

## STATE FFA OFFICERS' CONFIDENCE AND TRUSTWORTHINESS OF BIOTECHNOLOGY INFORMATION SOURCES

*Gary J. Wingenbach, Associate Professor*  
*Tracy A. Rutherford, Assistant Professor*  
Texas A&M University

### Abstract

*Are state FFA officers' awareness levels of agricultural topics reported in mass media superior to those who do not serve in leadership roles? The purpose of this study was to determine elected state FFA officers' awareness of biotechnology, and their confidence and trust of biotechnology information sources. Descriptive survey methods were used to obtain data from all elected state FFA officers for the 2004-2005 academic year. More than 52% (N = 177) of the accessible population responded, representing 44 states and Puerto Rico. Respondents were most aware of how agricultural biotechnology practices will affect their food, followed by its effects on environment and health. State FFA officers' awareness levels of agricultural biotechnology were superior to previously studied college of agriculture students. Respondents had somewhat high confidence in biotechnology statements made by seven of nine sources, with university scientists/researchers receiving the greatest amount of confidence. Significant, moderate positive relationships existed between respondents' confidence and trustworthiness of biotechnology statements made by cooperative extension specialists, food companies, government agencies, and farm/ranch groups. Additional studies are needed to determine the "definitive differences" in communication skill sets between state FFA officers and all other agricultural education students in high school and college.*

### Introduction

Why is it important to study the opinions of young leaders, such as those who serve as elected state FFA officers? Succinctly stated, since 1928, the National FFA Organization has prepared youth to become leaders of their peers, while instilling a sense of leadership that may help them become future civic leaders. Brannon, Holley, and Key (1989) noted "...an impressive number of former [FFA] members serving as local, state, and national leaders. These leaders with vocational agriculture/FFA backgrounds include former President Jimmy Carter, senators, representatives, governors, astronauts, broadcasters, magazine editors, leaders in education..." (p. 37); this statement remains true as verified through analysis of the "Prominent Former Members" list (National FFA Organization, 2006).

FFA officers gain valuable skill sets while serving in local, district, state, or national leadership roles. Among those skill

sets are communications, decision making, interpersonal relationships, learning, resource management, understanding self, and working with groups (Rutherford, Townsend, Briers, Cummins & Conrad, 2002; Wingenbach & Kahler, 1997).

Like most young people, elected state FFA officers probably use their learned and/or innate leadership skill sets in settings beyond the role of FFA officer. But, are the select few elected state FFA officers really different than their counterparts when considering awareness levels and/or information source preferences for staying abreast of current topics such as agricultural biotechnology? Do state FFA officers have elevated awareness levels of biotechnology or make more sophisticated choices in gathering reliable information to form their opinions about biotechnology?

### Conceptual Framework

Perhaps one of the primary factors associated with elevated communication

skills is one's awareness of important issues, especially awareness of biotechnology practices in the agricultural industry. Wingenbach, Rutherford, and Dunsford (2003) found college of agriculture students were most aware of biotechnology practices affecting their food, but only somewhat aware of its effects on health or environment. Respondents who were more aware of biotechnology affecting food, health, and/or environment, perceived its use more positively than did all other respondents. Fritz et al. (2003) found the "percentage of adults who were reportedly aware of how biotechnology would affect food, health, and environment was almost three times (proportionally) that of youth [including college students] respondents" (p. 180).

Students' awareness of biotechnology effects on food, health, and environment is not a topic solely studied in the United States. Dawson and Taylor (2000) found high school students did not consider the long-term consequences of biotechnology when asked to propose solutions to bioethical quandaries. Students were inexperienced and unrealistic in their decision making and reasoning. Finke and Kim (2003) surveyed American and Korean college students to determine acceptance of biotechnology. Korean students were less accepting of biotechnology because of the negative portrayal displayed in the media.

Media, and its role in communicating the effects of biotechnology, as Finke and Kim (2003) found, has a profound impact on how biotechnology is viewed by the public. It is important to understand what information sources are used when forming opinions about biotechnology. Are those sources reliable? Are they science-based? Do they originate from places or parties with a particular agenda in the agricultural biotechnology arena? A component of framing theory is utilization of information sources with a particular agenda to shape public opinion. Framing is "a way of giving some overall interpretation to isolated items of fact" (McQuail, 2005, p. 379). In this study, the issue of biotechnology can be framed through media interaction, information sources, and experience.

Vestal and Briers (1999) examined information sources used by journalists when writing about scientific issues such as biotechnology. Journalists trusted university scientists and health authorities for the most accurate biotechnology information. They did not trust the same type of information from food and biotechnology company representatives. Journalists' biotechnology perceptions were positively associated with their connection to agriculture. If they had an agricultural background, they perceived biotechnology and its benefits more positively.

Wingenbach and Rutherford (2005) found journalists viewed university scientists and newspaper personnel as trustworthy, unbiased, and fair in communicating agricultural biotechnology issues. Likewise, they perceived activist groups as untrustworthy, completely biased, and unfair for the same issues. Wingenbach et al. (2003) asked college of agriculture students what sources they used to form their attitudes toward biotechnology. They responded by ranking "knowledge from science classes, experience in science labs, and university professors' biotechnology beliefs" (p. 90) as the three sources most used to form attitudes about biotechnology.

It is not enough to know what journalists and students use as information sources for biotechnology information, it is just as important to know what biotechnology experts believe when it comes to consumer acceptance of their science. Lang, O'Neill, and Hallman (2003) surveyed biotechnology experts and found those experts believed consumers should review numerous sources for biotechnology information. Experts believed they should not be looked upon as authoritative sources. They acknowledged their communications with the public were poor—the public was not receiving complete and accurate information about biotechnology. Lang et al. found that biotechnology experts relied on universities and/or scientists for their information, while consumers relied primarily on the media. Biotechnology experts recognized the importance of working closely with media sources to better inform consumers.

True, biotechnology science has its uncertainties, but numerous studies indicate

there is much trust placed in scientists' claims about their research. Jenkins (1999) found that although scientists were seen as trustworthy sources of information, they were not influential communicators of their research to the public. Consumers want more communicative scientists who share their knowledge through various information sources.

Brossard and Shanahan's (2003) study revealed that biotechnology is still too technical for public comprehension. Consumer acceptance is low because the public does not understand the biotechnology science; confirmed by earlier findings, consumers got most of their biotechnology information from the media. The more heterogeneous media sources consumers used, such as newspapers, Internet, and magazines, the more input those consumers felt they should have in policy regarding the use of genetically-modified food products. Other studies (Blaine, Kamaldeen, & Powell, 2002; Macer, 2001; National Science Foundation, 2000) support the notion that most consumers get their biotechnology information from popular media (e.g., television and newspapers).

Awareness of biotechnology effects on food, health, and environment, and the information sources used with confidence and trust will continue to play a significant role in the public's acceptance of agricultural biotechnology practices. It is paramount that our future leaders, communicators, and policy makers understand the differences in claims about biotechnology made by various information sources. Are those sources trustworthy? Do elected state FFA officers' place greater confidence and trust in one biotechnology information source over another?

### Purpose and Objectives

The purpose was to determine elected state FFA officers' awareness of biotechnology, and their confidence and trust of biotechnology information sources. Specific objectives that guided this study were to:

1. Identify elected state FFA officers' awareness of biotechnology effects on food, health, and environment.
2. Determine state FFA officers' confidence in biotechnology statements made by various information sources.
3. Identify the perceived trustworthiness of sources providing biotechnology information.
4. Determine if associations existed between confidence levels and trustworthiness of biotechnology information sources.

### Methods

Selected methods used in reporting the results of this study were part of a larger research project titled, *Texas' Perceptions about Agricultural and Biotechnology Issues Reported in the Mass Media*. Similar descriptions of the research methods and demographics exist for the larger project (Wingenbach, 2003), but are described fully herein.

Descriptive methodology was used to complete the study. Online data collection methods were chosen for questionnaire delivery because of its ability to achieve fast response rates at minimal expense (Ladner, Wingenbach, & Raven, 2002), and its suitability with college students (Kypri, Gallagher, & Cashell-Smith, 2004). Census data were collected after obtaining approval to conduct the study from the Texas A&M University Institutional Review Board (#2003-0034).

The population included elected state FFA officers from all 50 U.S. states, Puerto Rico, and the Virgin Islands. The target population ( $N = 360$ ) was all 2004-2005 elected state FFA officers, as identified through a database of officer names and e-mail addresses provided by the National FFA Organization. The accessible population included 335 officers who had reported valid e-mail addresses to the National FFA Organization.

Modified versions of two previously tested instruments, *College Students'*

*Perceptions of Biotechnology* (Wingenbach, 2003) and *Perceptions and Discourses of Bioengineered Food Innovations: The Ghanaian College Students' Outlook* (Adovor, 2005), were used to create the research instrument. Specific wording, question sequencing, and country affiliation changes constituted the modifications.

The instrument, *State FFA Officers' Perceptions of Biotechnology*, contained four multi-part questions (for results reported in this paper) measuring FFA officers' awareness of biotechnology, confidence, and trustworthiness of information sources. State FFA officers' awareness of biotechnology practices affecting food, health, or environmental issues was determined using a three-point scale (1 = no, 2 = somewhat, 3 = yes). To frame the awareness response, respondents were asked how recently (< one week; < six months; < one year; > one year; or never) they had heard or read something about biotechnology.

Confidence levels for statements about biotechnology from nine sources (activist groups, biotechnology company representatives, celebrities/popular stars, cooperative extension specialists, farm/ranch groups, food companies, government agencies, health professionals, and university scientists/researchers) were measured using a four-point Likert scale. Responses ranged from very low (1) to very high (4); reliability analyses revealed a Cronbach's alpha coefficient of .78 for the confidence scale.

Trustworthiness of claims was measured by asking, how important is it for you, as a future agricultural industry professional, to investigate claims made about biotechnology by the following sources? Respondents ratings, using a similar Likert scale (1 = not at all important...4 = very important), for investigating sources' claims about biotechnology were reverse-coded to counter the negative connotation of the trust question. Responses ranged from not at all important (1) to very important (4). A Cronbach's alpha coefficient of .88 for the trustworthiness scale was deemed reliable. A final demographic section collected other (gender, year in school, age, ethnicity, and

residence) relevant information about the participants.

A census of the 335 participants was conducted by sending (via National FFA Organization offices) personal invitations to participate in September 2004. Personalized e-mail invitations included a link to the online survey and a guarantee of anonymity as participants in the study. Follow-up e-mails and telephone contact was continued with all non-respondents every two weeks until the end of October 2004, producing a response rate of 52.84% ( $N = 177$ ).

Research indicates that non-respondents often are similar to late respondents (Goldhor, 1974). According to Lindner, Murphy, and Briers (2001), one method of determining that "nonresponse is not a threat to external validity" (p. 51) is to compare early to late respondents' scores for significant differences on the variables of interest. In this study, insufficient responses from successive "waves" of stimuli resulted in late respondents being operationally defined as all those who responded only after the second wave of stimuli ( $N = 37$ ). No significant differences were found when comparing groups' summed scores for confidence or trustworthiness levels in statements from the nine information sources. Non-respondents were considered equivalent to the respondent group. Findings may be generalized to the accessible population ( $N = 335$ ).

Descriptive statistics were derived for each section and the instrument as a whole. Demographic data were analyzed using percentages and frequencies. Significant relationships between selected variables were established using bivariate analyses. Significance levels were set *a priori* at  $\alpha = 0.05$ . Relationships between variables with continuous scores were analyzed using Pearson's product-moment correlations (Borg & Gall, 1989).

## Findings

Valid responses were collected from 177 (52.84%) elected state FFA officers representing 44 states and Puerto Rico. Respondents were female (57%), Caucasian (96%), and primarily in their freshman year

(51.4%) at college (Table 1); not all percentages equal 100% due to missing information. More than three-fourths (78%) of elected state FFA officers were 18 or 19

years old at the time of this study. Respondents indicated they had lived (72.9%) or worked (89.3%) on a farm or ranch.

Table 1  
*Demographic Profile of Respondents (N = 177)*

Variables		<i>f</i>	%
Gender:	Female	101	57.1
	Male	75	42.4
Race:	Caucasian	170	96.0
	Other <sup>a</sup>	4	2.3
	Hispanic American	2	1.1
Status:	College Freshman	91	51.4
	High School Senior	31	17.5
	College Sophomore	30	16.9
	Other College	24	13.6
Age	18	92	52.0
	19	46	26.0
	17	29	16.4
	20	7	4.0
	21+	1	0.6
Agricultural Factors <sup>b</sup>	Have lived on a farm or ranch	129	72.9
	Have worked on a farm or ranch	158	89.3

<sup>a</sup>Responses included Asian/Pacific Islander and Arab American. <sup>b</sup>Frequencies indicated a positive response.

Respondents were asked if they were aware of how biotechnology will affect their food, health, and environment issues. Elected state FFA officers' reported their awareness levels using a three-point scale (1 = No, 2 = Somewhat, 3 = Yes). Table 2 illustrates that respondents were most aware of how biotechnology will affect their food (64.4%), followed by its effects on the environment (52.5%), and health (52%). In contrast, colleges of agriculture students (Wingenbach et al., 2003) were most aware

of biotechnology effects on food, but only somewhat aware of its effects on health or environment (Table 2).

Awareness level responses were contextualized by asking respondents how long it had been since last hearing or reading something about biotechnology. Almost one-half (48.6%) reported hearing or reading something one week before participating in this study; 41.8% had heard or read something about biotechnology within six months prior to the study.

Table 2  
*Respondents' Awareness of Biotechnology Effects*

Variable	Awareness Level	State FFA Officers ( <i>N</i> = 177)		Agriculture College Students <sup>a</sup> ( <i>N</i> = 330)	
		<i>f</i>	%	<i>f</i>	%
Food	No	5	2.8	30	9.1
	Somewhat	58	32.8	145	43.9
	Yes	114	64.4	155	47.0
Health	No	9	5.1	29	8.8
	Somewhat	75	42.4	175	53.0
	Yes	92	52.0	126	38.2
Environment	No	9	5.1	38	11.5
	Somewhat	73	41.2	166	50.3
	Yes	93	52.5	126	38.2

<sup>a</sup>Adapted from "Agricultural communications students' awareness and perceptions of biotechnology issues." (Wingenbach et al., 2003).

Percentages may not total 100 because of missing data

Objective two was completed by asking elected state FFA officers to report how much confidence they placed in biotechnology statements made by nine information sources (activist groups, biotechnology company representatives, celebrities/popular stars, cooperative extension specialists, farm/ranch groups, food companies, government agencies, health professionals, and university scientists/researchers). Responses were

reported on a four-point Likert scale (1 = very low to 4 = very high). Respondents perceived somewhat high confidence in biotechnology statements from seven of the nine sources, with university scientists/researchers receiving the greatest ( $M = 3.35$ ,  $SD = .63$ ) amount of confidence (Table 3). Activist groups and celebrities/popular stars both received very low ( $M \leq 1.50$ ) confidence level ratings.

Table 3  
*Respondents' Confidence Levels of Biotechnology Statements by Information Source (N = 177)*

Information Sources	<i>M</i> <sup>a</sup>	<i>SD</i>	Confidence in Sources' Statements about Biotechnology
University Scientists/Researchers	3.35	.63	Somewhat High
Cooperative Extension Specialists	3.13	.61	Somewhat High
Farm/Ranch Groups	3.08	.55	Somewhat High
Health Professionals	2.98	.68	Somewhat High
Government Agencies	2.96	.72	Somewhat High
Biotechnology Company Representatives	2.90	.71	Somewhat High
Food Companies	2.75	.67	Somewhat High
Activist Groups	1.49	.61	Very Low
Celebrities/Popular Stars	1.23	.45	Very Low

<sup>a</sup>Scale: 1 = very low, 2 = somewhat low, 3 = somewhat high, and 4 = very high

Perceived trustworthiness of claims made by the same nine sources listed in the confidence question was determined by respondents' ratings on the importance for investigating those claims about biotechnology. Since the original trustworthiness question was stated in terms of a mistrusting situation, respondents' ratings for investigating information sources' claims about biotechnology were reverse-coded to counter this negative connotation.

Table 4 shows respondents had the least trust for celebrities/popular stars and activist groups (i.e., respondents deemed it

“important” to investigate both groups' biotechnology claims) ( $M = 3.19$  and  $2.55$ , respectively). University scientists/researchers garnered respondents' greatest level ( $M = 1.73$ ,  $SD = .73$ ) of trustworthiness by having their claims deemed “somewhat important” to investigate. Likewise, state elected FFA officers perceived the other six groups' (biotechnology company representatives, cooperative extension specialists, farm/ranch groups, food companies, government agencies, and health professionals) claims about biotechnology as somewhat important ( $M = 1.51$ - $2.50$ ) to investigate (Table 4).

Table 4  
*Respondents' Trustworthiness of Biotechnology Statements by Information Source (N = 177)*

Information Sources	<i>M</i> <sup>a</sup>	<i>SD</i>	Level of Importance for Investigating Sources' Claims about Biotechnology
Celebrities/Popular Stars	3.19	1.15	Important
Activist Groups	2.55	1.08	Important
Biotechnology Company Representatives	1.92	.74	Somewhat Important
Cooperative Extension Specialists	1.91	.77	Somewhat Important
Government Agencies	1.84	.77	Somewhat Important
Health Professionals	1.82	.75	Somewhat Important
Food Companies	1.80	.68	Somewhat Important
Farm/Ranch Groups	1.79	.70	Somewhat Important
University Scientists/Researchers	1.73	.73	Somewhat Important

<sup>a</sup>Scale: 1 = not at all important, 2 = somewhat important, 3 = important, and 4 = very important

Finally, respondents' raw scores for confidence and trustworthiness of biotechnology information sources were analyzed using Pearson's correlation coefficients (Hinkle, Wiersma, & Jurs, 1994). Relationships were described using the standards established by Davis (1971). Table 5 shows significant, moderate positive relationships existed between respondents' perceived confidence and trustworthiness of

claims about biotechnology made by cooperative extension specialists ( $r = .39$ ), food companies and government agencies ( $r = .33$ ), and farm/ranch groups ( $r = .31$ ). Significant, low ( $r = .17$  to  $.29$ ) relationships existed between confidence and trustworthiness for all other information sources' claims about biotechnology, except for the claims made by celebrities/popular stars (Table 5).



Table 5  
*Correlations Between Confidence and Trustworthiness of Information Sources' Claims About Biotechnology (N = 177)*

Information Sources	<i>r</i>	Sig.
Cooperative Extension Specialists	.39*	.00
Food Companies	.33*	.00
Government Agencies	.33*	.00
Farm/Ranch Groups	.31*	.00
University Scientists/Researchers	.29*	.00
Activist Groups	.23*	.00
Biotechnology Company Representatives	.19*	.01
Health Professionals	.17*	.02
Celebrities/Popular Stars	.14	.07

\*  $p < 0.05$

### Conclusions, Recommendations, and Implications

Elected state FFA officers' awareness levels of how biotechnology will affect food, health, and environment were different than colleges of agriculture students in a previous study (Wingenbach et al., 2003; Fritz et al., 2003). Based on review of the data collected for this study, state FFA officers had much higher awareness levels than did college of agriculture students studied just three years ago (Wingenbach et al., 2003). However, we cannot simply conclude that elected state FFA officers' elevated awareness levels were due to their leadership status.

While FFA officers may have greater exposure to current event issues, such as biotechnology, because of their public role with the national organization, their increased awareness could be explained by increased media coverage of biotechnology and its effects on food, health, and environment over the past three years. An increase in media coverage of biotechnology issues supports framing theory since increased coverage of an issue by the media

creates an impression that the topic is of greater public importance now than in past years. This difference has opened the door for debate about "real world" awareness levels between state FFA officer and non-officer students in colleges of agriculture.

State FFA officers' perceived confidence and trustworthiness of claims made by university scientists/researchers and activist groups in this study confirmed similar findings in previous studies (Wingenbach & Rutherford, 2005; Vestal & Briers, 1999). Respondents had the greatest confidence in biotechnology statements made by university scientists/researchers and they perceived it least important to investigate claims (trust issue) made by this informant group. Likewise, they had least confidence in biotechnology claims made by celebrities/popular stars and activist groups, and perceived it important to investigate claims made by these same groups. Wingenbach and Rutherford found similar results for the same informant groups when researching journalists' perceptions of biotechnology issues.

The resultant associations between confidence and trust levels, although not as

strong as originally believed, illustrated researchers' beliefs about biotechnology information sources; as confidence increased, the level of "mistrust," or level of importance placed on investigating that source's claims about biotechnology decreased. One source, celebrities/popular stars, did not produce any significant relationship between confidence and trust. Perhaps, elected state FFA officers perceived statements about biotechnology made by celebrities/popular stars as inconsequential, therefore negating any thoughts about investigating this source's claims because no amount of investigation could change respondents' perceptions or confidence in this group as an authoritative source for agricultural biotechnology issues. Additional study may help us understand respondents' perceptions of "media laden" groups and their impact, positive or negative, on agricultural topics.

Jenkins (1999) found that scientists were seen as trustworthy sources of information, but were not influential communicators of their research to the public, primarily because biotechnology is still too technical for public comprehension (Brossard & Shanahan, 2003). In this study, elected state FFA officers placed trust in statements made by university scientists/researchers, but perceived it still "somewhat important" to investigate claims made by this group. We should take heart that future agriculturists will not be content with simply accepting scientists' claims about university-produced science, for the mere sake of its origin. It shows us that they will be critical consumers of scientific information, regardless of its origin. Now all we have to do is find ways to install this same quality in all students.

The results of this study raised several areas of inquiry into communication skill sets, as practiced within the National FFA Organization. For example, are FFA officers' information gathering skills superior to those who do not serve in leadership roles? An intensive study of communication skill sets from specific FFA chapters, officers, and non-officers may shed new light on our understanding of those skill sets. If FFA officers' information gathering skills are superior to those of non-

officers, can they be used as models for teaching communication skills to all high school and college students, regardless of career interests?

Evidence exists that active participation in FFA leadership roles translates into active civic leadership roles for some former FFA members (Brannon et al., 1989; National FFA Organization, 2006). Additional studies are needed to determine the "definitive differences" in communication skill sets between FFA officers and all other agricultural education students (high school and college), or between FFA officers and non-agriculture students. Such studies may illuminate our collective understanding of the important communication skill characteristics needed by all future agriculturists, especially those who will become communicators of agricultural science and technology.

## References

- Adovor, D. (2005). *Perceptions and discourses of bioengineered food innovations: The Ghanaian college students' outlook*. Unpublished master's thesis, Michigan State University, East Lansing.
- Blaine, K., Kamaldeen, S., & Powell, D. (2002). Public perceptions of biotechnology. *Journal of Food Science*, 67(9), 3200-3208.
- Borg, W. R., & Gall, M. D. (1989). *Educational research: An introduction* (5th ed.). New York: Longman.
- Brannon, T., Holley, C. W., & Key, J. P. (1989). Impact of vocational agriculture/FFA on community leadership. *Journal of Agricultural Education*, 30(3), 37-45.
- Brossard, D., & Shanahan, J. (2003). Do citizens want to have their say? Media, agricultural biotechnology, and authoritarian views of democratic processes in science. *Mass Communication and Society*, 6(3), 291-312.
- Davis, J. A. (1971). *Elementary survey analysis*. Englewood Cliffs, NJ: Prentice-Hall.

Dawson, V., & Taylor, P. (2000). Do adolescents' bioethical decisions differ from those of experts? *Journal of Biological Education*, 34(4), 184-188.

Finke, M. S., & Kim, H. (2003). Attitudes about genetically modified foods among Korean and American college students. *AgBioForum*, 6(4), 191-197.

Fritz, S., Husmann, D., Wingenbach, G., Rutherford, T., Egger, V., & Wadhwa, P. (2003). Awareness and acceptance of biotechnology issues among youth, undergraduates, and adults. *AgBioForum*, 6(4), 178-184.

Goldhor, H. (1974). *The use of late respondents to estimate the nature on non-respondents*. Washington, D.C.: U.S. Office of Education. (ERIC Document ED083309)

Hinkle, D., Wiersma, W., & Jurs, S. (1994). *Applied statistics for the behavioral sciences*. Boston: Houghton Mifflin.

Jenkins, R. O. (1999). Biotechnology education. *Biochemical Education*, 27, 100-101.

Kypri, K., Gallagher, S. J., & Cashell-Smith, M. L. (2004). An Internet-based survey method for college student drinking research. *Drug and Alcohol Dependence*, 76, 45-53. Retrieved December 26, 2005, from <http://users.tpg.com.au/kypri/Downloads/Publications/Web%20survey%20Kypri%20et%20al%202004.pdf>

Ladner, D., Wingenbach, G., & Raven, M. (2002). Internet and paper-based data collection methods in agricultural education research. *Journal of Southern Agricultural Education Research*, 52(1), 40-51.

Lang, J. T., O'Neill, K. M., & Hallman, W. K. (2003). Expertise, trust, and communication about food biotechnology. *AgBioForum*, 6(4), 185-190.

Lindner, J. R., Murphy, T. H., & Briers, G. E. (2001). Handling nonresponse in social science research. *Journal of Agricultural Education*, 42(4), 43-53.

Macer, D. (2001). Bioethics: Perceptions of biotechnology and policy implications. *International Journal of Sustainable Development* 3(1/2), 117-133.

McQuail, D. (2005). *McQuail's mass communication theory*, (5th ed.). Thousand Oaks, CA: Sage.

National FFA Organization. (2006). *Prominent former members*. Retrieved June 29, 2006, from [http://www.ffa.org/about\\_ffa/html/ffa\\_formermembers.html](http://www.ffa.org/about_ffa/html/ffa_formermembers.html)

National Science Foundation. (2000). Chapter 8: Science and technology: Public attitudes and public understanding. *Indicators 2000*. Washington D.C.: Author.

Rutherford, T. A., Townsend, C. D., Briers, G. E., Cummins, R., & Conrad, C. R. (2002). Leadership self-perceptions of WLC participants. *Journal of Agricultural Education*, 43(2), 22-33.

Vestal, T. A., & Briers, G. E. (1999). Metro news journalists critique food biotechnology. *Journal of Applied Communications*, 83(2), 23-34.

Wingenbach, G. J. (2003). Texans' perceptions about agricultural and biotechnology issues reported in the mass media. CSREES-TEX08934; HATCH Project No. H-8934.

Wingenbach, G. J., & Kahler, A. (1997). Self-perceived youth leadership and life skills of Iowa FFA members. *Journal of Agricultural Education*, 38(3), 18-27.

Wingenbach, G. J., & Rutherford, T. A. (2005). Trust, bias, and fairness of information sources for biotechnology issues. *AgBioForum Journal*, 8(4), 213-220.

Wingenbach, G. J., Rutherford, T. A., & Dunsford, D. (2003). Agricultural communications students' awareness and perceptions of biotechnology issues. *Journal of Agricultural Education*, 44(4), 80-93.

GARY J. WINGENGACH is an Associate Professor in the Department of Agricultural Leadership, Education, and Communications at Texas A&M University, MS 2116, 218 Scoates Hall, College Station, TX 77843-2116. E-mail: [g\\_wingenbach@tamu.edu](mailto:g_wingenbach@tamu.edu)

TRACY A. RUTHERFORD is an Assistant Professor in the Department of Agricultural Leadership, Education, and Communications at Texas A&M University, MS 2116, 125 Scoates Hall, College Station, TX 77843-2116. E-mail: [trutherford@tamu.edu](mailto:trutherford@tamu.edu)