I consider myself to be a good cook?

[STATEMENTS H TO P "A" VERSION ONLY]

h. The way food looks is less important than the way it tastes?
i. Food is a good way to learn about different cultures?
j. Food should not take a lot of effort to eat?
k. I like to give food as gifts?
l. Food should not take a lot of time to make?
m. Food should be kept simple?
n. My family has a secret recipe?
o. I like to watch cooking shows?
p. I like to subscribe to cooking magazines?

7. Now I'd like to ask you about the kinds of things you consider important when deciding what to eat. For each of the following please tell me what is important to you when deciding what to eat. On a scale from 1 to 10 where 1 is "not at all important" and 10 is "extremely important," how important is it that (insert statement) in deciding what to eat? **[IF RESP. SAYS "IT DEPENDS ON THE ITEM/ WHAT I'M BUYING, ETC" SAY: I realize some of the items I read may be more applicable to some food products more than others….think about each statement in more general terms….that is your overall decisions."**

[CATI RANDOMIZE ITEMS. DK = 98 REF =99 RATINGS 1 TO 10]

a. It's a food you've had before?
b. It's grown in the USA?
c. It's produced organically?
d. It doesn't contain artificial colors?
e. It doesn't contain artificial flavors?
f. It's a familiar brand?
g. It's vegetarian?
h. It doesn't contain any ingredients you're allergic to?
i. It's Kosher or Halal (Hah – lal)?
j. It's not been processed?
k. It's vegan? (vee'-gan) **[NOTE: IF ASKED FOR DEFINITION. A VEGAN CONSUMES NO ANIMAL PRODUCTS OR ANIMAL BY-PRODUCTS]**

[STATEMENTS L TO R "B" VERSION ONLY]
l. It has a low calorie content?
m. It has a low cholesterol content?
n. It has a low sodium content?
o. It has a low fat content?
p. It has a high vitamin content?
q. It has a low sugar content?
r. It has a high protein content?

s. It's easy to get?

[STATEMENTS T TO Y "B" VERSION ONLY]
t. It's already been prepared?
u. It's easy to prepare?
v. It's inexpensive?
w. It's on my diet?
x. It's not very spicy?
y. It's grown locally?

8. Please tell how often you eat the following food products? Do you eat **(insert from list)** regularly, frequently, occasionally, or never? **[REPEAT SCALE AS NEEDED]**

a. Corn flakes cereal?
b. Ground beef?
c. Bananas?

[STATEMENTS D TO N "A" VERSION ONLY]

d. Snack foods?
e. Sodas, pop, or soft drinks?
f. Coffee or tea?
g. Alcoholic beverages?
h. Sports drinks (like Gatorade or Powerade)?
i. Energy drinks (like Red Bull, (So-Be, or Burn)?
j. Power, energy, or protein bars?
k. Vitamin supplements?
l. Herbal supplements? **[IF NEEDED: LIKE BEE POLLEN, GINGKO, ST. JOHN'S WORT]**
m. Sugar substitutes?
n. Meal replacements **[IF NEEDED: SLIMFAST, ENSURE, INSTANT BREAK-FASTS]**

9. Are you allergic to particular food or food products?

1 – Yes 2 – No 8 – DK 9 - REF

10. Is anyone else in your household allergic to particular foods or food products?

1 – Yes 2 – No 8 – DK 9 – REF

[QUESTIONS 12 TO 14 VERSION "A" ONLY]

12. Now I would like to ask you a few questions concerning food labels. Beyond just looking at the brand name, how often do you read food labels? Do you read them never, rarely, sometimes, frequently, or always?

1 – Never
2 – Rarely
3 – Sometimes
4 – Frequently
5 – Always
8 – Don't know
9 – Refused

13. Thinking about the way food is currently labeled, is there any additional information you would like to see included on food labels?

1 – Yes
2 – No **[GO TO Q.15]**
8 – DK **[GO TO Q.15]**
9 – REF **[GO TO Q.15]**

14. What additional information would you be interested in seeing on food labels? **[DO NOT READ LIST. CHECK ALL THAT APPLY. PROBE: "ANYTHING ELSE?"]**

1 – Contains pesticides
2 – Contains GMO's
3 – Fat content
4 – Health benefits
5 – Grown locally
6 – Country of origin
7 – Certified Organic
8 – Irradiation (food was irradiated)
9 – More information about ingredients
17 – Other (specify)
18 – DK
19 - REF

15. How often do you buy food products labeled specifically as "Organic?" Would you say: **[READ LIST]**

1 – Never,
2 – Rarely,
3 – Sometimes,
4 – Frequently, or
5 – Always?
8 – (vol) DK
9 – (vol) REF

11. Please tell me whether the following statements about your eating habits are true or false? **[RANDOMIZE]**

a. I'm careful about the foods I put into my body?
b. I consider my diet to be mostly "meat and potatoes"?
c. People say I am a picky eater?
d. I am usually willing to try new foods?

[STATEMENTS E TO H "B" VERSION ONLY]
e. I tend to eat meals even when I'm not hungry?
f. I often skip meals?
g. When I am sad or upset I eat to make myself feel better?
h. I dislike eating leftovers?

[Q.16 VERSION "B" ONLY]

16. Please tell me whether you tend to strongly disagree, somewhat disagree, neither disagree or agree, somewhat agree, or strongly agree with the following statements.

    Compared to what people ate 50 years ago, food available in the grocery store (insert statement).

    a. Is healther now?
    b. Tastes better now?
    c. Is safer now?
    d. Is more nutritious now?
    e. Has more preservatives now?
    f. Is less expensive now relative to the cost of living?
    g. Is fresher now?
    h. Has more pesticide now?
    i. Has a longer shelf life now?

17. My next question again involves word association. When you think about (insert one of the three terms) what is the first thought or image that comes to mind? **[RECORD VERBATIM]**

    [CATI INSERT ONLY ONE OF THE 3 PHRASES IN EACH, SO THAT EACH IS ASKED OF 1/3 OF THE TOTAL SAMPLE]

    a. Genetic engineering?

    b. Genetic modification?

    c. Biotechnology?

[IF RESPONSE TO Q.17 IS "DK/REF" GO TO Q.18B]

18a. Would you say this thought or image is positive, negative, or neutral? **[IF RESP. ANSWERS "POS" OR "NEG" ASK: Is that extremely or somewhat (positive/negative?)**

    1 – Extremely negative,
    2 – Somewhat negative,
    3 – Neutral,
    4 – Somewhat positive, or
    5 – Extremely positive?
    8 – (vol) DK
    9 – (vol) REF

18b. Would you say you feel the term (insert term from Q.17) is positive, negative, or neutral? **[IF RESP. ANSWERS "POS" OR "NEG" ASK: Is that extremely or somewhat (positive/negative?)**

    1 – Extremely negative,
    2 – Somewhat negative,
    3 – Neutral,
    4 – Somewhat positive, or
    5 – Extremely positive?
    8 – (vol) DK
    9 – (vol) REF

[Q19 VERSION "A" ONLY]

19. Please tell me whether you think the following statements about farming are true or false?

    a. Most of the food in the U.S. is produced on small family farms?
    b. Most of the farmers in the U.S. work off the farm to supplement their income?
    c. There is enough food produced in the U.S. to feed all the people in this country?
    d. Most of the bananas sold in the U.S. supermarkets are grown in this country?
    e. Most of the corn grown in the U.S. is used to feed animals such as cows?
    f. Peanuts grow on trees?
    g. The sweetener used in most foods comes from sugarcane?

20. Now I would like to ask you a question concerning another food production method. Genetic modification involves new methods that make it possible for scientists to create new plants and animals by taking parts of the genes of one plant or animal and inserting them into the cells of another plant or animal. This is sometimes called genetic engineering or biotechnology. How much have you heard or read about these methods? Would you say you've heard or read **(READ LIST)**

    1 – Nothing at all,
    2 – Not much,
    3 – Some, or
    4 – A great deal about these methods?
    8 – (vol) DK
    9 – (vol) Ref

21. Before this interview, have you ever discussed biotechnology, genetic engineering, or genetic modification with anyone?

    1 – Yes
    2 – No **(GO TO 22a)**
    8 – DK **(GO TO 22a)**
    9 – REF **(GO TO 22a)**

    21a. Would you say you have discussed this issue **(READ LIST):**

        1 – Frequently,
        2 – Occasionally, or
        3 – Only once or twice?
        8 – (vol) DK
        9 – (vol) REF

22a. How much do you know about biotechnology, genetic engineering, or genetic modification? Would you say you know **(READ LIST):**

    1 – Nothing at all, **(GO TO Q.23)**
    2 – Very little,
    3 – A fair amount, or
    4 – A great deal?
    8 – (vol) DK
    9 – (vol) REF

22b. As it is currently being used, do you believe biotechnology, genetic engineering, or genetic modification is acceptable?

1 – Yes **(GO TO Q.23)**
2 – No
8 - DK **(GO TO Q.23)**
9 – REF **(GO TO Q.23)**

22c. Why do you consider biotechnology, genetic engineering, or genetic modification unacceptable? **[DO NOT READ LIST. PROBE FOR CLARITY AS NEEDED. MULTIPLE RECORD.]**

1 – Violates religious or ethical principles
2 – Is unhealthy for humans
3 – Is unhealthy for animals
4 – Is unhealthy for the environment
5 – Changes the taste or nutritional value of the food
6 – Is just wrong
17 – Other (specify)
18 – DK
19 - REF

[ASK ALL]

23. As far as you know, have you ever eaten any food containing genetically modified ingredients?

1 – Yes 2 – No 8 – DK 9 – Ref

24. As far as you know, are there any foods containing genetically modified ingredients in supermarkets now?

1 – Yes 2 – No 8 – DK 9 – Ref

25. On a scale of 1 to 10 where “1” means it is “not important” and “10” means it is “extremely important”…how important is it when deciding what to eat to have foods that DO NOT contain genetically modified ingredients?

1 2 3 4 5 6 7 8 9 98 (DK) 99 (REF)

26. Do you think that foods that contain genetically modified ingredients should be labeled as such?

1 – Yes 2 – No 8 – DK 9 – Ref

27. If you were shopping and saw that some products were labeled as containing genetically modified ingredients, would you be any more willing or less willing to purchase them, or would it not make a difference?

[IF MORE OR LESS ASK: Is that much (more/less) willing, or somewhat (more/less) willing?]

1 – Much more willing
2 – Somewhat more willing
3 – Somewhat less willing
4 – Much less willing
5 – Would not make a difference
8 – Don't know
9 - Refused

28. When you are shopping, would you take the time to look at labels to see if genetically modified ingredients are listed?

1 – Yes 2 – No 8 – Don't know 9 – Refused

29. In general, do you approve or disapprove of using genetic modification to create plant based food products? **[IF APPROVE/DISAPPROVE: Is that strongly or somewhat (approve/disapprove)?]**

1 – Strongly approve
2 – Somewhat approve
3 – Somewhat disapprove, or
4 – Strongly disapprove?
8 – Don't know
9 - Refused

30. In general, do you approve or disapprove of using genetic modification to create animal based food products? **[IF APPROVE/DISAPPROVE: Is that strongly or somewhat (approve/disapprove)?]**

1 – Strongly approve
2 – Somewhat approve
3 – Somewhat disapprove, or
4 – Strongly disapprove?
8 – DK
9 – Ref

31. From what you know or have heard, do you think genetic modification will make the quality of life for people such as yourself <u>better or worse?</u> **[PROBE: Is that much (better/worse) or somewhat (better/worse)?**

1 – Much better
2 – Somewhat better
3 – Somewhat worse
4 – Much worse
8 – Don't know
9 – Refused

32. Please tell me whether you tend to agree or disagree with the following statements about genetically modified food. **[CATI RANDOMIZE STATEMENTS]**

a. Genetically modified food presents no danger for future generations?
b. Eating genetically modified food will be harmful to my health or my family's health?
c. Genetically modified food threatens the natural order of things?
d. I think it is safe for me to eat genetically modified food?
e. Serious accidents involving genetically modified foods are bound to happen?
f. I am sure about my opinions about genetically modified food?
g. I would buy genetically modified food if it contained less fat than ordinary food?
h. I would pay more for non-genetically modified food?
i. I would buy genetically modified food if it contained less pesticide residues than ordinary food?
j. I would buy genetically modified food if it were grown in a more environmentally friendly way than ordinary food?
k. I would buy genetically modified foods if it tasted better than ordinary food?
l. I would be prepared to take part in public discussions or hearings about biotechnology?
m. I would take time to read articles or watch TV programs on the advantages and disadvantages of biotechnology?
n. I would buy genetically modified food if it were cheaper than ordinary food?
o. I think the potential benefits of genetic modification outweigh the potential harms?

[P1 VERSION A ONLY]

p1. I would be unhappy if I were served genetically modified food in a restaurant without knowing it?

[P2 VERSION B ONLY]

p2. If food I was eating in a restaurant contained genetically modified food, I would not mind?

[Q'S 33 TO 35 VERSION B ONLY]

33. I'm now going to ask you about your involvement with the news. During the last week how often did you (insert item a to h individually), would you say never, once, more than once but not everyday, or everyday?

a. Read a newspaper?
b. Watch national news?
c. Watch local news?
d. Listen to talk radio?
e. Listen to public radio?
f. Listen to news radio?
g. Read a news magazine?
h. Get news through the internet?

34. Do you recall any events or news stories concerning genetically modified food?

1 – Yes
2 – No **(GO TO Q.36)**
8 – DK **(GO TO Q.36)**
9 – REF **(GO TO Q.36)**

35. What were they? **[DO NOT READ LIST. MULTIPLE RECORD]**

1 – Starlink
2 – Prodigene
3 – Soybeans
4 – Monarch Butterfly
5 – Pharmaceuticals in food supply
6 – Taco Bell taco-shells/taco-shells
7 – Dolly the Sheep
8 – Mexican Maize
9 – Something to do with corn
17 – Other (specify)
18 – Don't know
19 – Refused

[ASK ALL]
36. Would you rate your own basic understanding of science and technology as **[READ LIST]:**

1 – Poor,
2 – Fair,
3 – Good,
4 – Very good, or
5 – Excellent?
8 – (vol) Don't know
9 – (vol) Refused

37. For each of the following statements, please tell me whether you think it is true or false? **[RANDOMIZE]**

a. There are bacteria which live on waste water?
b. Ordinary tomatoes do not contain genes, while genetically modified tomatoes do?
c. By eating a genetically modified fruit, a person's genes could also become modified?
d. It is the mother's genes that determine whether a child is a girl?
e. Yeast for brewing beer consists of living organisms?
f. Genetically modified animals are always bigger than ordinary animals?
g. It is not possible to transfer animal genes to plants?
h. Tomatoes genetically modified with genes from catfish would probably taste fishy?
i. Genetically modified foods are created using radiation to create genetic mutations?
j. The cloning of living things produces genetically identical copies?
k. More than half of the human genes are identical to those of chimpanzees?

38. Finally I have a few questions for classification purposes only. What was your age on your last birthday?

(97 = 97 or older, 98 = DK, 99 = Ref)

39. **[IF "DK" OR "REF" IN 38:]** I don't need to know exactly. Are you: **[READ LIST]**

1 – 18 to 24
2 – 25 to 34
3 – 35 to 44
4 – 45 to 54
5 – 55 to 64
6 – 65 or older
8 – (vol) Don'tknow
9 – (vol) Refused

40. What is the last year or grade of school you completed? **[INTERVIEWER PROBE FOR THE LAST LEVEL OF FORMAL EDUCATION]**

1 – No formal schooling
2 – 1st thru 7th grade
3 – 8th grade
4 – Some high school (9th but didn't finish 12th)
5 – High school graduate/GED
6 – Some college/2 year Associate Degree
7 – Four year college degree
8 – Post graduate
9 – Refused

41. Are you presently employed full-time, part-time, in the military, unemployed, retired and not working, a student, a homemaker, or are you disabled or too ill to work.

1 – Employed full-time
2 – Employed part-time
3 – In the military
4 – Unemployed
5 – Retired
6 – Student
7 – Homemaker
8 – Disabled/too ill to work
9 – Refused

42. Are you currently single, married, unmarried but living with a partner, separated, divorced or widowed?

1 – Single
2 – Married
3 – Unmarried but living with a partner
4 – Separated
5 – Divorced
6 – Widowed
8 – Don't know
9 – Refused

43. Including yourself, how many adults, 18 years or older, currently live in your household? **[RESPONSE MUST BE AT LEAST ONE. 98 = DK, 99 = REF]**

44. Do you have any children 17 years or younger living in the household?

1 – Yes 2 – No 8 – Don't know 9 – Refused

[REFER TO Q.41. IF EMPLOYED FULL OR PART TIME ASK:]

45. How many hours a week do you work on average? **[98 = DK, 99 = REF]**

46. During an average month, would you say you attend a church or other house of worship…**[READ LIST]**

1 – At least once a week,
2 – Several times a month,
3 – At least once a month,
4 – Less than once a month,or
5 – Never?
8 – (vol) DK
9 – (vol) REF

47. Regardless of the political party you might favor, do you consider yourself to be a liberal, conservative, or somewhere in between?

1 – Liberal **[GO TO Q.49]**
2 – Conservative **[GO TO Q.49]**
3 – Somewhere in between
8 – DK **[GO TO Q.49]**
9 – REF **[GO TO Q.49]**

48. Do you lean more toward the liberal side or more toward the conservative side?

1 – Liberal
2 – Conservative
3 – Somewhere in between
8 – Don't know
9 – Refused

49. Are you, yourself, of Hispanic origin or descent that is Mexican, Puerto Rican, Cuban, Central American, South American or some other Spanish background?

1 – Yes 2 – No 8 – DK 9 – REF

50. Are you white, black/African-American, Asian or Pacific Islander, Native American or of some other race?

1 – White
2 – Black/African-American
3 – Asian or Pacific Islander
4 – Native American
5 – Other (specify)
8 – Don't know
9 – Refused

51. Would you say your total household income for 2002 was below $50,000 or was it $50,000 or above?

1 – Below $50,000
2 - $50,000 or above
3 – DK
4 – REF

52. **[IF BELOW $50K]** Was it: **[READ CHOICES]**

1 – Under $25,000,
2 - $25,000 to $34,999, or
3 - $35,000 to $49,999?
8 – (vol) DK
9 – (vol) REF

53. **[IF $50K OR ABOVE]** Was it: **[READ CHOICES]**

1 – $50,000 to $74,999
2 - $75,000 to $99,999,
3 - $100,000 to $124,999, or
4 - $125,000 or more?
8 – (vol) DK
9 – (vol) REF

54. **[STATE READ IN FROM SAMPLE]**

[REFER TO Q.8. IF RESPONDENT EATS CORN FLAKES, BANANAS, GROUND BEEF "REGULARLY, FREQUENTLY, OR OCCASSIONALLY" CONTINUE WITH Q55. IF "NEVER" TO ALL THREE FOODS THIS IS THE END OF THE INTERVIEW. Say: Thank you very much for your cooperation. Have a nice day/evening.]

55. Your responses have been helpful to us. We are asking a select number of people to participate in a mail survey about food. To thank you for participating in the mail survey you will receive $5.00. Would you be interested in participating?

1 – Yes 2 – No/Don't know **[END INTERVIEW – Thank you very much for your cooperation. Have a nice day/evening.]**

Please understand at this point I'll need to collect your name and address so that I can mail the questionnaire to you. Also please know that while you are no longer anonymous, your responses will still be. That is your name and address will not be linked to your responses.

[OBTAIN COMPLETE MAILING ADDRESS AND REPEAT TO RESPONDENT. ASK FOR SPELLING FOR VERIFICATION.]

Thank you very much for you cooperation. Please look for the survey in the mail within the next several days.

Appendix B: Thoughts and Images Related to Genetic Modification, Genetic Engineering, and Biotechnology

% within First Thought or Image

		First Thought or Image														
		Don't Know	Science	Negative	Positive	Sheep	Other Animals	People	Changing Things	Plants	Science Fiction	Farming	Cloning	Business/ Industry	Other	Total
First thought or image	Don't Know	100.0%														**30.6%**
	chemicals/chemistry		14.0%													**2.0%**
	DNA/genes/cells		28.5%													**4.1%**
	laboratory/test tubes/experiments		24.4%													**3.5%**
	science/technology/biology		19.8%													**2.8%**
	frankenstein/freak monster/mutant/deformity			14.9%												**2.2%**
	wrong/bad/don't approve/immoral			23.2%												**3.5%**
	unnatural/disgusting/disturbing/gross/scary/yuck			14.4%												**2.2%**
	fake/artificial/additives/man-made			21.5%												**3.2%**
	tampering/playing God/mad scientist			8.8%												**1.3%**
	danger/evil/death/disaster/disease			7.2%												**1.1%**
	uncertainty/unintended consequences			2.2%												**.3%**
	germs/bacteria														.9%	**.1%**
	good/in favor/approve				11.0%											**.7%**
	improvement/making things better/benefits/progress				43.8%											**2.7%**
	medicine/drugs/health				39.7%											**2.4%**
	future/modern				5.5%											**.3%**
	sheep					100.0%										**.6%**
	chickens						17.4%									**.3%**
	cows						30.4%									**.6%**
	animals						52.2%									**1.0%**
	babies/children/kids							50.0%								**.7%**
	humans/people							50.0%								**.7%**
	changing things/altering things								100.0%							**.8%**
	plants									16.9%						**1.0%**
	corn									53.5%						**3.2%**
	tomatoes									18.3%						**1.1%**
	wheat									4.2%						**.2%**
	other plants									7.0%						**.4%**
	science fiction										3.4%					**.1%**
	computers/robots/machines										65.5%					**1.6%**
	fertilizer											5.9%				**.1%**
	farms/agriculture											58.8%				**.8%**
	organic											35.3%				**.5%**
	hybridization		5.8%													**.8%**
	cloning												100.0%			**8.5%**
	food														12.1%	**1.1%**
	production/industry/manufacturing													68.0%		**1.4%**
	war/weapons			6.6%												**1.0%**
	genetic manipulation of plants, plant biotechnology		7.6%													**1.1%**
	genetic engineering														5.6%	**.5%**
	clean/sterile														1.9%	**.2%**
	GM sci-fi characters										10.3%					**.2%**
	specific research org/company/university													12.0%		**.2%**
	money related													20.0%		**.4%**
	artificial growing conditions/greenhouses/hydroponics														10.3%	**.9%**
	meat														1.9%	**.2%**
	specific GM item/ news story														4.7%	**.4%**
	modified meat														.9%	**.1%**
	large crops/big plants										20.7%					**.5%**
	controversy			1.1%												**.2%**
	missing														5.6%	**.5%**
	recode														56.1%	**5.0%**
Total		**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Appendix C: Approval of GM Foods by Age, Education and Gender

	Plant-Based GM Foods			Animal-Based GM Foods		
	Approve	Disapprove	Don't Know	Approve	Disapprove	Don't Know
Age						
18-24	59%	36%	5%	38%	57%	5%
25-34	56%	37%	7%	27%	67%	6%
35-44	49%	44%	7%	27%	68%	4%
45-54	53%	38%	9%	27%	68%	5%
55-64	55%	35%	10%	28%	64%	8%
65+	31%	42%	27%	17%	63%	19%
Education						
High school or less	43%	42%	15%	26%	63%	11%
Some college	50%	40%	9%	27%	68%	5%
4-year college degree	59%	34%	6%	24%	71%	4%
Post-graduate degree	64%	29%	7%	32%	63%	5%
Gender						
Male	58%	34%	9%	35%	59%	6%
Female	42%	45%	14%	19%	72%	9%