12-13-2003

Awareness and Acceptance of Biotechnology Issues among Youth, Undergraduates, and Adults

Susan Fritz  
*University of Nebraska - Lincoln*, sfritz1@unl.edu

Dann E. Husmann  
*University of Nebraska - Lincoln*, dhusmann2@unl.edu

Gary Wingenbach  
*Texas A&M University*

Tracy Rutherford  
*Texas A&M University*

Valerie Egger  
*University of Nebraska - Lincoln*, vegger1@unl.edu

See next page for additional authors

Follow this and additional works at: [http://digitalcommons.unl.edu/aglecfacpub](http://digitalcommons.unl.edu/aglecfacpub)

Part of the [Other Public Affairs, Public Policy and Public Administration Commons](http://digitalcommons.unl.edu/otherpubaffpolicredit)

Fritz, Susan; Husmann, Dann E.; Wingenbach, Gary; Rutherford, Tracy; Egger, Valerie; and Wadhwa, Preeti, "Awareness and Acceptance of Biotechnology Issues among Youth, Undergraduates, and Adults" (2003). *Faculty Publications: Agricultural Leadership, Education & Communication Department*. Paper 41.  
[http://digitalcommons.unl.edu/aglecfacpub/41](http://digitalcommons.unl.edu/aglecfacpub/41)

This Article is brought to you for free and open access by the Agricultural Leadership, Education & Communication Department at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Faculty Publications: Agricultural Leadership, Education & Communication Department by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.
Producers and consumers view the potential of genetically modified (GM) crops from different perspectives. From the producers’ perspective, an increase in acceptance has resulted in increased production of GM crops. For example, between 1995 and 2001, the share of US soybean, cotton, and corn acreage planted to GM varieties increased from a negligible amount to over 70% for soybeans, 56% for cotton, and 26% for corn (Huffman, Rousu, Shogren, & Tegene, 2003). According to another report by industry-backed International Service for the Acquisition of Agri-Biotech applications (2003), seven million farmers in 18 countries grew GM crops on 167.2 million acres in 2003, compared with six million farmers in 16 countries on 145.2 million acres in 2002, for an approximate increase of 22 million acres.

From the consumer perspective, domestic and international studies of consumer acceptance reveal a mismatch of acceptance with production. This mismatch potentially threatens the future of agricultural biotechnology and limits options for addressing world food shortages.

Awareness

Globally, biotechnology awareness seems to be highest among consumers in the United States, Canada, and Western Europe and lowest in Southeast Asia, Asia, and Latin America (McCann-Erickson, 2000). At least one study showed that general awareness of biotechnology by European consumers has not increased, but public trust of biotechnological information sources has decreased significantly (European Commission, 2000). However, a recent survey on European agricultural biotechnology views revealed that the percentage of Europeans who reported that they were hearing from both sides equally (opponents and proponents) increased since 2001 (KRC Research, 2003). As indicated in a 2002 report by Agricultural Biotechnological Europe, 48% in the “Big Five” European countries (Germany, France, UK, Italy, and Spain) said that they had heard a “lot” or “some” about biotechnology (KRC Research, 2003). The awareness was highest in Germany (63%) and lowest in Spain (34%).

Several official reports on public opinion and perceptions published in the recent years suggest that US consumers have fewer concerns about GM food than European consumers (Sittenfeld & Espinoza, 2002). Most Americans, however, are not aware of the extent to which biotechnology has already become part of their food supply. In a US-based Gallup poll (2001), researchers concluded that the growing use of GM food had yet to ignite public interest or concern. A Harris poll of 1,015 consumers found only one in seven, or 15%, of adults have taken much interest in the GM food issue (Taylor, 2000).

Consumer acceptance is hindered by limited understanding of modern agricultural practices and the science involved in biotechnology (Falk et al., 2002). Research has shown that if knowledge or experience with a topic is low, it was possible for people to base their perceptions on already-present global attitudes toward the topic (Sanbonmatsu & Fazio, 1990). Ad-
ditionally, research by Schoell and Guiltinan (1995) concluded that consumers’ perceptions and attitudes are influenced by friends, family, class, and their culture. Consequently, prevailing cultural attitudes may influence those consumers who have limited understanding of biotechnology.

These cultural attitudes can be articulated by a number of individuals and groups. Hoban (2001) found that consumers in the United States and Japan put the highest trust in independent health and scientific experts. A 2001 study of Americans’ sources of specific scientific information (such as global warming or biotechnology) indicated that about 44% of the respondents cited the Internet as their main source and 24% cited books or other printed material. Other sources (magazines, television, newspapers, etc.) remained below 10% (National Science Foundation, 2002). For those US consumers who rely on newspapers as their primary media source, research indicates that biotechnology-related stories frequently may be written by journalists who perceive their levels of scientific knowledge to be higher than assessments indicate (Vestal & Briers, 1999). An inherent danger exists in that journalists lacking adequate knowledge about biotechnology processes may produce media that is biased, yet those media sources can play a role in public agenda-setting, as shown by Marks and Kalaitzandonakes (2001).

Acceptance

Both GM crops and GM foods are better supported in the United States than in Europe. However, the same does not hold true for biotechnology in general. It has been found that although people in the United States are more supportive of GM crops and GM foods, people in Europe are more supportive of genetic testing (Gaskell, Bauer, Durant, & Allum, 1999). Additionally, even though European sentiment towards GM crops is predominantly negative, there is diversity of opinion among consumers in individual European countries. For example, consumer interviews in 1997 and 1999 in Denmark, Germany, the United Kingdom, and Italy determined that preferences for GM products was generally low, but more so in Denmark and Germany than in the UK and Italy (Bredahl, 2001).

In a US-based Gallup poll (August 2001), researchers found that few Americans had heard about biotechnology issues, and only 30% felt that GM foods posed a serious health hazard to consumers. Nearly four in ten (38%) said they opposed GM foods, and a slight majority (52%) supported the use of biotechnology in agricultural and food products.

In a recent Purdue University study, Lusk found that consumers might be willing to pay more for a GM food if they perceive direct personal benefits from the product. For this to occur, Lusk contended that the focus of biotechnological information has to shift towards communicating the potential benefits of the GM food from the consumer’s point view rather than just from the producer’s point of view (Lusk, 2003).

Most of the studies in GM awareness and acceptance have focused on adult consumers despite youth comprising a significant consumer segment. For example, a survey by Teenage Research Unlimited revealed that in the year 1988, as many as 9 out of 10 teenagers (males and females) shopped for themselves or their families spending $47.7 billion annually on groceries and household products (Blumenthal, 1990). More recently, Catlett (2004) reported that children between the ages of 11 and 13 directly spent $158 billion in 2002. Adolescents’ food purchasing habits may have an immediate and long-term effect on the future of GM food. Therefore, it is important to compare the awareness and acceptance of biotechnology across age groups (youth/adolescents, undergraduate students, and adults).

Purpose of the Study

The purpose of this study was to assess levels of awareness and acceptance of biotechnology issues among youth, undergraduate students, and adults by: (a) comparing adult and youth respondent groups’ awareness levels of biotechnology affects on food, health, or environment; (b) comparing media sources utilized by adults and undergraduates to form perceptions about biotechnology issues; (c) comparing acceptance levels (perceptions) of biotechnology practices among adult, youth, and undergraduates; (d) comparing perceptions of youth, undergraduates, and adults towards biotechnology issues; and (e) exploring the relationship between awareness and acceptance of biotechnology practices for adults and youth respondent groups.

Methods

Procedures

Measurement of awareness and acceptance levels for all three respondent groups was accomplished through the use of modified versions of the instrument Metro News Journalists’ Perceptions of Food Biotechnology (Vestal & Briers, 1999). The instrument was derived from the work of Duhe, Barton, and the North Carolina Nationwide Survey on Biotechnology (as cited in Vestal & Briers, 1999).
Population and Sample

The youth population (n = 283) included students enrolled in biology classes at local high schools from the Lincoln and Omaha, Nebraska areas. Undergraduate responses (n = 330) were gathered from agricultural communications students at 11 land-grant universities in 10 states. These included Clemson University, Oklahoma State University, Texas A&M University, Michigan State University, Western Illinois University, Kansas State University, Washington State University, and Texas Tech University (Wingenbach, Rutherford, & Dunsford, 2003).

Undergraduate respondents represented six majors. Specific areas of self-reported majors included those in agricultural education (79 or 23.9%), other colleges of agriculture majors including poultry, forestry, food sciences, or agribusiness/agricultural economics (78 or 23.6%), agricultural communications (66 or 20%), liberal arts (52 or 15.8%), animal science (29 or 8.8%), and health-related fields (18 or 5.5%). Three (0.9%) respondents were undecided about their major.

Adult respondents (n = 166) for this study mainly represented five categories of professions from Colorado and Nebraska. Adult respondents described their occupational responsibilities as school administrator (4.2% or 7), 7–12 grade educator (15.1% or 25), 9–12 grade educator (6% or 10), extension educator (44% or 73), and dietician (1.8% or 3). Thirty-seven did not specify their professions.

Results

Awareness Levels

The percentage of adults (49 or 34.5%) who were reportedly aware of how biotechnology would affect food, health, and environment was almost three times (proportionally) that of youth respondents (35 or 12.9%). A chi-square comparison (df = 2, \( \chi^2 = 39.27, p < .000 \)) indicated this difference was significant. However, there emerged little difference in the percentage of adult (77 or 54.2%) and youth (145 or 53.5%) respondents who felt that they were only somewhat aware of affects of biotechnology on food, health, and environment. Finally, the percentage of youth (91 or 33.6%) who were reportedly not aware of how biotechnology would affect food, health, and environment was three times that of adults (16 or 11.3%).

Acceptance Levels

Tukey Post Hoc tests indicated a statistically significant difference between the mean responses of youth (M = 2.17) and undergraduate students (M = 1.93), and between adults (M = 2.17) and undergraduate students, regarding their acceptance level of genetic modification of microorganisms. However, the means were within the same scale range (1.50–2.49) and therefore not practically significant (Table 1). The same was true for the responses to acceptance levels of genetic modification of landscape/forest plants, food crops, and humans. The respondents from all three groups were somewhat accepting of genetic modification of food crops (M = 1.92).

Table 1. Comparison of acceptance of genetic modification in selected organisms by adult, youth, and undergraduate student response groups.

<table>
<thead>
<tr>
<th>GM acceptance levels</th>
<th>Adult n = 140</th>
<th>Youth n = 279</th>
<th>Undergraduates n = 330</th>
<th>Total N = 749</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M  SD</td>
<td>M  SD</td>
<td>M  SD</td>
<td></td>
</tr>
<tr>
<td>Microorganisms</td>
<td>2.17a 0.79</td>
<td>2.17a 0.63</td>
<td>1.93ab 0.79</td>
<td>2.06 0.81</td>
</tr>
<tr>
<td>Landscape/forest plants</td>
<td>2.07b 0.79</td>
<td>2.14a 0.88</td>
<td>1.72ab 0.79</td>
<td>1.94 0.84</td>
</tr>
<tr>
<td>Food crops</td>
<td>2.05b 0.82</td>
<td>2.05a 0.84</td>
<td>1.72ab 0.78</td>
<td>1.92 0.83</td>
</tr>
<tr>
<td>Animals</td>
<td>2.46 0.86</td>
<td>2.43 0.94</td>
<td>2.40 0.99</td>
<td>2.42 0.94</td>
</tr>
<tr>
<td>Humans</td>
<td>3.00c 0.94</td>
<td>2.67ac 1.01</td>
<td>3.16b 0.98</td>
<td>2.95 1.01</td>
</tr>
</tbody>
</table>

Note. 1 = highly acceptable, 2 = somewhat acceptable, 3 = somewhat unacceptable, 4 = highly unacceptable.

* Denotes significant difference between youth and undergraduate students as a result of Tukey Post Hoc tests.

a Denotes significant difference between adults and undergraduate students as a result of Tukey Post Hoc tests.

b Denotes significant difference between adults and youth as a result of Tukey Post Hoc tests.

1 The authors used a paper survey for this study. A web-based version of the survey instrument (in this instance used to survey Texas journalists) is available at http://www.ag-communicators.org/surveys/btmedia.asp
followed by that of landscape/forest plants ($M = 1.94$), microorganisms ($M = 2.06$), and animals ($M = 2.42$). They were somewhat unaccepting of genetic modification of humans ($M = 2.95$; Table 1).

**Importance Levels**

Statistically significant differences were observed between the mean responses of youth ($M = 2.34$) and undergraduate students ($M = 1.85$), and between adults ($M = 2.00$) and youth ($M = 2.34$), regarding the level of importance placed on biotechnology research on reduction of pesticides (Table 2). However, the difference was not significant in practical terms. The same was true for biotechnology research on control of released genes and for additional nutritional value. Further, though the difference between the mean responses of adults ($M = 1.87$), undergraduate students ($M = 1.55$), and youth ($M = 1.87$) regarding the importance of biotechnology research on safer food was statistically significant, there existed no practical significance. The same could be said for the importance of biotechnology research on harming the environment (Table 2). A statistically significant difference was observed between the mean responses of adults ($M = 1.85$), undergraduate students ($M = 1.45$), and youth ($M = 1.92$) regarding the importance of biotechnology research on benefits to environment (Table 2).

**Information Sources**

Newspapers emerged as the most popular media source utilized by both adults (73.8% or 104) and undergraduates (76.7% or 253) for information on biotechnology (Table 3). The Internet was cited as another important source by 58.9% (83) of adults and 58.2% (192) of the undergraduates in the study. Popular magazines emerged as yet another important source with a little less than one half of the adult (64 or 45.4%) and undergraduate respondents (144 or 43.6%) relying on them for information (Table 3). Technical publications were a common source of information for adults, with nearly one half (66 or 46.8%) of the respondents relying on them. However, only about 17.3% (57) of the undergraduate students cited technical publications as their source of information. Additionally, use of scientific journals was reported relatively higher for adult respondents (57 or 40.4 %) than for undergraduates (107 or 32.4%; Table 3).

There emerged statistically significant differences in mean responses between youth and undergraduates
regarding faith in statements made by different spokes-
persons. However, there existed no practical signifi-
cant differences between all responses except for those
made about faith in statements by celebrities. Even
though both youth (M = 3.30) and undergraduate stu-
dents (M = 3.60) had the least faith in statements made
by celebrities, undergraduates were more skeptical
(very low) of those statements than were youth (low).
Responses from both youth (M = 2.04) and under-
graduate respondent (M = 1.83) groups indicated that they
had highest faith in the statements about biotechnology
issues made by university scientists (Table 4).

Table 4. Comparison of the level of faith in statements about biotechnology made by various spokespersons between youth and undergraduate respondent groups.

<table>
<thead>
<tr>
<th>Faith in statements</th>
<th>Youth (n = 274)</th>
<th>Undergraduates (n = 327)</th>
<th>Total (N = 601)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Food companies</td>
<td>2.52</td>
<td>0.66</td>
<td>2.37</td>
</tr>
<tr>
<td>Biotechnology companies</td>
<td>2.31</td>
<td>0.76</td>
<td>2.19</td>
</tr>
<tr>
<td>Government agencies</td>
<td>2.53</td>
<td>0.87</td>
<td>2.31</td>
</tr>
<tr>
<td>Farm groups</td>
<td>2.30</td>
<td>0.71</td>
<td>2.00</td>
</tr>
<tr>
<td>University scientists</td>
<td>2.04</td>
<td>0.72</td>
<td>1.83</td>
</tr>
<tr>
<td>Celebrities</td>
<td>3.30</td>
<td>0.83</td>
<td>3.60</td>
</tr>
</tbody>
</table>

Note. 1 = very high, 2 = high, 3 = low, 4 = very low.
*p < .05.

Table 5. Comparison of obstacles to acceptance for using biotechnology in food production by adults and youth respondent groups.

<table>
<thead>
<tr>
<th>Obstacles</th>
<th>Adults (n = 137)</th>
<th>Youth (n = 278)</th>
<th>Total (N = 415)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Religious/ethical concern</td>
<td>3.16</td>
<td>1.27</td>
<td>3.10</td>
</tr>
<tr>
<td>Fear of genes moving unchecked</td>
<td>2.72</td>
<td>1.10</td>
<td>3.00</td>
</tr>
<tr>
<td>Fear of food safety</td>
<td>2.85</td>
<td>1.05</td>
<td>2.63</td>
</tr>
<tr>
<td>Fear of environmental harm</td>
<td>2.76</td>
<td>1.13</td>
<td>2.56</td>
</tr>
</tbody>
</table>

Note. 1 = very high, 2 = high, 3 = neutral, 4 = low, 5 = very low.
*p < .05.

Relationship Between Self-reported Awareness and Acceptance

A statistically significant, positive correlation (r = .12–
.29, p < .01) existed between self-reported awareness and acceptance levels for all the biotechnological prac-
tices except for those concerned with genetic modi-
fication of humans (r = -.43). In the case of humans, there
emerged a negative correlation; however, it was not sta-
tistically significant.

Implications and Future Research

Both adult (M = 3.16) and youth (M = 3.10) respondent
groups considered religious/ethical concerns as the
least important obstacle to their acceptance of biotech-
nology production (Table 5). There was a statistically
significant difference in the mean responses of adults
and youth when considering obstacles regarding fear
of genes moving unchecked into the environment (M
= 2.72, M = 3.00, respectively) and fear of food safe-
ty (M = 2.85, M = 2.63, respectively). This difference,
however, was not practically significant.

Both youth and undergraduate respondent groups had
a high degree of faith in statements made by univer-
sity scientists and much less faith in statements made by
celebrities regarding biotechnological issues. This was consistent with Hoban’s (2001) study that indicated consumers in the United States and Japan put the highest trust in independent health and scientific experts.

A large number of respondents (both adults and undergraduates) cited newspapers and the Internet as sources for learning about biotechnology. This finding is similar to findings of a 2002 study by the National Science Foundation. An opportunity exists to capitalize on the high degree of faith in university scientists and the frequent use of newspapers and Internet for biotechnology information. Perhaps credible information from university scientists available to consumers on the Internet has the potential to impact biotechnology awareness. Further, university scientists providing valid scientific biotechnology reports or briefs to journalists could influence the biotechnology awareness of consumers.

A limitation of the study was that the generalization from the three respondent groups to the general consumer population might be suspect because of the contexts that they represent (agricultural sciences, food sciences, extension education, agricultural communications, etc.). Indeed, the warnings of Fischhoff and Fischhoff (2001) that “there can be no simple description of the public’s opinion about biotechnology” (p. 155), bears repeating after analyzing the results of this study. Therefore, this study should be replicated with a cross-section of respondents that more closely represents national and international consumers.

Similar to the findings of Sanbonmatsu and Fazio (1990), it was evident in the study that those who reported being not aware, or somewhat aware, still had opinions. It is unclear whether these opinions were shaped by influence from family and friends. Future research should explore the impact or influence of all of these groups on respondents’ awareness of biotechnology.

Acknowledgement
Partial funding was received from USDA CSREES IF-AFS support, grant #00-52100-9710.

References


