COLLEGE STUDENTS' PERCEPTIONS

OF THE NATIONAL ANIMAL IDENTIFICATION SYSTEM

A Thesis

by

JEANIE MARIE LONG

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 2007

Major Subject: Agricultural Education

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Approved by:

Co-Chairs of Committee,	Gary Wingenbach
	Tracy Rutherford
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ABSTRACT

College Students' Perceptions of the National Animal Identification System. (December 2007)

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The purpose of this study was to determine awareness, knowledge, and perceptions of the National Animal Identification System (NAIS) among college students in the College of Agriculture and Life Sciences at Texas A&M University. Since the issue of a government-sponsored electronic national identification system for livestock is relatively new, many pros and cons exist regarding increased biosecurity and increased surveillance by the government. While many adult producer groups have expressed their concerns over the implications of the proposed identification system, little attention has been focused on future producers—youth and college students.

This study investigated how college students gathered information about livestock industry issues from mass media or other resources, and how the students' awareness and knowledge of the identification system influenced their perceptions of the NAIS.

The sample population consisted of students enrolled in courses related to animal agriculture and production during the spring 2007 semester at Texas A&M University. Stratified random sampling was used to determine participants, and a total of 92 students responded to the survey. The strata were animal science majors and non-animal science majors, and upperclassmen and lowerclassmen.

An online, self-administered survey was used to collect data from the participants. The survey consisted of close-ended and open-ended questions; a pilot study of students with similar

majors and classification as the sample established face validity of the instrument. Descriptive statistics, correlations, and one-way ANOVA were used to examine the data.

Major findings were that as a group, students were somewhat aware of the NAIS, and were knowledgeable of general NAIS concepts. Students disagreed with the statement that they are well-informed about the NAIS. Students' perceptions of the NAIS were positively associated with their awareness of the NAIS. Livestock leadership experiences (4-H or FFA membership, livestock show team member, exhibitor experience, and youth livestock organization member) had positive moderate correlations with NAIS awareness. Livestock exhibitor experience had a moderate correlation with perception of the NAIS.

University professors, Internet, and family members were preferred information sources. Opinion leaders' influence as information sources affected students' awareness and perceptions of the NAIS. Cooperative Extension, private organizations, and university professors were all moderately correlated with students' awareness of the NAIS. University professors had a positive, yet low correlation with students' perceptions of the NAIS.

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CHAPTER I

INTRODUCTION: BACKGROUND OF THE STUDY

The practice of identifying livestock dates back to ancient civilization when domesticated animals, especially horses, were highly valued—in particular 356 B.C. when Alexander the Great ruled the Greek Empire (Blancou, 2001). The practice of branding, identifying, and recording ownership of branded animals continued for centuries.

Cattle ranchers in the late 1800s and early 1900s used hot-iron brands to indicate ownership and deter theft of their animals on the open range (APHISa). Swine producers used ear notching for record keeping and registration purposes (Richey, Slack, & Vise-Brown, 2005). With the outbreak of rabies or tuberculosis near the end of WWI, livestock identification became more important for tracking diseased animals (Richey et al.). Eradication programs in the 1960s for brucellosis, tuberculosis, and pseudorabies required some form of identification; metal ear tags became the standard form of identification. As the diseases were eradicated, the level of identification declined as well (Marchant, 2002).

Development of automated identification systems began in the 1960s as a way to help producers manage and record data for large herds of livestock (Rossing, 1999). In the mid-1980s, the Food and Nutrition Board of the National Academy of Sciences recommended a traceback and recall system in the meat and poultry industries as one component of a modernization plan (Vitiello & Thaler, 2001). Many food production companies used a hazard analysis and critical control point (HACCP) system to monitor critical control points – a system considered logical and simple, but not embraced by all members of the food production and processing industries (Vitiello & Thaler).

This thesis follows the style of the *Journal of Agricultural Education*.

In the 1990s, food-borne pathogens became an issue as reports of an *E. coli* O157:H7 outbreak in Seattle garnered national attention (Vitiello & Thaler, 2001). The food production industry and the government slowly realized that harmful pathogens could enter the food supply and that production standards were failing public health expectations (Vitiello & Thaler). Changes in the HACCP system in 1996 called for more stringent processing standards that would prevent food safety hazards and required processing facilities to meet specific food safety performance standards (Vitiello & Thaler).

On December 23, 2003, U.S. Agriculture Secretary Ann Veneman announced the first case of bovine spongiform encephalopathy (BSE) in the United States. As a result, 53 countries imposed sanctions, and refused to import beef from the United States (APHIS a). In April 2004, the USDA announced plans to create a national animal identification system to track livestock in the event of a disease outbreak (APHISa).

The National Animal Identification System (NAIS) proposed by the USDA will be capable of traceback and source verification (APHISb). In addition to tracing sick animals back to the original herd, the animal identification system would allow public health officials to trace animals through the processing chain and prevent consumption of products that were exposed to disease or harmful pathogens (Vitiello & Thaler, 2001).

The USDA proposes using the latest technology to electronically record and trace livestock records with high-tech digital computer systems (Ishmael, 2006). Livestock will be tagged with electronic radio frequency identification (RFID) tags that will store all necessary data; wands or electronic readers will retrieve data from the tag (Ishmael). The RFID tags have an identification number engraved with a laser on the outside of the tag, which corresponds to the ISO (International Standards Organization) number programmed on the RFID tag (Mennecke

& Townsend, 2005). This cross-reference of identifying numbers reduces the chances of misidentifying an animal (Mennecke & Townsend).

Currently, the primary forces driving the animal identification systems are public and private demands: disease control and eradication, disease surveillance, emergency response to foreign animal diseases, global trade, consumer concerns over food safety, and emergency management programs (Wiemers, 2000).

Statement of the Problem

Information seen or read through mass media channels creates the reality of science for most people (Nelkin, 1995). With the new age of technology, consumers are able to read and receive news around the clock, and from every corner of the earth. Therefore, the news media plays a major role in disseminating information and bringing scientific issues to the public's attention (Malone, Boyd, & Bero, 2000).

The reoccurrence of BSE cases in the United States since December 2003, along with *E.coli* outbreaks in spinach and lettuce during January 2007, has heightened American consumers' awareness of potential health hazards and food safety issues. The potential impact of these diseases is tremendous, threatening the U.S. economy and human health. One factor that may alleviate health concerns is a national animal identification system.

Limited material exists that describes the media coverage of the NAIS. While the issue itself is not as pertinent as BSE, foot-and-mouth, or other health-related incidences, the system will impact everyone—producers, future producers, industry members, and consumers. As with any government program, pros and cons exist. Information dissemination plays a key role in informing and educating program participants.

Livestock industry officials have recognized the importance of youth involvement in the NAIS. Youth livestock exhibitors, owners, producers and caretakers have the responsibility to

learn proper animal handling and management practices to ensure animal health, public health, food safety, consumer confidence, and market access (Rusk, 2006).

Even though college students are not considered youth, they are transitioning from their experiences as a youth and preparing for adulthood. In three to four years, college students will be making consumer decisions and entering the workforce, some in the livestock industry, others in industries impacted by the livestock industry.

By studying the information sources and channels, awareness, knowledge and perceptions of college students about the NAIS, agricultural communicators will be better prepared to disseminate effective communication materials in the future.

Purpose of the Study

The purpose of this study was to determine awareness, knowledge, and perceptions of the NAIS among college students in the College of Agriculture and Life Sciences at Texas A&M University. The objectives guiding this research were:

1) Determine students' awareness of the NAIS.
2) Determine students' knowledge of the livestock industry and the NAIS.
3) Determine students' perceptions of the NAIS.
4) Determine students' information sources for livestock industry issues.
5) Determine the relationship between students' youth leadership experience and their awareness of the NAIS.
6) Determine the relationship between students' youth livestock experience and their perceptions of the NAIS.
7) Determine if significant differences exist between students' awareness of the NAIS when compared by selected demographics.

8) Determine if significant differences exist between students' perceptions of the NAIS when compared by selected demographics.
9) Determine if significant differences exist between students' knowledge of the NAIS when compared by selected demographics.
10) Determine if relationships exist among students' awareness, knowledge, and perceptions of the NAIS.

Significance of the Study

Since the issue of a government-sponsored electronic national identification system for livestock is relatively new, many pros and cons exist regarding increased biosecurity and increased surveillance by the government. While many adult producer groups have expressed their concerns over the implications of the proposed identification system, little attention has been focused on future producers—youth and college students.

This study investigated how college students gathered information about livestock industry issues from mass media or other resources, and how the students' awareness and knowledge of the identification system influenced their perceptions of the NAIS. Understanding college students' information sources, awareness, knowledge, and perceptions of the NAIS would enable agricultural communicators and educators to disseminate information more effectively and efficiently.

Definition of Terms

Awareness: having information and being conscious of that information. Hoban (1998) contends that the importance of an issue can be determined by people's level of awareness. Likewise, awareness is the first step in the innovation adoption process (Hoban, 2002).

Knowledge: recalling specifics, methods, processes, patterns, structures, or settings (Bloom, 1956). Knowledge is gained when information is learned and retained by a person, and the facts that are remembered or memorized provide a foundation for understanding (Bloom).

Perceptions: to become aware of through the senses; ability to understand (Merriam-Webster Dictionary, 2004). Public perceptions can influence the adoption of technologies (Blaine, Kamaldeen, & Powell, 2002), whereas knowledge, experience, or global attitudes reported in the mass media can shape and form people's perceptions (Wingenbach, Rutherford, & Dunsford, 2003).

Information sources: Students receive information from someone or from a particular medium. Traditional media, including newspapers and television news, health professionals, farmers, growers, and university scientists were trusted biotechnology information sources for Ohio residents (Tucker, Whaley, & Sharp, 2006). Sources of information can also include Extension specialists, family members, friends, university professors, private organizations, radio, trade publications, popular magazines, and Web sites.

Opinion leader: a person who provides information and advice about innovations to individuals (Rogers, 2003). Because the opinion leader earns and maintains his status by his technical competence, conformity to norms, and social accessibility (Rogers), he is considered an expert and is trusted for accurate and truthful information. Opinion leaders are also seen as having an influence on others and access the mass media more than the average person.

National Animal Identification System: a voluntary animal identification and tracking system that is capable of tracking sick, infected, and exposed animals to a herd or farm of origin. The NAIS is a voluntary partnership between producers and state, federal, and animal industry officials; the program utilizes a modern, digitalized system to assist producers and animal health officials in the United States to respond quickly to animal health events (APHISb).

Research Hypotheses

H_1 Opinion leaders affect students' awareness of the NAIS.

H_2 Opinion leaders affect students' knowledge of the NAIS.

H_3 Opinion leaders affect students' perceptions about the NAIS.

Assumptions

One major assumption of the study was that the sample was representative of the target population and the accessible population. Another assumption was respondents would answer the survey truthfully and honestly.

Limitations

The use of a self-administered survey limited this study. Because students completed the survey on their own, they could have lacked motivation to respond and answer each question. Respondents could have felt the survey was not important or that they did not have anything to contribute. Dillman (2007) suggested that the researcher can motivate the respondent to answer and return the survey by sending follow-up reminders, communicating to the respondent that their responses are important, and designing a respondent-friendly questionnaire. Respondents may also ignore the instructions for each question, give incomplete answers, skip questions, or even fail to return the questionnaire to the researcher (Dillman).

A second limitation to the study was the four types of survey error: sampling, coverage, measurement, and non-response. Sampling error results when a portion of the population is surveyed and not all members of the sample (Dillman, 2007). The researcher attempted to reduce sampling error in this study by using a stratified random sample of the target population.

Coverage error occurs when the sample does not include all elements of the population (Dillman, 2007), such as omitting students without an e-mail address. In this study, coverage

error was addressed by contacting students through their NEO e-mail accounts, an e-mail system sponsored and maintained by Texas A&M University. All students enrolled at Texas A&M University are required to have a NEO email account. However, students who did not check their NEO e-mail accounts daily or even regularly could have hindered the response rate of the survey.

Measurement error occurs when students do not answer the survey or parts of the survey because of poor, inaccurate, or imprecise wording (Dillman, 2007). In a self-administered survey, respondents can not leave feedback about inaccurate or misleading questions (Dillman). To control for measurement error, the researcher conducted a pilot test of the survey and asked students to provide feedback about misleading or confusing questions.

Non-response error occurs when non-respondents have significant characteristics that could contribute to the study (Dillman, 2007). Despite the researcher's attempts to reduce survey error, there was a chance that the errors would occur.

A third limitation was the use of a convenience sample – college students enrolled in courses related to livestock industry issues at Texas A&M University. Therefore, the results from this study can not be generalized to all college students in the United States.

A fourth limitation was the first-time use of the instrument. Even though reliability and validity was determined through a review of literature, an expert panel review, and a pilot test, the instrument modification could still be made to accurately measure students' awareness, knowledge, and perceptions of the NAIS.

A fifth limitation was media coverage of livestock industry issues in the six months prior to the study. Coverage of the NAIS or animal health issues in the media may not have been as prominent at the time of the study compared to coverage of these issues one year earlier.

A sixth limitation was the subject matter in the selected livestock production-related courses. The researcher sampled students enrolled in courses related to animal agriculture and livestock production. However, the professor or the course itself may not have discussed the NAIS, its impact, or its significance to the livestock industry.

CHAPTER II

REVIEW OF LITERATURE

Agriculture is an integral part of the American economy and consumers depend on agriculture for food, clothing, and shelter. While the agricultural industry relies on the media to inform the public about issues such as food safety (Heuer & Miller, 2006), the public also relies on media for information about the American food system and its safety (Whaley & Doefert, 2003). Mainstream media has come to serve the agricultural industry in an indirect way by providing information to the non-farming public (King & Cartmell, 2005). Since they are far removed from production agriculture, the non-farming public depends on mainstream media for their knowledge of the agricultural industry (Reisner &Walter, 1994).

Theoretical Framework

The theoretical framework guiding this study was the two-step flow model – how messages flow from the media to opinion leaders, and to a less active or informed public audience. The two-step flow model, constructed by Lazarsfeld, Berelson and Gaudet during the early 1940s, focused on decision-making in the 1940 Presidential election campaign. Evidence existed that media effects were minimal but social influences had an effect on voters' opinions (Lowery & DeFleur, 1995). Social influence came from opinion leaders, people who were heavily involved with or exposed to the political campaigns (Lowery & DeFleur). Therefore, people who had less knowledge or interest turned to opinion leaders for information because they trusted opinion leaders more than political propaganda (Lowery & DeFleur). The conceptual model of the two-step flow theory is depicted in Figure 1.

Lazarsfeld et al. determined "that print and electronic media influence masses of people through an indirect 'two-step flow of communication'" (Griffin, 2000, p. 348). In the first step, information is transferred to a small group of people, usually opinion leaders, or others who stay

abreast with current news and information (Griffin). In the second step, opinion leaders interpret the message and pass it along to other people through speeches, interpersonal communication, and discussion (Griffin). Essentially, information is transferred to a mass audience through various forms of media (television, Internet, radio, satellite); the receivers attempt to validate the information through people they respect and trust (Griffin).

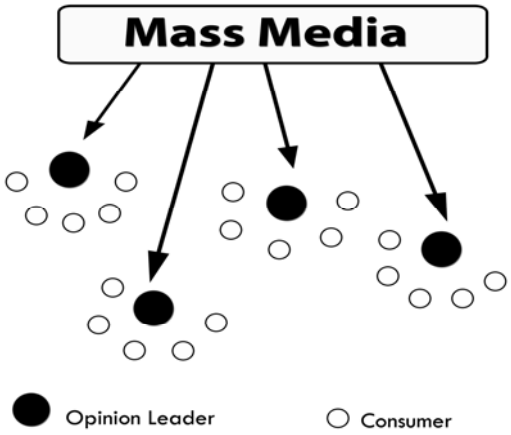

Figure 1. Two-step Flow Model: Mass Media to Consumer (Katz & Lazarsfeld, 1955).

Perceptions and Mass Media

University students' perceptions of agriculture issues were studied by Terry and Lawver (1995), who suggested that urbanization has contributed to consumer's low awareness of agriculture and most importantly, their inaccurate perceptions of agricultural industry issues. Terry and Lawver suggested that as more people become removed from production agriculture, they are less concerned about the supply of food and fiber, therefore failing to understand the benefits of agriculture to society.

The key findings in this study were that students generally held positive perceptions about the impact of agriculture on the economy and the environment. Students perceived the food supply to be safe for human consumption, but males were generally more positive about animal welfare and production agriculture methods. Terry and Lawver (1995) found that students' gender, college major, and hometown were related to perceptions about agricultural issues.

Knowledge, experience, or global attitudes reported in the mass media can shape and form people's perceptions (Wingenbach et al., 2003). Therefore, to effectively educate students, determining what sources influence perceptions or what sources are used to form perceptions is essential. In their study of student awareness and perceptions of biotechnology issues, Wingenbach et al. found that students gained awareness of biotechnology through science classes, labs, and university professors' beliefs. It was determined that already-present global attitudes did not influence student perceptions, but awareness of biotechnology practices did in fact influence student perceptions (Wingenbach et al.).

Student perceptions in acceptance of biotechnology practices were influenced by demographics such as family ownership of agricultural production land and whether students lived or worked on a farm or ranch (Wingenbach et al., 2003). Students whose family owned production land and those who had lived on a farm or ranch had more positive perceptions towards accepting biotechnology practices and more faith in biotechnology information sources (Wingenbach et al.). Additional evidence indicated that males held more positive perceptions toward biotechnology practices than did females (Wingenbach et al.).

Heuer and Miller (2006) indicated that mass media has the ability to influence public opinion and set the public agenda—or determine the way the public should think about a topic.

Meyers and Rhoades (2006) suggested a direct relationship exists between information that appears in the media and what the viewers perceive as important.

The way a story is packaged by the media to help people understand an issue is referred to as framing (Meyers & Rhoades, 2006). Kalaitzandonakes, Marks, and Vickner (2004) stated that media highlight certain points-of-view and marginalize other topics through frames, and use frames to explain how events are to be understood. Ruth, Eubanks, and Telg (2005) studied the impact framing—the way an issue is portrayed in the media—had on the Bovine Spongiform Encephalopathy (BSE) or mad cow disease outbreak. Media coverage in the United States focused on the implications BSE would have on humans, thus causing consumers to fear BSE as a high-risk disease (Ruth et al.). Frames included industry crisis, economic calamity, blame and responsibility, and health risk. The health risk frame was most frequently reported in U.S. media coverage, whereas the crisis frame was most frequently reported in Canadian media coverage (Ruth et al.).

Because frames can create public understanding of an event (Entman, 1991), Ruth et al.(2005) said that their study of framing in the livestock industry could shed light on the public's basic awareness and perceptions of BSE. They also said that the framing of BSE during the time period surrounding the outbreak could potentially affect perceptions of agriculture in general because the beef cattle industry is such a large part of the agricultural industry (Ruth et al.).

Media Coverage of Livestock Issues

Since the December 2003 confirmation of BSE in the United States, two other cases have been confirmed. The second case was confirmed June 2005 in a 12-year-old cow in Texas, while the third case was confirmed March 2006 in a 10-year-old cow in Alabama (APHISb). These three instances highlighted the need for an immediate trace back system in the United

States livestock industry. Consumers demanded information whether their health had been jeopardized and whether the tainted meat had entered the food supply.

An unpublished study by Long (2006) analyzed media coverage of the NAIS from July 1, 2005 to August 1, 2006. News stories appearing in newspapers from the top three cattle producing states and the bottom three cattle producing states were examined for major themes. Disease control, financial impact, foreign trade, and political concerns were four major reoccurring themes in the articles (Long).

Invasion of privacy and infringement of certain religious practices were among the many political concerns (Long, 2006). Other political topics included the voluntary program becoming mandatory, storage of personal information collected by the animal identification system, and outsourcing of the governmental program to private firms.

References made to avian flu and mad cow disease in several articles highlighted how the NAIS could be used to track and prevent diseases (Long, 2006). Other topics in the disease control theme included bioterrorism and whether small herds could be responsible for spread of disease as opposed to large herds.

The financial impact of the NAIS was the third most occurring theme in the study. Concerns centered on who would pay for the initial cost of the program, and who would absorb the costs—taxpayers or producers (Long, 2006). The study found references to producers receiving higher prices for cattle tagged with an electronic identification ear tag.

The effect of the NAIS on foreign and domestic trade was the fourth most dominant theme found by Long (2006). Media sources cited that the NAIS was vital to reestablishing foreign markets, winning trading partners' trust, and most important, ensuring consumer confidence.

Kalaitzandonakes et al. (2004) suggested that researchers should shift their focus to the impact of media coverage on consumer behavior rather than the linkage between media and public perceptions. Media coverage is never static and that it can fluctuate over time when unpredictable events occur or new knowledge is developed (Kalaitzandonakes et al.). Likewise, it is difficult to observe and measure how consumers access and understand the information (Kalaitzandonakes et al.).

Attitudes Towards Livestock Industry Issues

Nordstrom et al. (2000) assessed student attitudes toward animal welfare, resource use, and food safety among high school students participating in the Pennsylvania Governor's School for Agricultural Sciences. Food safety was ranked by all students as the area of utmost importance and concern; resource use and animal welfare followed as the second most important issue (Nordstrom et al.). Microbial contamination was ranked as the major food safety concern for both urban and rural students while providing shelter was the primary concern for all students in regards to animal welfare issues (Nordstrom et al.). For urban students, animal health ranked second, and processing (harvesting) was ranked second by students with agricultural experience (Nordstrom et al.). All students participating in the program indicated that they had the greatest concern over the dairy industry (Nordstrom et al.).

An important conclusion was that agricultural education programs can provide a foundation for students on animal and environmental issues, while enhancing their knowledge and fostering dialogue related to these areas. For some students, their only agricultural experience was the ownership and care of companion animals, which varied greatly from the ownership and care of farm animals (Nordstrom et al.). For those who lacked experience with farm animals, their attitudes toward the use of animals for food, fiber, and research may be affected when distinguishing between farm and companion animals (Nordstrom et al.).

Furthermore, the lack of agricultural literacy could lead consumers to question animal production methods, livestock management practices, and ultimately, the safety of the food supply.

One of the main findings for Nordstrom et al. (2000) was that urban students were not the only ones questioning specific animal management practices. They found students with agricultural backgrounds questioned management practices regarding food safety, resource use, and animal welfare. Researchers concluded that students with agricultural backgrounds were critically assessing animal production methods and practices (Nordstrom et al.).

Perceptions and Knowledge of the Agricultural Industry

Balschweid (2002) found that urban students who were enrolled in a high school biology course that used animal agriculture as the context reported positive perceptions about animal agriculture at the conclusion of the course. Ninety percent of the students agreed that the course helped them understand the relationship of agriculture and science. Most important, Balschweid reported urban students with limited exposure to agriculture reported positive perceptions and attitudes toward farmers and animal agriculture. Therefore, it can be concluded that regardless of geography and urban environment, students realized the importance of the livestock industry, and that education had a positive effect on students' attitudes.

Harbstreit and Welton (1992) concluded that high school students had limited awareness of international agriculture, but as students advanced to the next high school class level, their awareness of international agriculture increased. They found that the longer a student was involved with a high school agriculture program, awareness of international agriculture increased.

Fritz et al. (2003) found a significant difference in the percentage of adults and youth who were reportedly aware of how biotechnology would affect food, health, and environment.

More adults reported awareness of biotechnology affects on food, health, and environment than did youth; however, an equal percentage of adults (54.2%) and youth (53.5%) reportedly were somewhat aware of affects of biotechnology on food, health, and environment.

House et al. (2004) studied female consumers' knowledge of genetically modified foods and found that respondents with a college education had significantly higher objective and subjective knowledge levels of genetically modified foods. They highlighted the importance of consumer education and knowledge of genetically modified foods and the impact consumer education could have for policy makers and agribusinesses. Moore, Ingram, and Dhital (1996) reported marginal differences in the percent of correct answers regarding international agriculture issues and students' class standing in college. However, students who had completed agriscience coursework in high school performed better on general agriculture geography knowledge items than did students who had no agriscience coursework.

Even though previous literature (Gaskell, Bauer, Duran, & Allum, 1999; Hoban, 1998) found that objective knowledge differed among respondents in different geographical locations, House et al. (2004) found no significant association between location and objective knowledge. However, (Sanbonmatsu & Fazio, 1990) concluded that when people had low knowledge or experience with a topic, it was possible for them to base their perceptions of that topic on already-present global attitudes. Previous literature (Brown, 1990; Humphrey, 1992, as found in Wright, Stewart, & Birkenholz, 1994) found that a weak positive relationship existed between knowledge and perceptions scores related to agriculture. Likewise, Vestal and Briers (2000) found that journalists' awareness of biotechnology affects on food, health, and the environment had a weak positive association with knowledge.

Youth Development and Awareness of the Livestock Industry

Iowa State University Extension (2007, ¶ 1) stated that "youth development is a process of mental, physical, social and emotional growth during which young people prepare to live a productive and satisfying life." Life skills allow youth to gain a better understanding of their values, be prepared to make responsible decisions, and be able to communicate with peers (Boyd, Herring, & Briers, 1992). Communication, leadership, and decision making are skills necessary for everyday living in adulthood, and are among the very basic life skills.

Young people who participate in youth programs often work with other youth and adults to make decisions, take responsibility, establish goals, and set priorities (Dept. HEW, 1977, as found in Seevers & Dormody, 1994a). In Seevers and Dormody's (1994a) study of senior 4-H members, respondents identified holding office, teaching younger members, fairs, livestock shows, judging contests, demonstrations, public speaking and community service as the top activities that contributed to the development of leadership life skills. In a similar study focusing on FFA members, Seevers and Dormody (1994b) found that judging contests, public speaking, chapter meetings, holding office, and parliamentary procedure were the top activities that contributed to the participants' life skills development. They concluded that 4-H and FFA members were active participants in leadership activities, but not as active in planning and implementing these activities. However, members reported the greatest participation in leadership activities at the club, county, and district levels.

Youth organizations play an integral role in promoting mental growth. In fact, Boleman, Cummings, and Briers (2004) found that youth participating in 4-H beef projects developed essential knowledge of the livestock industry. Rusk, Martin, Talbert, and Balshweid (2002) concluded that the Indiana 4-H livestock judging program had a positive influence on participants' life skill "livestock industry knowledge." In addition to learning skills of livestock

production, youth were also learning life skills that would carry over into their adulthood (Shih & Gamon, 1997). Therefore, youth who develop essential knowledge of the livestock industry would be prepared to make decisions and communicate about animal agriculture issues, such as the NAIS.

Birkenbolz and Schumacher (1994) found that students' involvement with livestock organizations was positively associated with specific leadership factors. More specifically, students who were involved with livestock organizations reported that they were accepted by their peers as a leader, were able to inspire people, and could motivate people (Birkenbolz & Schumacher). With an ever changing global society, it is important to ensure that youth are equipped with knowledge about agricultural industry issues and the leadership skills to guide and direct the industry in the future.

Cano and Bankston (1992) found that minority youth had positive perceptions regarding their 4-H experience and perceived 4-H programs and activities as meaningful and educational. Participants indicated that 4-H was a place to learn new things and develop leadership skills, and those participants living in urban areas had a strong desire to learn about livestock, mainly because livestock were inaccessible to them (Cano & Bankston). Lack of advertising, poor communication, and apathy from parents affected general perceptions of the 4-H.

Information Sources and Food Safety

Tucker et al. (2006) studied perceptions of food safety risks among Ohio residents, and the factors influencing their perceptions. Pesticide residues in food and contamination of drinking water were the highest concerns for participants, while genetically-modified foods generated the least amount of concern (Tucker et al.). Tucker et al. concluded that bioterrorism, mad cow disease, use of growth hormones, bacterial and pesticide contamination, and genetically-modified foods were at the top of consumer's food safety concerns.

Tucker et al. (2006) found that respondents favored traditional media such as newspapers and television news while physicians and other health professionals were the most trusted information sources for Ohio residents. Farmers, growers and university scientists followed closely with moderate levels of trust; friends, family, consumer advocacy groups, and the U.S. Environmental Protection Agency were the least favorable sources of information (Tucker et al.). Furthermore, respondents who had high dependence on mass media channels and expressed higher levels of food risk generally viewed biotechnology as having a negative impact on the food supply (Tucker et al.).

Tucker et al. (2006) stated that food safety specialists and communicators can play a critical role in influencing the development of consumer opinions of food biotechnology risks and benefits. These specialists and communicators can also be key players in educating consumers about food biotechnology risks and benefits (Tucker et al.). Therefore, it is important that information concerning food biotechnology be presented realistically, with unbiased opinions from either side, and disseminated through commonly used mass media channels. Widespread media coverage of topics such as avian bird flu, mad cow disease, foot-and-mouth disease, and bioterrorist attacks on the food supply would undoubtedly increase awareness of food safety issues among all consumers, not just those actively seeking food safety information.

Lang, O'Neill, and Hallman (2003) studied the information sources of experts, the experts' experts, and found that they relied on various sources for information. Academics and consumer advocates depended on scientists and other academics; food industry experts relied on biotech industry scientists and trade journals; other groups had no clear pattern and cited the popular press, the Internet, and agricultural magazines for information (Lang et al.). Moreover, experts realized that consumers should trust governmental information sources, but these sources

were often difficult to understand or not consumer-friendly because of the political and bureaucratic motivations (Lang et al.).

Researchers have suggested that if the public were given more information about bioengineering, then they would have fewer fears about the technology (Brady & Brady, 2003; Hoban, 1997, as found in Lang et al., 2003). Furthermore, in America, consumers place higher confidence in doctors, university scientists, and nongovernmental organizations (Lang, 2003, as cited in Lang et al., 2003).

Food Safety

Research has confirmed that consumers feel their food is less safe in 2003 than it was 10 years earlier (Whaley, Tucker, Sharp, & Knipe, 2003). Events such as the 1989 Alar residue on apples and the cyanide-laced grapes from Chile elevated consumer concerns over pesticide residue after massive national publicity (Whaley et al.). Food-borne illnesses garnered national attention with the report of *E.coli*, *Salmonella*, and *Listeria* outbreaks, which caused people to become sick, and in some instances, fatally ill (Heuer & Miller, 2006). Issues such as these heighten awareness among consumers, which consequently elevates their interest in the origin of their food.

Current concerns include genetically modified foods, bacterial and pesticide contamination, use of growth hormones in livestock, mad cow disease, and bio-terrorism (Whaley et al., 2003). Even with the discovery of BSE, in the U.S., food-borne illnesses consistently ranks at the top of consumer's concerns and is the most frequently appearing topic in news media (Whaley & Doefert, 2003). Researchers found five reasons why U.S. citizens have food fears: little understanding of the food production process, little knowledge about chemistry and new food technologies, acceptance of agricultural media coverage, desire for

absolute certainty and zero risk, and lastly, scientist's inability to effectively communicate research findings in everyday terms (Lee, 1989).

Animal Tracking and Food Safety

Animal tracking is important in the case of BSE, foot-and-mouth, or any other disease that could potentially threaten food safety and the food supply chain. For example, Canada implemented a mandatory animal identification program in July 2002 (Lawrence, Strohbehn, Loy, & Clause 2003). When the BSE incident occurred in spring of 2003, the RFID tags helped to speed the investigation along and fueled consumer confidence (Lawrence et al.). While the RFID tags did not prevent the BSE outbreak, the tags enabled Canadian officials to identify other cattle that had contact with that particular diseased cow and isolate them before they entered the food chain.

Individual animal traceability assures consumers that the meat they are purchasing and eating is not from a diseased animal. This social advantage ties directly into an economic advantage for producers and all participants in the industry. Mennecke and Townsend (2005) suggested that in the future, traceability, via RFID tags, would be a branding and marketing tool for producers as a value-adding characteristic.

Food safety hazards, such as residues and harmful pathogens, could be tracked and prevented through the use of an animal identification program (Marchant, 2002). Food safety hazards are defined by HACCP (Hazard Analysis and Critical Control Point) system regulations as any "biological, chemical or physical property that may cause food to be unsafe for human consumption" (Vitiello & Thaler, 2001, p. 598). Chemical food safety hazards include pesticide and drug residues in the carcass of the animal, such as those used to treat an illness prior to slaughter. If the animal is harvested before the adequate withdrawal period noted by the manufacturer of the medication, then drug residues could be transferred into the food supply.

When animals are harvested before the withdrawal period, a drug residue will appear in the carcass of the animal (Vitiello & Thaler). Plant management could hold the supplier accountable for the drug residue if animal identification records existed (Vitiello & Thaler).

From an economic standpoint, an identification system could track an animal through the farm-to-table continuum and determine who is responsible for each segment in the food chain cycle (Vitiello & Thaler, 2001). Furthermore, this traceability could force the segments of the food chain found responsible for a food-borne illness to absorb the costs and reward the segments of the food chain that are taking preventative measures (Vitiello & Thaler). Producers who implement an identification program can ensure the meat processor that the animals meet certain criteria and that they have a documented production history (Vitiello & Thaler)

The economic burden of disease outbreaks could be reduced for the packer and producer with the use of an identification system. Researchers could track food-borne pathogens and identify solutions to prevent pathogens from entering the food supply while other segments of the livestock industry could use the identification system to modify their management practices (Vitiello & Thaler, 2001). In addition to food-borne pathogens, producers, packers and researchers are concerned about zoonotic diseases such as cysticercosis and leptospirosis (Vitiello & Thaler). Zoonotic diseases are transmittable between animals and humans, so the need to identify the source of infestation is necessary to prevent more animals from becoming infected with pathogens and entering the food supply (Vitiello & Thaler). Once producers learn about the infestation, they can adjust their management and vaccination practices to prevent further infections (Vitiello & Thaler). Swine and cattle are the main carriers of leptospirosis, and while the disease is not likely to survive in food and affect consumers, it does pose a threat to processing plant employees and USDA meat inspectors through mucosal contact (Vitiello & Thaler). Vitello and Thaler identified the following benefits of animal identification: reduction of

pathogens in the processing industry, control of residues, backward/forward tracing in the event of a food-borne disease outbreak, and control of zoonotic pathogens.

Even though public health could clearly benefit from an animal identification system, improvements in food safety are hindered by a weak animal identification system (Vitiello & Thaler, 2001). For animal identification to be successful in improving food safety, Vitiello and Thaler suggested that the system be open, reliable, and uniform. A reliable system would enable public health officials to identify animal products exposed to disease and preventing the tainted products from entering the food supply. Ultimately, industry officials would be responsible for ensuring that all information is reliable while the government would have open access to the information. The thought of government access to records infuriates many livestock producers and has sparked debate among producer groups and livestock associations across the United States.

The National Animal Identification System

The NAIS Communications Campaign initiated a stakeholder focus group in June 2006 to identify stakeholders' awareness, attitudes, and perceptions of the NAIS (Mobley, 2006). The campaign concluded that messages generated from APHIS were inconsistent and incomplete, the printed NAIS materials were ineffective, and the NAIS Web site was not being used as an information source. They also found where producers were concerned about privacy and viewed the NAIS as increased paperwork, red tape, and bureaucracy (Mobley).

Patent, Roe, and Fluharty (2006) investigated cattle exhibitors' awareness of the NAIS and found that exhibitors who owned larger herds of cattle were more aware of the NAIS. However, researchers found that cattle exhibitors were "somewhat familiar" when asked how aware they were of the NAIS (Patent et al.). Patent et al. suggested that awareness is vital to ensuring beef cattle exhibitors comply with and participate in the NAIS.

CHAPTER III

METHODOLOGY

As outlined in Chapter I, the purpose of this study was to determine awareness, knowledge, and perceptions of the NAIS among college students in the College of Agriculture and Life Sciences at Texas A&M University. The objectives guiding this research were:

1) Determine students' awareness of the NAIS.
2) Determine students' knowledge of the livestock industry and the NAIS.
3) Determine students' perceptions of the NAIS.
4) Determine students' information sources for livestock industry issues.
5) Determine the relationship between students' youth leadership experience and their awareness of the NAIS.
6) Determine the relationship between students' youth livestock experience and their perceptions of the NAIS.
7) Determine if significant differences exist between students' awareness of the NAIS when compared by selected demographics.
8) Determine if significant differences exist between students' perceptions of the NAIS when compared by selected demographics.
9) Determine if significant differences exist between students' knowledge of the NAIS when compared by selected demographics.
10) Determine if relationships exist among students' awareness, knowledge, and perceptions of the NAIS.

Hypotheses

H_1 Opinion leaders affect students' awareness of the NAIS.

H_2 Opinion leaders affect students' knowledge about the NAIS.

H_3 Opinion leaders affect students' perceptions of the NAIS.

Research Design

A correlational, ex-post facto design was used to determine relationships between variables and to understand the effects of opinion leaders on students' awareness, knowledge, and perceptions of the NAIS. In ex-post facto designs, the researcher must examine the effects of a naturally occurring treatment after it has occurred (Tuckman, 1999). Because no treatment is applied to the group, the researcher is unable to cause a variable to occur (Tuckman). In this study, the researcher examined college students' awareness, knowledge, and perceptions of the NAIS. Their awareness, knowledge, and perceptions had formed in the past and the researcher had no control over these variables. Because the treatment was included by selection rather than manipulation, a simple causal relationship between variables could not be determined or assumed (Tuckman).

Correlational studies are ex-post facto, and are simply used to determine if an association exists between variables (Tuckman, 1999). A possible relationship between variables does not imply a cause and effect association and cannot establish causal relationships among variables (Tuckman). One limitation to an ex-post facto correlational design is the inability to determine the exact cause of the observed relationship (Tuckman).

The independent variables in this study were students' gender, age, and experience with livestock through their involvement level on a farm or ranch. Media sources and students'

information sources were additional independent variables. The dependent variables were the students' awareness, knowledge levels, and perceptions of the NAIS.

Population and Sample

Research protocol for this study was exempted from review by the Institutional Review Board at Texas A&M University because the study used survey procedures that did not identify respondents or link their responses to identifying information. The protocol approval number for this study was 2006-0545.

The target population was 5,285 undergraduate students enrolled in the College of Agriculture and Life Sciences at Texas A&M University during the spring 2007 semester. The accessible population was 1,293 students enrolled in courses related to animal agriculture and production. The sample size, 296, was determined using Dillman's sampling table. The researcher chose to use a 50/50 split with a 5% sampling error at a 95% confidence level (Dillman, 2007). Males and females, ranging in age from 18 to 25, were the target audience. All classifications of students–freshman, sophomore, junior, and senior–were included.

The classes surveyed were: AGEC 105 (Introduction to Ag Economics), ANSC 107 (Introduction to Animal Science), ANSC 201 (Introduction to Equine Science), ANSC 307 (Meats), ANSC 406 (Beef Cattle Production & Management), ANSC 412 (Swine Production & Management), ANSC 414 (Sheep & Goat Production & Management), ANSC 420 (Equine Production & Management), DASC 202 (Dairying), POSC 201 (General Avian Science), POSC 209 (Poultry Meat Production), RLEM 102 (Introduction to Range Systems), RLEM 316 (Rangeland Communities), WFSC 101 (Introduction to Wildlife and Fisheries), WFSC 301 (Wildlife & Changing Environment), and WFSC 407 (Field Wildlife Habitat Management).

Stratified random sampling was employed to ensure the sample was representative of the population. Stratification is precise and ensures the sample is proportional across the population

(Tuckman, 1999). Random sampling allows the researcher to estimate the characteristics of a population with precision while controlling for selection bias (Dillman, 2007; Tuckman). When respondents are chosen by random methods within each stratum, sources of invalidity can be eliminated or controlled (Tuckman).

The strata were animal science majors and non-animal science majors, and upperclassmen and lowerclassmen. All students were entered into a Microsoft Excel spreadsheet and the total number of students in each stratum was calculated. The researcher calculated the percentage of students needed from each stratum.

Instrumentation

The instrument measured awareness, knowledge, and perceptions of the NAIS among students in the College of Agriculture and Life Sciences at Texas A&M University. The instrument was a self-administered survey that consisted of 71 items; 60 were close-ended and 11 were open-ended items. Close-ended questions provided the students with answer choices that ranged from ordered to unordered. In this instrument, 31 questions were close-ended with ordered responses. Ordered responses require the student to determine the best answer that fits on the scale (Dillman, 2007). The scales used in this instrument were: *strongly agree* to *strongly disagree*, *very important* to *not important*, *less than one week* to *more than one year*, *very biased* to *very unbiased*, *I am very knowledgeable* (about the NAIS) to *I have no knowledge*. In addition to the scalar responses, the instrument had eight true/false questions and 10 yes/no questions.

Close-ended questions with unordered answers are useful when an evaluative response is wanted from the respondent (Dillman, 2007). The answers are presented in no particular order and the respondent must choose the answer that best describes their opinion (Dillman). In this instrument, 11 questions were close-ended with unordered responses. These questions addressed

the media and information sources used by students and demographic information that could not be obtained from scalar responses.

Open-ended questions help to clarify responses or to explore responses unknown to the researcher (Dillman, 2007). One limitation to using open-ended questions is the student's willingness to think about the question and provide a complete and accurate answer. In this instrument, 11 open-ended questions were used to gather information sources and demographic information. Ten open-ended questions were used to explore the influence of opinion leaders and information sources. One additional open-ended question asked what species of livestock the student or their family owned.

All questions in this instrument required an answer, which helped to determine characteristics of the survey population (Dillman, 2007). These characteristics included attitudes, beliefs, perceptions, and attributes for each respondent (Dillman). The main themes appearing in the instrument were determined by a review of literature. Experts from animal science, agricultural education, and agricultural communications determined the content validity of the instrument. A pilot study of students with similar majors and classification as the sample established face validity of the instrument. Internal consistency was tested by summing and evaluating each conceptual scale with Cronbach's coefficient alpha (α).

Section one measured students' awareness of the NAIS with five close-ended questions with ordered answer choices (Scale = *No*, *Somewhat*, *Yes*); Cronbach's alpha coefficient was .77 for the awareness construct. Section two measured students' knowledge with eight close-ended questions and unordered answer choices (*true* or *false*); Cronbach's split-half coefficient for the knowledge scale was .062. Section three measured students' perceptions with 14 close-ended statements on two separate Likert-type scales. The first scale had 10 questions on a five-point Likert-type scale (*Strongly Disagree* to *Strongly Agree*); the second scale had four questions

with a four-point, Likert-type scale (*Not Important* to *Very Important*). Cronbach's alpha coefficient for the four-point scale was .86 and .73 for the three-point scale.

Section four measured the two-step flow of communication from the media to opinion leaders to students with a series of close-ended items with unordered responses. Section five measured students' use of media sources with nine close-ended questions on a four-point Likert-type scale. Cronbach's alpha coefficient was .88 for the media source scale. Demographic information such as gender, involvement with livestock, and participation in the NAIS program, was gathered in section six. Students' experience in youth livestock organizations was measured with a separate construct. Cronbach's alpha coefficient for the experience construct was .88.

Research has shown that respondents are more truthful when answering self-administered surveys as opposed to one-on-one interviews (Dillman, 2007). A weakness of self-administered surveys is social desirability (Dillman), meaning that students may mark an answer they believe is socially desired rather than the answer that pertains to them. Campbell and Williams (2000) said that the term social desirability implies an attachment or adherence to mainstream values or mores. Therefore, if a student answered a question with what s/he perceived was a socially desirable answer, then the survey failed to collect the student's actual and accurate perception of the NAIS.

Another weakness to self-administered surveys is motivation—mainly the respondent's motivation to respond to the survey and to answer each question (Dillman, 2007). Respondents may not feel the survey is important or that they do not have anything to contribute. Dillman suggested that the researcher can motivate the respondent to answer and return the survey by sending follow-up reminders, communicating to the respondent that their responses are important, and designing a respondent-friendly questionnaire. Respondents may also ignore the

instructions for each question, give incomplete answers, skip questions, or even fail to return the questionnaire to the researcher (Dillman).

When respondents are unable to answer a question because it is inaccurate, vague or irrelevant, a measurement error has occurred (Dillman, 2007). To reduce measurement error, a pilot test of the instrument was administered to a group of students similar to those in the study population. The pilot test enabled the researcher to pinpoint questions that were vague, irrelevant, or misleading. The pilot test was used to determine the reliability of the instrument; minor modifications were made to increase the instrument's reliability.

Data Collection Procedures

The researcher followed Dillman's Total Design Method and data were collected through an online survey. Instructors for each course were contacted in advance to seek access to the class roster. Once all members of the sample were identified, they were contacted through Texas A&M University's NEO e-mail system. Each participant received a personalized pre-notice e-mail message that informed him/her about his/her selection to participate in the study, and provided a brief description of the study. A second personalized e-mail was sent three days after the pre-notice and contained a link to the actual study. Dillman concluded that personalized e-mail messages increase the response rates in a survey (2007).

When students clicked on the hyperlink, they were redirected to the homepage of the survey where they were prompted to log in with their unique password. The unique password provided the researcher with a system for identifying participants who had responded to the survey and those who filled out the survey more than once. Furthermore, the use of the class roster and Texas A&M University's NEO e-mail account services eliminated coverage error because all students were listed on the roster and had a NEO e-mail account.

When the participants entered the Web site, they were required to read a short introduction that explained the purpose of the study and what they could contribute. If the participants agreed to answer survey questions, they indicated their consent by clicking on a radio button marked "I agree." The introduction also informed participants that if at any time they felt uncomfortable answering survey questions or changed their mind, they could close out of the Web browser and their answers would not be submitted.

Participants' names, unique passwords, and e-mail addresses remained confidential. All data were reported as group data and participants were not able to identify their responses. However, the unique passwords and e-mail addresses enabled correct follow-up procedures for non-respondents. The first personalized e-mail reminder was sent to non-respondents one week after the pre-notice. There was a spike in completed surveys each day a reminder was sent. Every five days, non-respondents were identified and additional personalized e-mail reminders were sent. A total of four e-mail reminders were sent to non-respondents throughout the survey period. Each e-mail contained the hyperlink to the online survey and encouraged the recipient to visit the information page. Dillman (2007) suggested that communicating with the participants demonstrates the importance of their participation and the usefulness of the survey.

Students who did not use their NEO account for regular e-mail, or those who did not check their account on a regular basis, possibly hindered the survey response. E-mail notices were undeliverable to six students, thus threatening external validity and the response rate. Taking these factors into consideration, the researcher visited the pilot group in person to explain the study and encourage all students to check their NEO e-mail accounts.

Data Analysis

Data were analyzed and reported at the group, rather than at the individual level. (Gall, Gall, & Borg, 2007). All answer choices were coded and recorded into a database when

participants submitted their surveys. SPSS® 13 (2004) was used to analyze data and calculate frequencies, means, standard deviations, correlations, and Analysis of Variances. Frequency counts determined the number of early and late respondents, demographics, student awareness, knowledge, and information sources used. Frequency counts were used to determine the overall rank of each information source in Objective 4.

Descriptive statistics were used for reporting student perceptions, sources used to gather information, and media sources used to gather information. Descriptive statistics were included on comparisons of the pilot and sample groups, as well as early and late respondents. Data were split and recoded for Lowerclassmen Non-Animal Science majors, Upperclassmen Non-Animal Science majors, Lowerclassmen Animal Science majors, and Upperclassmen Animal Science majors. Descriptive statistics were reported for each of these groups for awareness, knowledge, and perceptions.

Standard deviations were included in the descriptive statistics because they measured how representative the sample was of the population. If a large standard deviation was produced, then the researcher could conclude that variability existed within the sample, and it would not be representative of the population (Field, 2005). If a small standard deviation was produced, then the researcher could assume that the sample was representative of the population (Field).

Correlations and ANOVAs were used to determine differences among variables; summed data were used for each correlation and ANOVA. Relationships between students' youth leadership experience and their awareness and perceptions were determined using a point-biserial correlation. The youth leadership construct was the dichotomous variable, and both the awareness and perception constructs were continuous variables. A bivariate correlation coefficient allowed the researcher to determine the strength of the relationship between two variables (Gall et al. 2007).

The degree of correlation among students' perceptions, awareness, and knowledge of the NAIS was determined with a Pearson's product-moment correlation coefficient (Field, 2005). Multivariate correlation methods were employed to explore relationships between the students' knowledge, attitudes, perceptions, information sources, and livestock experience. All three hypotheses were tested with Pearson's product-moment correlation coefficients to determine if relationships existed between opinion leaders' affects on student awareness, knowledge, and perception. The multivariate correlation methods allowed the researcher to explore relationships between three or more variables (Gall, et al.).

The amount of covariance had to be determined to accurately measure relationships (Field, 2005). If two variables were related, the researcher investigated whether changes in one variable were related to changes in another variable (Field). If a relationship existed between variables, the researcher knew that as one variable deviated from its mean, the other variable deviated from its mean (Field). Covariance is the crude measure of the relationship between variables and a coefficient of 0 indicates no linear relationship while a coefficient of +1 indicates a perfect positive relationship and -1 indicates a perfect negative relationship (Field).

One-tailed tests were used to test the direction of the hypotheses. To determine statistical significance, an alpha level of $p < .05$ was used. When using a $p < .05$, the significance level required to reject the null hypothesis is raised, and the likelihood of Type I error is reduced (Gall et al. 2007). However, when the chance for a Type I error is reduced, the chance of a Type II is increased (Gall et al.). A Type II error would be accepting the null hypothesis of no difference when in fact a difference does exist (Gall et al.).

Analysis of Variance was used to determine if differences existed between the pilot and sample groups, as well as early and late respondents. This statistical procedure was conducted for student awareness, knowledge, perception, major, and classification in Objectives 7, 8, and 9

to determine if significant differences existed between those variables. Respondents were sorted and classified by their class status and major (Animal Science or Non-Animal Science). The LSD post hoc test was used to determine differing variables in the ANOVA tests.

A confidence interval of .05 was used on all tests because of the available research on college students' perceptions. Confidence limits define the upper and lower values for a sample statistic; therefore, the researcher can draw conclusions and "make inferences from a sample statistic to a population parameter" (Gall et al. 2007, p. 147). Confidence intervals define and describe regions of acceptance for the null hypothesis. If the hypothesized value is inside the confidence interval values, then the researcher fails to reject the null hypothesis.

CHAPTER IV

RESULTS

The purpose of this study was to determine awareness, knowledge, and perceptions of the NAIS among college students in the College of Agriculture and Life Sciences at Texas A&M University. Lack of student participation coupled with administering the survey near the end of the semester resulted in low response rate. Because students enrolled in livestock production courses at Texas A&M University during spring 2007 were sampled, these results are only applicable to those in the sample.

Population Response

The target population was 5,142 undergraduate students enrolled in the College of Agriculture and Life Sciences at Texas A&M University during spring 2007. The accessible population was 1,293 students enrolled in courses related to animal agriculture and production; the sample size was 296 and was determined using Dillman's sampling table. Data collection began on April 9, 2007 and ended on May 7, 2007. Table 1 shows 94 (31.76%) students responded to the online survey. Of these responses, 92 were useable, resulting in a useable response rate of 31.08%.

Table 1

Response to Survey (N = 92)

Group	*n*	%
Respondents, complete	92	31.08
Respondents, incomplete	2	.68
Nonrespondents	202	68.24
Total	296	100

Comparison of Groups

The pilot test group had 16 respondents, and the sample group had 78 respondents. Results from the pilot test group were included in the sample because no significant difference existed in either group's responses, as shown in Table 2. Combining the data from both groups illustrates a more complete picture of the students in the College of Agriculture and Life Sciences.

Table 2

Comparison of Pilot Group and Sample Group (N = 92)

Group		*n*	*M*	*SD*	*F*	Sig.
Awareness	Pilot	16	9.06	2.59	.967	.328
	Sample	76	9.82	2.82		
Knowledge	Pilot	15	4.27	1.43	.482	.489
	Sample	76	4.50	1.13		
Perception	Pilot	15	20.20	7.49	2.64	.108
	Sample	76	24.18	8.88		

Note. Awareness (Min = 5, Max = 15); Knowledge (Min = 0, Max = 8); Perception (Min = 0, Max = 40).

Comparison of Early versus Late Respondents

Students who responded to the survey within the first week and up until the second e-mail reminder were considered as early respondents. Students who responded to the survey after the second e-mail reminder were considered as late respondents. Figure 2 depicts the survey response over an 18-day period. Significant spikes in student response were evident on days when the researcher sent e-mail reminders to students who had not submitted the survey.

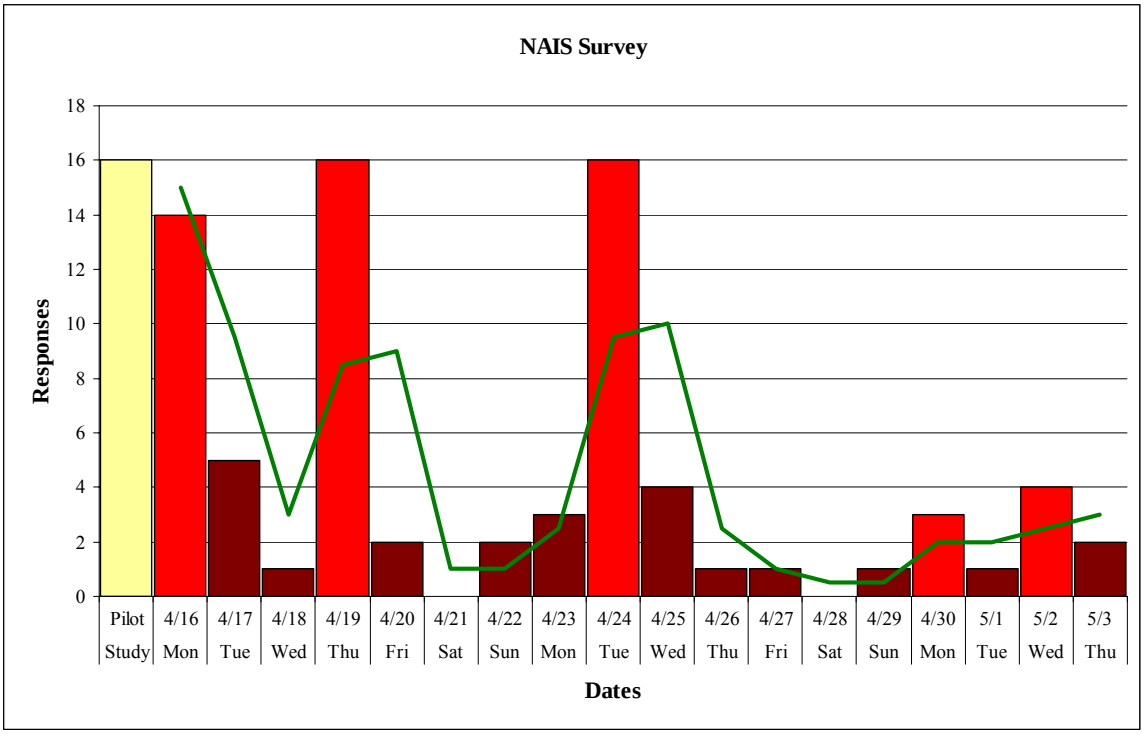

Figure 2. Student Response to Survey.

To determine if nonresponse was a threat to external validity, early versus late respondents were compared (Lindner, Murphy, & Briers, 2001). The frequency and percent of the useable data by return status is shown in Table 3.

Table 3

Return Status of Response to Survey (N = 92)

Return Status	*f*	%
Early	59	64.13
Late	33	35.87
Total	92	100.0

No significant difference existed between early respondents and late respondents, as shown in Table 4. Late respondents were slightly more aware of the NAIS than were early respondents, but both groups were only somewhat aware of the NAIS.

Table 4

Comparison of Early vs. Late Respondents Survey Response (n = 91)

Return Status		*n*	*M*	*SD*	*F*	Sig.
Perceptions	Early	58	2.24	.87	3.35	.07
	Late	33	2.59	.86		
Knowledge	Early	58	4.62	1.24	2.94	.09
	Late	33	4.18	1.04		
Awareness	Early	59	9.42	2.57	1.45	.23
	Late	33	10.15	3.11		

Profile of Students

Demographics of the college students were described by gender, major, grade classification, and involvement with livestock. Involvement with livestock included ownership of livestock, involvement in youth livestock organizations, and whether students grew up or worked on a farm or ranch.

Gender was evenly split among the students–46 (50%) females and 46 (50%) males, as shown in Table 5. Thirty-four (37%) students were underclassmen (freshman or sophomore), and 58 (63%) students were upperclassmen (junior or senior). Sixty-eight (73.9%) students were non-animal science majors and 24 (26.1%) students were animal science majors. Fourteen (18.4%) students were lowerclassmen, non-animal science majors, eight (10.5%) students were lowerclassmen, animal science majors, 41 (53.9%) students were upperclassmen non-animal science majors, and 13 (17.1%) were upperclassmen, animal science majors.

Table 5

Demographic Frequencies of Respondents (N = 92)

Variables		*f*	%
Gender	Female	46	50
	Male	46	50
Major	Animal Science	24	26.1
	Non-Animal Science	68	73.9
Class Status	Upperclassmen (U3 – U4)	58	63
	Lowerclassmen (U1 – U2)	34	37

As shown in Table 6, 50 (54.3%) students reported growing up on or around a farm or ranch, while 60 (65.2%) students reported working on a farm or ranch. Ownership of livestock by the student or family member was reported by 54 (58.7%) students. Of those students owning livestock, 27 (29.3%) owned less than 50 head of livestock; species were combined if more than one species. Cattle were the most frequent reported species (n = 37). Five (5.4%) students reported that their family farm or the farm where they worked participates in the NAIS program; 11 (12%) students reported that their family farm or the farm where they worked has a premise identification number.

Table 6

Demographic Frequencies of Respondents as Related to Agricultural Factors (N = 92)

Variables		*f*	%
Agricultural Factors[a]	Grew up on a farm or ranch	50	54.3
	Worked on a farm or ranch	60	65.2
	Owned livestock	54	58.7
Number of livestock units owned (species combined)[b]	Less than 50	27	29.3
	51 – 100	14	15.2
	101 – 500	10	10.9
	501 – 1000	6	6.5
	More than 1001	3	3.3
Species owned[c]	Cattle	37	
	Horses	8	
	Swine	2	
	Sheep	2	
	Combined species	3	
NAIS Factors[a]	Family has a premise identification number	11	12.0
	Family participates in the NAIS	5	5.4

Note. [a]Frequencies indicate a positive response. [b]Frequencies may not total 92 because of missing data. [c]Respondents wrote in answer, which may have contained multiple species.

Students' involvement in youth livestock organizations is shown in Table 7. Twenty-seven (29.3%) students reported being a 4-H member in high school. A little less than half of respondents (47.8%) reported being a FFA member in high school. Thirty-three students indicated membership in a livestock show team, and 40 (43.5%) students indicated they exhibited livestock at shows and fairs. Only 18 (19.6%) students reported membership in a youth livestock organization during high school.

Table 7

Frequencies of Students' Involvement in Youth Livestock Organizations (N = 92)

Livestock Organization Participation in High School[a, b]	*f*	%
4-H member	27	29.3
FFA member	44	47.8
Livestock show team member	33	35.9
Exhibited livestock at shows and fairs	40	43.5
Member of a youth livestock organization	18	19.6

Note. [a]Frequencies indicate a positive response. [b]Frequencies may not total 92 because of missing data.

Findings Related to Objective 1

The first objective was to determine students' awareness of the NAIS. The student awareness variable consisted of five statements, based on the review of literature, and reviewed by a panel of experts. Answers from these statements indicated student awareness of the NAIS.

As shown in Table 8, 45 (48.9%) students were not aware of how the NAIS will affect United States national security. Forty-three (46.7%) students were not aware of how the NAIS will affect the United States economy. Forty-three (46.7%) students were somewhat aware when asked if they thought there was a risk of foreign animal disease outbreaks in the United States. Thirty-nine (42.4%) were somewhat aware when asked if they thought there was a risk that such an outbreak would be severe enough to warrant the use of the NAIS. Thirty-five (38.0%) students were somewhat aware of how the NAIS will affect food safety.

Table 8

Frequencies of Respondents' Awareness of the NAIS (N = 92)

Statement	No		Somewhat		Yes	
	f	%	*f*	%	*f*	%
Are you aware of how the NAIS will affect United States' national security?	45	48.9	23	25.0	24	26.1
Are you aware of how the NAIS will affect the United States' economy?	43	46.7	29	31.5	20	21.7
Do you think there is a risk of a foreign animal disease outbreak in the United States?	17	18.5	43	46.7	32	34.8
Do you think the risk [of foreign animal disease] would be severe enough to warrant the use of the NAIS?	22	23.9	39	42.4	31	33.7
Are you aware of how the NAIS will affect food safety in the United States?	33	35.9	35	38.0	24	26.1

Findings Related to Objective 2

The second objective was to determine students' knowledge of the livestock industry and the NAIS. The knowledge construct consisted of eight true or false statements, based on the review of literature, which were reviewed by a panel of experts. Answers to these statements indicated the students' knowledge levels of the NAIS.

Table 9 displays respondents' correct and incorrect responses for each of the eight knowledge statements. As a group, respondents' knowledge levels for individual statements ranged from a low of 7.6 to a high of 88% correct. A majority (88%) of students correctly answered the statement, "The NAIS is a program that was created by the United States Department of Agriculture."

Three-fourths (75%) of the respondents correctly answered two of the knowledge statements: "Participation in the NAIS is voluntary at the Federal level" and "The NAIS was

created to track diseased livestock." A majority (90%) of students incorrectly answered the statement, "The NAIS provides the government a way to continuously monitor livestock records." Also, a majority (77%) of students incorrectly answered the statement, "The NAIS will track and identify the movement of all livestock in the United States" (Table 9).

Table 9

Frequencies of Respondents' Knowledge of the NAIS (N = 92)

Statement	Incorrect[a]		Correct[a]	
	f	*%*	*f*	*%*
The NAIS is a program that was created by the United States Department of Agriculture. (True)	9	9.8	81	88.0
The NAIS will include all animal livestock species: cattle, horses, swine, sheep, goats, bison, poultry, cervids (elk and deer), and camelids (llamas, alpacas). (True)	18	19.6	73	79.3
The NAIS was created to track diseased livestock. (True)	22	23.9	69	75.0
Participation in the NAIS is voluntary at the Federal level. (True)	22	23.9	69	75.0
The NAIS will include livestock and pets (dogs and cats). (False)	36	39.1	55	59.8
The NAIS will allow the government to pinpoint a farm's location and record the number of livestock on the property through the use of a global positioning system (GPS). (False)	59	64.1	32	34.8
The NAIS will track and identify the movement of all livestock in the United States. (False)	71	77.2	20	21.7
The NAIS provides the government a way to continuously monitor livestock records. (False)	83	90.2	7	7.6

Note. [a]Total frequencies may not equal 100% because of missing data. Respondents' individual knowledge levels ranged from zero to eight correct responses.

Findings Related to Objective 3

The third objective was to determine students' perceptions of the NAIS. The perception variable consisted of 14 statements, which were based on the review of literature and reviewed by a panel of experts. Answers to these statements indicated the students' perceptions of the NAIS. The statements were ranked by calculating the means and standard deviations for students' responses to each statement.

In Table 10, respondents agreed that the NAIS will help track sick animals back to the source of contamination or infection ($M = 2.75$) and agreed that the NAIS is important to national security ($M = 2.56$). Respondents also agreed with the statement that the NAIS will prevent the spread of disease in livestock ($M = 2.53$). Respondents disagreed with the statement that the NAIS is an invasion of their privacy ($M = 2.49$). Respondents disagreed with the statement that the NAIS will have an economic benefit to the producer ($M = 1.88$). Respondents also disagreed with the statement that they are well informed about the NAIS ($M = 1.83$).

Table 10

Descriptive Statistics for Perceptions of the NAIS (n = 89)

Statement	*M*	*SD*
The NAIS does not affect me.	2.93	1.15
The NAIS will help track sick animals back to the source of contamination or infection.	2.75	1.46
The NAIS is an important program.	2.65	1.34
The NAIS is important to national security.	2.56	1.41
The NAIS will help prevent the spread of disease in livestock.	2.53	1.45
The NAIS is an invasion of my privacy.	2.49	1.45
My belief system influences my perceptions of the NAIS.	2.04	1.29
I am not concerned about the voluntary NAIS becoming mandatory.	1.99	1.35
The NAIS will have an economic benefit to the producer.	1.88	1.54
I am well informed about the NAIS.	1.83	1.09

Note. Five-point, Likert-type scales measured respondents' perceptions. 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree, 0 = Unsure.

As consumers, respondents reported that traceability of food through the food supply chain is important ($M = 2.37$). In Table 11, respondents also reported that, as consumers, the NAIS is important to national homeland security ($M = 1.86$), important to the U.S. economy ($M = 1.97$), and important to maintain a safe U.S. food supply ($M = 2.41$).

Table 11

Descriptive Statistics for Perceptions of the NAIS from a Consumer Viewpoint (n = 90)

Statement	*M*	*SD*
As a consumer, how important is the NAIS to maintain a safe U.S. food supply?	2.41	.83
As a consumer, how important is the traceability of food through the food supply chain?	2.37	.72
As a consumer, how important is the NAIS to the U.S. economy?	1.97	1.02
As a consumer, how important is the NAIS to national homeland security?	1.86	1.02

Note. Three-point, Likert-type scales measured respondents' perceptions. 1 = Not Important, 2 = Important, 3 = Very Important.

Findings Related to Objective 4

The fourth objective was to determine students' information sources on livestock industry issues. Ten information sources were included, based on the review of literature, which was verified by a panel of experts. Students' indicated which information sources they used to learn about the NAIS, the influence of the source, and how often they accessed each source. Respondents recorded influence on a scale of 1 = no influence to 10 = most influence.

Use of sources to gather information about the NAIS is presented in Table 12. Forty-six students rated university professors as a very influential information source (M = 7.40), 38 students rated the Internet as an influential information source (M = 5.72), and 33 students rated family member or friend as an influential information source (M = 5.69). Cooperative Extension was rated as somewhat influential (M = 4.44) by 20 students, and popular magazines were rated as somewhat influential (M = 3.72) by 16 students.

Table 12

Descriptive Statistics for Information Sources Used to Gather Information about the NAIS (N = 92)

Source	*f*	*M*[a]	*SD*
University professors	46	7.40	3.11
Internet	38	5.72	2.94
Family member/friend	33	5.69	2.77
Trade publications (*Beef, Dairy Herdsman, Drovers*)	23	5.43	2.97
Television	22	5.26	3.26
Newspapers	31	5.06	2.87
Private organizations (Texas Beef Council, Farm Bureau)	22	4.92	3.23
Radio	17	4.52	3.14
Cooperative Extension Service	20	4.44	3.29
Popular magazines (*Times, Newsweek, People)*	16	3.72	2.85

Note. [a]Scale: 1 = no influence…10 = most influence.

Table 13 illustrates the overall ranking of information sources. University professors were ranked as a very influential source for NAIS information. Internet ranked as the second most influential source followed by family members or friends. Newspapers ranked fourth, followed by trade publications, television, private organizations, Cooperative Extension, radio, and popular magazines.

Table 13

Responses to Influence of Information Sources Used to Gather NAIS Information (N=92)

Source	Ranking Frequencies										Total	Overall Rank[a]
	1	2	3	4	5	6	7	8	9	10		
University professors	5	4	6	0	25	12	21	48	54	210	385	1
Internet	5	6	3	16	40	30	28	48	27	60	263	2
Family member/friend	3	4	9	8	40	24	28	48	18	40	222	3
Newspapers	3	8	6	12	25	12	42	32	27	10	177	4
Trade publications	3	4	6	4	45	0	0	8	27	30	127	5
Television	3	4	3	8	25	6	7	16	9	40	121	6
Private organizations	5	4	3	4	15	12	14	32	9	20	118	7
Cooperative Extension	4	8	6	4	15	6	14	16	18	20	111	8
Radio	4	4	3	12	15	12	7	0	18	20	95	9
Popular magazines	5	0	3	8	15	12	7	8	9	0	67	10

Note: [a]Overall rank was determined by weighting rank scores. Scores of 1 indicated no influence and received 1 point while scores of 10 indicated most influence and received 10 points. Individual weighted scores for each source were summed to determine the overall rank.

Table 14 illustrates how frequent sources were used to gather information about livestock industry issues. On average, students reported the last time they used sources to gather information about livestock industry issues was less than one week (M = 1.29).

Table 14

Responses to Media Sources Used To Gather Information about Livestock Industry Issues (N = 92)

Source	*M*	*SD*
Radio	1.11	1.26
Trade publications (*Beef, Dairy Herdsman, Drovers*)	1.17	1.28
Television	1.18	1.12
University professors	1.19	.86
Internet	1.30	.92
Popular magazines (*Times, Newsweek, People*)	1.37	1.29
Private organizations (Texas Beef Council, Farm Bureau)	1.38	1.32
Cooperative Extension Service	1.44	1.43
Newspapers	1.49	1.17

Note. Five-point, Likert-type scales measured students' use of media sources: 0 = *Never*, 1 = *Less than 1 Week*, 2 = *Less than 6 Months*, 3 = *Less than 1 Year*, 4 = *More than 1 Year*.

Findings Related to Objective 5

The fifth objective was to determine the relationship between students' youth leadership experience and their awareness of the NAIS. The youth leadership experience variable consisted of five statements and the awareness variable consisted of three statements. Only three of the five awareness statements were used for the analysis: "Are you aware of how the NAIS will affect food safety in the United States?", "Are you aware of how the NAIS will affect the United States' economy?", and "Are you aware of how the NAIS will affect United States' national security?" The three awareness statements used provided a better representation of students' awareness than all five awareness statements. The mean score for the awareness variable was

calculated then correlated with each of the five statements in the youth leadership experience variable.

Table 15 shows associations between youth leadership experiences and students' awareness of the NAIS. Based on Davis' (1971) work, correlations of .10 to .29 have low associations, .30 to .49 have moderate correlations, .50 to .69 have substantial correlations, and .70 or higher have very strong correlations. Therefore, all livestock experience variables were moderately correlated with students' awareness of the NAIS.

Table 15

Relationship of Students' Youth Leadership Experience and Awareness of the NAIS (N = 92)

Leadership Experience	NAIS Awareness	
	r_{pb}	Sig.
4-H member	.35*	.00
FFA member	.30*	.00
Livestock show team member	.40*	.00
Livestock exhibitor	.42*	.00
Youth livestock organization	.36*	.00

* $p < .05$

Findings Related to Objective 6

The sixth objective was to determine the relationship between students' youth leadership experience and their perceptions of the NAIS. The youth leadership experience variable consisted of five statements and the perception variable consisted of ten statements.

Table 16 shows associations between youth leadership experience and students' perceptions. Using Davis' (1971) association conventions, livestock exhibitor experience had a moderate correlation with perception of the NAIS. Experience as a FFA member, a livestock

show team member, or with a youth livestock organization had low correlations with perception of the NAIS. Experience as a 4-H member was not associated with perception of the NAIS.

Table 16

Relationship of Student's Youth Leadership Experience and Perceptions of the NAIS (N = 92)

Leadership Experience	Correlation coefficient	
	r_{pb}	Sig.
Livestock exhibitor	.36*	.00
FFA member	.25*	.02
Livestock show team member	.25*	.02
Youth livestock organization	.26*	.05
4-H member	.17	.13

* $p < .05$

Findings Related to Objective 7

The seventh objective was to determine if significant differences existed between students' awareness of the NAIS, when compared by major and classification, using Analysis of Variance (ANOVA) tests. Table 17 provides means (*M*), standard deviations (*SD*), F ratio (*F*) and significance (Sig.) for students' NAIS awareness. The F-ratio, the ratio of between-groups mean square to within-groups mean square (Field, 2005), was 3.1 with a significance level of .03. Significant differences existed between students' NAIS awareness when compared by classification and major.

Table 17

Analysis of Variance for Student Awareness, Classification, and Major (N = 92)

Classification	Major	*n*	*M*	*SD*	*F*	Sig.
Lowerclassmen	Non-Animal Science	26	9.19	2.80	3.1	.03
	Animal Science	8	11.00	2.83		
Upperclassmen	Non-Animal Science	42	9.17	2.39		
	Animal Science	16	11.19	3.19		

Note. Not Aware = 0–7.5; Somewhat Aware = 7.51–12.5; Aware = 12.51–15.

Equal variances were assumed and the Least Significant Difference post hoc test was conducted to control for Type I error (Field, 2005). The LSD post hoc test showed that upperclassmen Animal Science majors were significantly more aware of the NAIS than were the other three groups. However, in terms of practical significance, all four groups were only somewhat aware of the NAIS. (Table 17).

Findings Related to Objective 8

The eighth objective was to determine if significant differences existed between students' perceptions of the NAIS, major, and classification. ANOVA was conducted for student perceptions, major, and classification. The F-ratio, shown in Table 18, was .60 with a significance of .62. No significant differences occurred between students' NAIS perceptions, major, and classification.

Table 18

Analysis of Variance for Student Perceptions, Classification, and Major (N = 92)

Classification	Major	*n*	*M*	*SD*	*F*	Sig.
Lowerclassmen	Non-Animal Science	25	21.4	7.87	.70	.55
	Animal Science	8	25.0	10.45		
Upperclassmen	Non-Animal Science	42	24.1	8.94		
	Animal Science	16	24.6	8.99		

Note. *Not Sure* = 0–5; *Strongly Disagree* = 5.1–15.0; *Disagree* = 15.1–25.0; *Agree* = 25.1–35.0; *Strongly Agree* = 35.1–40.0.

Findings Related to Objective 9

The ninth objective was to determine if significant differences existed between students' NAIS knowledge, major, and classification. Analysis of Variance (ANOVA) was conducted for student knowledge, major, and classification. As shown in Table 19, the F-ratio was .51 with a significance of .68; therefore, no significant differences occurred between students' NAIS knowledge, major, and classification.

Table 19

Analysis of Variance for Student Knowledge, Classification, Major (N = 92)

Classification	Major	*n*	*M*	*SD*	*F*	Sig.
Lowerclassmen	Non-Animal Science	25	4.28	1.10	.51	.68
	Animal Science	8	4.50	1.69		
Upperclassmen	Non-Animal Science	42	4.45	1.19		
	Animal Science	16	4.75	1.07		

Note. Unknowledgeable = 0–5.5; *Knowledgeable* = 5.51–8.

Findings Related to Objective 10

The tenth objective was to determine if relationships existed among students' perceptions, awareness, and knowledge of the NAIS. Bivariate correlations, shown in Table 20, were conducted for student perceptions, awareness, and knowledge.

Table 20 shows that perception of the NAIS was positively correlated with awareness of the NAIS in all four groups. Using Davis' (1971) association conventions, perceptions of the NAIS were very strongly correlated with awareness for lower (r = .88) and upperclassmen (r = .90) Animal Science majors. Perceptions of the NAIS were substantially correlated with awareness for lower (r = .55) and upperclassmen (r = .53) non-Animal Science majors. Knowledge was not significantly correlated with either awareness or perception of the NAIS.

Table 20

Relationship of Student Awareness, Knowledge, and Perception of the NAIS (N = 92)

Group	n		Pearson Correlation	
			Perception	Knowledge
Lowerclassmen, Non-Animal Science majors	25	Awareness	.55*	-.19
		Perception		-.12
Lowerclassmen, Animal Science majors	8	Awareness	.88*	.03
		Perception		-.11
Upperclassmen, Non-Animal Science majors	42	Awareness	.53*	-.03
		Perception		.18
Upperclassmen, Animal Science majors	16	Awareness	.90*	-.44
		Perception		-.45

$p < .05$

Findings Related to Hypothesis 1

Opinion leaders would affect students' awareness of the NAIS. Students were asked to mark sources they used to gather information about the NAIS, and then rate the influence of the sources (1 = *No Influence*, 10 = *Most Influence*). Student awareness was determined by a construct of five questions. Hypothesis one was answered by using Pearson's Product Moment Correlations. The composite score for student awareness was correlated against each opinion leader. The correlation matrix and significance levels for student awareness and opinion leaders are shown in Table 21.

Student awareness was associated positively with Cooperative Extension (r = .49), private organizations (r = .46), and university professors (r = .33). Using Davis' (1971) association conventions, Cooperative Extension, private organizations, and university professors were all moderately correlated with student awareness of the NAIS. Therefore, the null hypothesis that opinion leaders do not affect students' awareness of the NAIS was rejected, and the alternative hypothesis was accepted as true. Statistical evidence suggested that opinion leaders' influence as information sources affect students' awareness of the NAIS.

Table 21

Relationship of Student Awareness, Knowledge, Perception, and Selected Opinion Leaders of the NAIS (N=92)

		Awareness		Knowledge		Perception	
Variables	*n*	*r*	Sig.	*r*	Sig.	*r*	Sig.
Cooperative Extension Service	25	0.49*	0.01	0.01	0.98	0.19	0.37
Family member/friend	39	0.24	0.14	0.00	1.00	0.20	0.22
Internet	46	0.28	0.06	0.15	0.32	0.17	0.25
Newspapers	35	0.21	0.22	-0.05	0.76	0.25	0.16
Popular Magazines	18	0.34	0.17	-0.14	0.58	0.33	0.18
Private Organizations	24	0.46*	0.02	-0.04	0.85	0.33	0.12
Television	23	-0.40	0.06	0.06	0.79	-0.08	0.71
Trade Publications	23	0.36	0.10	0.30	0.17	0.28	0.19
Radio	21	0.13	0.57	0.04	0.88	-0.01	0.98
University Professors	52	0.33*	0.02	0.04	0.76	0.29*	0.04

* Correlation is significant at the 0.05 level (2-tailed).

Findings Related to Hypothesis 2

Opinion leaders affect students' knowledge of the NAIS. The student knowledge construct consisted of eight true or false statements. The opinion leader construct included 10 opinion leaders. Students were asked to rate the influence of each opinion leader on scale from 1 to 10 (1 = *No influence*, 10 = *Most influence*).

Hypothesis two was answered by using Pearson's Product Moment Correlations. The composite score for student knowledge was correlated against each opinion leader. The correlation matrix and significance levels for student perception and opinion leaders are shown in Table 21.

Student knowledge was not correlated with any of the listed opinion leaders. Because of the insufficient evidence, the null hypothesis that opinion leaders do not affect student

knowledge of the NAIS failed to be rejected. Statistical evidence did not suggest that opinion leaders affect students' knowledge of the NAIS.

Findings Related to Hypothesis 3

Opinion leaders affect students' perceptions of the NAIS. Student perceptions were determined by a construct of 10 questions. The opinion leader construct included 10 opinion leader types. Students rated the influence each opinion leader had on the student's opinion about the NAIS. Hypothesis three was answered by using Pearson's Product Moment Correlations, and the composite score for student perception was correlated against each opinion leader. The correlation matrix and significance levels for student perception and opinion leaders are shown in Table 21.

University professors (r = .29) had a positive, yet low correlation with students' perception. Therefore, the null hypothesis that opinion leaders do not affect students' perception of the NAIS was rejected and the alternative hypothesis was accepted as true. Statistical evidence suggested that opinion leaders' influence as information sources affect students' perceptions of the NAIS.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to determine college students' perceptions of the NAIS. The specific objectives of the study were to:

1) Determine students' awareness of the NAIS.
2) Determine students' knowledge of the livestock industry and the NAIS.
3) Determine students' perceptions of the NAIS.
4) Determine students' information sources for livestock industry issues.
5) Determine the relationship between students' youth leadership experience and their awareness of the NAIS.
6) Determine the relationship between students' youth livestock experience and their perceptions of the NAIS.
7) Determine if significant differences existed between students' awareness of the NAIS when compared by selected demographics.
8) Determine if significant differences existed between students' perceptions of the NAIS when compared by selected demographics.
9) Determine if significant differences existed between students' knowledge of the NAIS when compared by selected demographics.
10) Determine if relationships existed among students' awareness, knowledge, and perceptions of the NAIS.

The following null hypotheses were developed to examine opinion leaders' effects on perceptions and to test the two-step flow theory:

H_1 Opinion leaders affect students' awareness of the NAIS.

H_2 Opinion leaders affect students' knowledge about the NAIS.

H_3 Opinion leaders affect students' perceptions of the NAIS.

Summary of Findings, Conclusions, and Recommendations

The conclusions for this study are based on the findings for each objective and hypotheses. Each objective and hypothesis is presented with its corresponding results.

Objective 1

The first objective was to determine students' awareness of the NAIS. Overall, more students were aware that there was a risk of foreign animal disease outbreak, than were students who were aware of how the NAIS would affect food safety in the United States. These findings are consistent with Whaley's et al. (2003) findings that consumers felt their food was less safe in 2003 than it was in 1993. Food safety concerns from the Whaley et al. study included genetically modified foods, bacterial and pesticide contamination, use of growth hormones in livestock, mad cow disease, and bio-terrorism. While these specific food safety issues were not measured in this study, it was interesting to note that proponents of the NAIS cited how the program could be used to track and prevent diseases (Long, 2006).

Students were equally aware of how the NAIS affected United States' food safety and national security, but fewer students were aware of how the NAIS will affect the United States economy. Again, while consumers were more concerned with food safety in 2003 than they were 1993, an animal tracking system could pinpoint the origin of chemical residues and disease (Vitiello & Thaler, 2001). A reliable system would enable public health officials to pinpoint animal products that contain harmful pathogens, prevent human consumption of those products,

and hold the segment of the food chain responsible for the contamination liable for any costs associated with the contamination (Vitiello & Thaler).

Patent et al. (2006) investigated cattle exhibitors' awareness of the NAIS and found that exhibitors who owned larger herds of cattle tended to be more aware of the NAIS. The researchers also found that cattle exhibitors were "somewhat familiar" when asked how aware they were of the NAIS (Patent et al.). The current study of students' perceptions of the NAIS did not investigate relationships between herd size and students' awareness; therefore, further research should be conducted to determine if relationships exist between herd size and students' awareness of the NAIS.

Objective 2

The second objective was to determine students' knowledge of the livestock industry and the NAIS. As a group, respondents scored 55% correct on the eight knowledge statements, but individual scores ranged from 7.6 to 88% correct.

Nine out of ten students incorrectly answered "True" to the statement, "The NAIS provides the government a way to continuously monitor livestock records" and seven out of nine students incorrectly answered "True" to the statement, "The NAIS will track and identify the movement of all livestock in the United States." Three out of five students incorrectly answered "True" to the statement, "The NAIS will allow the government to pinpoint a farm's location and record the number of livestock on the property through the use of a global positioning system."

Overall, students were more informed about general aspects of the NAIS than they were about the specifics. They were less informed about common myths such as the use of a global positioning system to pinpoint farm locations, the ability to track and identify movement of all livestock in the United States, and the continuous monitoring of livestock records. These three myths were reoccurring themes that Long (2006) found in a study of the NAIS media coverage.

Most importantly, a portion of the Animal and Plant Health Inspection Services (APHIS) Web site is dedicated to addressing these common myths, but the NAIS Communications Campaign concluded through a stakeholder focus group that the NAIS Web site was not being used as an information source (Mobley, 2006).

House's et al. (2004) study of female consumers' knowledge of genetically modified foods highlighted the importance of consumer education and knowledge of genetically modified foods, and the impact consumer education can have for policy makers and agribusinesses. Even though previous literature (Gaskell et al., 1999; Hoban, 1998) found that objective knowledge differed among respondents in different geographical locations, House et al. (2004) found no significant association between location and objective knowledge. Therefore, further research on NAIS knowledge should be conducted in various geographic locations to determine if such relationships exist.

Objective 3

The third objective was to determine students' perceptions of the NAIS. Reduction of pathogens in the processing industry, control of residues, backward/forward tracing in the event of a food-borne disease outbreak, and control of zoonotic pathogens are among the many benefits of an animal identification system (Vitello & Thaler, 2001). This literature was supported by the finding that respondents' agreed with the statement that the NAIS will help track sick animals back to the source of infection, and with the statement that the NAIS would prevent the spread of disease in livestock.

However, respondents' disagreement with the statement that the NAIS would have an economic benefit to the producer was inconsistent with findings in Vitello and Thaler's (2001) research and Long's (2006) study of news media frames of the NAIS. Vitello and Thaler cited the economic burden of disease outbreaks could be reduced for the packer and producer with the

use of an identification system. Researchers could track food-borne pathogens and identify solutions to prevent the pathogens from entering the food supply while other segments of the livestock industry could use the identification system to modify their management practices (Vitiello & Thaler). Long also found evidence of financial impact through news media frames, more specifically references to producers receiving higher prices for cattle tagged with an electronic identification ear tag. Sources in Long's study cited the NAIS was vital to reestablishing foreign markets, winning trading partners' trust, and most importantly, ensuring consumer confidence.

Only one-fourth of the respondents were aware of how the NAIS would affect national security, yet respondents generally agreed that the NAIS was important to national security. Perhaps the respondents' disagreement with the statement that they were well informed about the NAIS sheds light on the fact that a majority of students incorrectly answered three of the eight knowledge questions.

Respondents disagreed that the NAIS was an invasion of their privacy and disagreed that their belief system influenced their perceptions of the NAIS. This finding was inconsistent with Long's (2006) observation that invasion of privacy and conflict with religious practices were among the most prevalent political concerns with the NAIS.

As consumers, respondents reported that traceability of food through the food supply chain was important. This was consistent with findings by Nordstrom et al. (2000) that food safety was of utmost importance and concern for participants in the Pennsylvania Governor's School for Agricultural Sciences. Respondents reported that as consumers, the NAIS was important to maintain a safe U.S. food supply and was important to the U.S. economy. This finding confirmed Terry and Lawver's (1995) conclusions that students generally held positive perceptions about the impact of agriculture on the economy and the environment.

Objective 4

The fourth objective was to determine students' information sources on livestock industry issues. Students' indicated which information sources they used to learn about the NAIS, the influence of the source, and how often they accessed each source. Evidence of university professors' rank as a very influential source for information about the NAIS supported the findings of Wingenbach et al. (2003) that students gained awareness of biotechnology through science classes, labs, and university professors' beliefs. This finding emphasizes the impact university professors had on students concerning livestock industry issues.

Respondents indicated that university professors, Internet, and family members or friends were the most favorable information sources while Cooperative Extension, radio, and popular magazines were the least favorable sources of NAIS information. These findings are somewhat inconsistent with Tucker et al. (2006) that respondents favored traditional media such as newspapers and television news and had moderate levels of trust in university scientists. This evidence was also inconsistent with their findings that friends, family, and consumer advocacy groups were the least favorable sources of information. Perhaps exploratory research should be conducted to determine if college students are using information sources for livestock industry issues that were not included in the survey.

Kalaitzandonakes et al. (2004) concluded that observing and measuring how consumers access and understand information gathered from media sources was difficult. Therefore, an in-depth investigation into how students access information about the NAIS and process that information could provide valuable information for agricultural educators and communicators.

Objective 5

The fifth objective was to determine the relationship between students' youth leadership experiences and their awareness of how the NAIS would affect U.S. national security, economy,

and/or food safety (collectively known as the NAIS awareness variable). All high school livestock leadership experiences (4-H or FFA membership, livestock show team member, exhibitor experience, and youth livestock organization member) had positive moderate correlations with NAIS awareness. However, in this particular study, participation in youth livestock organizations was not associated with awareness levels of the NAIS.

Communication, leadership, and decision making skills are necessary for everyday living in adulthood, and are among the very basic life skills.Young people who participate in youth programs often work with other youth and adults to make decisions, take responsibility, establish goals, and set priorities (Dept. HEW, 1977, as found in Seevers & Dormody, 1994). Likewise, youth organizations play an integral role in promoting mental growth. In fact, Boleman et al. (2004) found that youth participating in 4-H beef projects developed essential knowledge of the livestock industry. Rusk et al. (2002) concluded that the Indiana 4-H livestock judging program had a positive influence on participants' life skill "livestock industry knowledge."

It can be inferred that since these youth were gaining knowledge of the livestock industry through their livestock projects, then they were also gaining awareness of industry issues. Therefore, youth who develop essential knowledge of the livestock industry are better prepared to make decisions and communicate about animal agriculture issues, such as the NAIS. However, further research should be conducted with youth livestock exhibitors, FFA members, 4-H members, and youth livestock organization members to accurately measure the relationship between their leadership experience and awareness of the NAIS. Further research should also consider the members' level of involvement within the organizations, and whether the level of involvement influences the members' awareness of the NAIS. Research should investigate relationships among youth livestock exhibitors, the species they exhibit, and awareness of the

NAIS. And lastly, further research should determine the effectiveness of individual FFA and 4-H activities on influencing students' awareness of the NAIS.

Objective 6

The sixth objective was to determine the relationship between students' youth leadership experience and their perceptions of the NAIS. Livestock exhibitor experience had a moderate correlation with perception of the NAIS. Experience as a FFA member, a livestock show team member, or with a youth livestock organization had a low correlation with perception of the NAIS. Experience as a 4-H member was not associated with perception of the NAIS.

Terry and Lawver (1995) suggested that urbanization has contributed to consumers' low awareness of agriculture and most importantly, their inaccurate perceptions of issues in the agricultural industry. Cano and Bankston (1992) found that although urban youth were far removed from production agriculture, they still had a strong desire to learn about livestock and farming. The researchers concluded that minority youth had positive perceptions regarding their 4-H experience and perceived 4-H programs and activities as meaningful and educational.

Wingenbach et al. (2003) determined that already-present global attitudes did not influence student perceptions, but awareness of biotechnology practices did in fact influence student perceptions. Most importantly, Birkenbolz and Schumacher (1994) found that students' involvement with livestock organizations was positively associated with specific leadership factors such as acceptance as leaders by their peers, and the ability to inspire and motivate people. With an ever changing global society, it is important to ensure that youth have positive perceptions about agricultural industry issues while possessing the leadership skills to guide and direct the industry in the future.

Future research should investigate and explore relationships between students' level of involvement in youth livestock organizations and their perceptions of the NAIS. This study did

not identify students' level of involvement, but whether students were a member of certain organizations. Again, this study should be repeated with youth livestock exhibitors, FFA members, 4-H members, and youth livestock organization members to accurately measure the relationship between their leadership experience and perceptions of the NAIS. Further research should determine the effectiveness of individual FFA and 4-H activities in influencing students' perceptions of the NAIS.

Objective 7

The seventh objective was to determine if significant differences existed between students' awareness of the NAIS, when compared by major and classification. ANOVA and post hoc tests indicated that students' NAIS awareness levels differed when compared by major and classification. Statistically, upperclassmen Animal Science majors were significantly more aware of the NAIS than were upperclassmen Non-Animal Science majors, lowerclassmen Animal Science majors, and lowerclassmen Non-Animal Science majors. However, the difference was not significant in practical terms because all four groups were only somewhat aware of the NAIS. These findings were supported by Patent et al. (2006) who found that cattle exhibitors were "somewhat familiar" when asked how aware they were of the NAIS.

Evidence of students' awareness was further supported by Harbstreit and Welton (1992) who found that in general, high school students had limited awareness of international agriculture, but as the students advanced to the next high school class level, their awareness of international agriculture increased. Fritz et al. (2003) found a significant difference in the percentage of adults and youth who were reportedly aware of how biotechnology would affect food, health, and environment. More adults reported awareness of affects of biotechnology on food, health, and environment than did youth, suggesting age affected awareness levels of affects of biotechnology on food, health, and environment. Fritz et al. also found a positive association

between awareness and acceptance levels of biotechnology. Therefore, it may be worthwhile to investigate students' awareness and acceptance levels of the NAIS. Further research should be conducted to determine if agricultural factors, such as family owned production property, experience with production agriculture, or experience with livestock and demographic factors such as classification and major are associated with students' awareness of the NAIS.

Objective 8

The eighth objective was to determine if significant differences existed between students' perceptions of the NAIS, when compared by major and classification. ANOVA tests indicated that students' perceptions of the NAIS were not significantly different when compared by major and classification.

Balschweid (2002) found that urban students with limited exposure to agriculture reported positive perceptions and attitudes toward farmers and animal agriculture; regardless of geography and urban environment, students realized the importance of the livestock industry. Balschweid's study concluded that education can have a positive effect on students' attitudes, regardless of students' prior experience, or lack of, with animal agriculture. Wingenbach et al. (2003) found where agricultural communications students who were aware of biotechnology practices held more positive perceptions of biotechnology than did respondents who were non-agricultural communications majors. Additional differences were found between agricultural communications students whose families owned agricultural production property. Likewise, Terry and Lawver (1995) concluded that students' gender, college major, and hometown were related to perceptions about agricultural issues.

Further research should be conducted to determine if agricultural factors, such as family-owned production property, experience with production agriculture, or experience with livestock

and demographic factors such as classification and major are associated with students' perceptions.

Objective 9

The ninth objective was to determine if significant differences existed between students' knowledge of the NAIS, when compared by major and classification. ANOVA tests indicated that knowledge levels were not significantly different when compared by major and classification.

House et al. (2004) found that female respondents with a college education had significantly higher objective and subjective knowledge levels of genetically modified foods. Moore et al. (1996) reported marginal differences in the percent of correct answers regarding international agriculture issues and students' class standing in college. However, students who had completed agriscience coursework in high school performed better on general agriculture geography knowledge items than did students who had no agriscience coursework. Previous literature (Boleman et al., 2004; Rusk et al., 2002) concluded that 4-H beef projects and livestock judging programs had positive influences on participants' knowledge of the livestock industry. Therefore, it may be worthwhile to determine if significant differences exist among students' previous experience with livestock, class status, major, and knowledge of the NAIS.

Objective 10

The tenth objective was to determine if a relationship existed among students' perceptions, awareness, and knowledge of the NAIS. Perceptions of the NAIS were positively associated with awareness of the NAIS for all respondents. However, lower and upperclassmen Animal Science majors' perceptions of the NAIS were very strongly associated with awareness of the NAIS. Perceptions of the NAIS were substantially associated with awareness for lower and upperclassmen non-Animal Science majors. These findings supported Wingenbach et al.

(2003), who concluded that students' awareness of biotechnology practices did influence their perceptions of it.

The finding that knowledge and perceptions of the NAIS were not associated suggests that further research should be conducted since previous literature (Brown, 1990; Humphrey, 1992, as found in Wright, Stewart, & Birkenholz, 1994) found weak positive relationships between knowledge and perceptions scores related to agriculture. Likewise, knowledge and awareness of the NAIS were not associated, yet Vestal and Briers (1990) found that journalists' awareness of biotechnology effects on food, health, and the environment had a weak positive association with knowledge.

Hypothesis One

The first hypothesis was that opinion leaders would affect students' awareness of the NAIS. Students' awareness was positively associated with Cooperative Extension, private organizations, and University professors. Cooperative Extension, private organizations, and university professors were all moderately correlated with students' awareness of the NAIS. Therefore, the null hypothesis that opinion leaders do not affect student awareness of the NAIS was rejected, and the alternative hypothesis was accepted as true. Statistical evidence existed to suggest that opinion leaders, used as information sources, affect students' awareness of the NAIS.

Although previous literature (Tucker et al., 2006; Wingenbach, et al., 2003) was supportive of the results derived from this hypothesis test, only this current study had sought to test opinion leaders' affect on students' awareness of any scientific topic. In their study of student awareness and perceptions of biotechnology issues, Wingenbach et al. (2003) found that students gained awareness of biotechnology through science classes, labs, and university professors' beliefs.

Information seen or read through mass media channels creates the reality of science for most people (Nelkin, 1995), and the news media plays a major role in disseminating information and bringing scientific issues to the public's attention (Malone, et al., 2000). In this current study, mass media outlets were not positively associated with students' awareness of the NAIS. Perhaps this is because the NAIS is not a critical issue for media outlets, therefore information about the NAIS is not broadcast in popular media channels.

The role of opinion leaders as information sources, such as Cooperative Extension, private organizations, and university professors in influencing students' awareness of the NAIS, highlighted the significance of the two-step flow of communication. The indirect flow of information from mass media to opinion leaders and then to the less informed public (student in this case) was demonstrated in this hypothesis test. Mass mediums such as television, radio, newspaper, nor popular magazines were significantly associated with students' awareness of the NAIS. Cooperative Extension, private organizations, and university professors, however, were significantly associated with students' awareness of the NAIS, thereby suggesting that opinion leaders were more influential on students' awareness of the NAIS than were mass mediums of information.

Although just outside the significance range, television was negatively associated with students' awareness of the NAIS. This suggested one of two things: as students' NAIS awareness levels increased, the influence of television as an information source decreased, or as students' NAIS awareness levels decreased, the influence of television as an information source increased. Further research should investigate this relationship to determine if the same relationship exists in different populations.

Hypothesis Two

The second hypothesis was that opinion leaders would affect students' knowledge of the NAIS. Student knowledge was not correlated with any of the listed opinion leaders. Because of the insufficient evidence, the null hypothesis that opinion leaders do not affect student knowledge of the NAIS failed to be rejected. Statistical evidence does not suggest that opinion leaders affect students' knowledge of the NAIS.

Although previous literature (House et al., 2004; Fritz et al., 2003;) was supportive of the results derived from this hypothesis test, only this current study had sought to test opinion leaders' affect on students' knowledge of any scientific topic. House et al. (2004) found that female respondents with a college education had significantly higher objective and subjective knowledge levels of genetically modified foods, and Fritz et al. (2003) found where youth and undergraduate respondents had the highest faith in statements made by university scientists.

An important conclusion from Nordstrom's et al. (2000) assessment of high school students' attitudes toward animal welfare, resource use, and food safety was that agricultural education programs can provide a foundation for students on animal and environmental impact issues while enhancing their knowledge and fostering dialogue related to these areas. For some students, their only agricultural experience is the ownership and care of companion animals, which varies greatly from the ownership and care of farm animals (Nordstrom et al.). For those who lack experience with farm animals, their attitudes toward livestock industry issues may be skewed. This current study of students' knowledge of the NAIS did not consider agricultural education programs as an opinion leader; however, future research should determine if agricultural education programs influence students' knowledge of the NAIS.

Even though previous literature (Gaskell et al., 1999; Hoban, 1998) found that objective knowledge differed among respondents in different geographical locations, House et al. (2004)

found no significant association between location and objective knowledge. More research on the influence of opinion leaders on students' knowledge of the NAIS should be conducted in different geographic locations to determine if relationships or differences exist.

Tucker et al. (2006) stated that food safety specialists and communicators can be key players in educating consumers about food biotechnology risks and benefits. It is important that information concerning food biotechnology be presented realistically, with unbiased opinions from either side, and disseminated through commonly used mass media channels. Widespread media coverage of topics such as avian bird flu, mad cow disease, foot-and-mouth disease, and bioterrorist attacks on the food supply would undoubtedly increase awareness of food safety issues among all consumers, not just those consumers actively seeking food safety information. Livestock industry specialists and communicators could be key players in educating college students and consumers alike about NAIS benefits, risks, and implications. Disseminating unbiased information about the NAIS is important to educate college students as they transition into consumer and livestock producer roles.

Hypothesis Three

The third hypothesis was that opinion leaders would affect students' perceptions of the NAIS. University professors had a positive, yet low correlation with students' perceptions of the NAIS. Therefore, the null hypothesis that opinion leaders do not affect students' perceptions of the NAIS was rejected and the alternative hypothesis was accepted as true. Statistical evidence suggests that opinion leaders' influence as information sources affect students' perceptions of the NAIS.

Although previous literature (Heuer & Miller, 2006; Meyers & Rhoades, 2006; Wingenbach et al., 2003) was confirmed by the results derived from this hypothesis test, only this current study had sought to test opinion leaders' affect on students' perceptions of any

scientific topic. Heuer and Miller indicated that mass media has the ability to influence public opinion and set the public agenda – or determine the way the public should think about a topic. Meyers and Rhoades suggested a direct relationship exists between information that appears in the media and what the viewers perceive as important.

Knowledge, experience, or global attitudes reported in the mass media can shape and form people's perceptions (Wingenbach et al., 2003). Previous research (Sanbonmatsu & Fazio, 1990) concluded that when people have low knowledge or experience with a topic, it is possible for them to base their perceptions of that topic on already-present global attitudes.

Furthermore, because media frames can create public understanding of an event (Entman, 1991), Ruth et al. (2005) said that their study of framing in the livestock industry could shed light on the public's basic awareness and perceptions of BSE. They also said that the framing of BSE during the period surrounding the outbreak could potentially affect perceptions of agriculture in general because the beef cattle industry is such a large part of the agricultural industry. The current study of students' perceptions of the NAIS did not investigate media frames as opinion leaders and their influence on students' perceptions, but future research should investigate the influence of media frames as opinion leaders on students' perceptions of the NAIS.

The role of university professors as information sources highlighted the significance of the two-step flow of communication in influencing students' perceptions of the NAIS. This hypothesis test confirmed that the indirect flow of information from mass media to opinion leaders and then to the less informed public existed. Mass mediums such as television, radio, newspaper, Internet, nor popular magazines were significantly associated with students' perceptions of the NAIS. University professors, however, were significantly associated with

students' perceptions of the NAIS, thereby suggesting that university professors were more influential on students' perceptions of the NAIS than were mass mediums of information.

Student perceptions in acceptance of biotechnology practices were influenced by demographics such as family ownership of agricultural production land and whether students lived or worked on a farm or ranch (Wingenbach et al., 2003). Future research should investigate and determine if relationships exist among opinion leaders, demographics, and students' perceptions of the NAIS. Perhaps exploratory research should be conducted to identify additional opinion leaders that were not included in this study.

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APPENDIX A

CORRESPONDENCE WITH SAMPLE

PRENOTICE

April 12, 2007

«Fname» «LName»
«School»
«Email»

Dear «Fname»:

How involved are you in the livestock industry?

What are your perceptions about the National Animal Identification System and who do go to for information about the livestock industry?

Next Monday, April 16, 2007, you will receive an e-mail for a brief online survey. The email will contain your password and the Web link to the survey. The survey will take about XX minutes to complete. As a way of showing my thanks, you will be entered to win a $25 iTunes gift card (or another similar business of your choice).

I would like to find out what information sources impact college students' perceptions of the National Animal Identification System. This study was approved (#2006-0545) by the Institutional Review Board—Human Subjects in Research, Texas A&M University. I am sending this note today because some people like to know ahead of time that they will be contacted.

Thank for your time «Fname». It is only through your help that this research can be successful.

Sincerely,

Jeanie Long
Senior Investigator
Department of Agricultural Leadership, Education, and Communications
Texas A&M University

FIRST NOTICE

April 16, 2007

«Fname» «LName»
«Email»

Dear «Fname»:

What are your perceptions of the National Animal Identification System?

I would like to find out what information sources impact college students' perceptions of the National Animal Identification System. This study was approved (#2006-0545) by the Institutional Review Board—Human Subjects in Research, Texas A&M University.

The questions in the survey will ask you about your perceptions and awareness of the National Animal Identification System. Your responses will remain confidential and will not be identifiable.

If you are ready, please go to:

http://www.ag-communicators.org/surveys/

Read the Information and Consent Form, and then enter your unique password, which is: «ID»

The survey will take about 10 minutes to complete. Remember «Fname», you need to answer all questions to be entered into the random drawing for a $25 iTunes gift card!

Thank you for your time and participation!

Sincerely,

Jeanie Long
Senior Investigator
Department of Agricultural Leadership, Education, and Communications
Texas A&M University

FIRST REMINDER

April 19, 2007

«Fname» «LName»
«Email»

Dear «Fname»:

Earlier this week, you were sent a link to an online survey asking questions about your perceptions of the National Animal Identification System. Your name was selected randomly from a list of Texas A&M University students enrolled in livestock production or industry related courses.

I encourage you to visit the Web site and fill out the survey. It will take about 10 minutes to complete, but the information that you provide will help us understand the impact of information sources on college students' perceptions. As a way to show my thanks, you will be entered into a drawing to win a $25 iTunes gift card.

If you are ready, please go to:

http://surveys.ag-communicators.org/NAISconsent.htm

Read the Information and Consent Form, and then enter your unique password, which is: «ID»

Remember «Fname», you need to answer all questions to be entered into the random drawing for a $25 iTunes gift card!

Thank you for helping with this important study.

Sincerely,

Jeanie Long
Senior Investigator
Department of Agricultural Leadership, Education, and Communications
Texas A&M University

SECOND REMINDER

April 23, 2007

«Fname» «LName»
«Email»

Dear «Fname»:

We still haven't heard from you about the National Animal Identification System. We only need about 10 minutes of your time for this short survey – we just want your honest opinions about the National Animal Identification System. Don't lose out on your chance to win a $25 iTunes gift card.

Just go to:

http://surveys.ag-communicators.org/NAISconsent.htm

Read the Information and Consent Form, and then enter your unique password, which is: «ID»

Remember you need to answer all questions to be entered into the random drawing for a $25 iTunes gift card.

«Fname», your thoughts about the National Animal Identification System are really important to us. If you are uncomfortable answering the questions, or do not want to participate, just send us an e-mail response so we can stop sending you reminders. Thank you for your time!

Sincerely,

Jeanie Long
Senior Investigator
Department of Agricultural Leadership, Education, and Communications
Texas A&M University

THIRD REMINDER

April 30, 2007

«Fname» «LName»
«Email»

Dear «Fname»:

This is your last chance to tell us about the National Animal Identification System. We only need about 10 minutes of your time for this short survey – we just want your honest opinions about the National Animal Identification System. If you want to participate, just go to:

http://surveys.ag-communicators.org/NAISconsent.htm

Read the Information and Consent Form, and then sign in with your unique password, which is: «pw»

After three days, we will randomly draw one student's name for the $25 iTunes gift card. To be eligible for the drawing «Fname», you need to answer all questions in the survey. We are truly interested in your thoughts about the National Animal Identification System, and your responses are really important to us!

If you are uncomfortable answering the questions, or do not want to participate, just send us an e-mail response telling us to stop sending reminders. If you would rather have a paper copy of the survey, respond to this note with your snail-mail address and we will send you one. Thank you for your time and good luck on your finals!

Sincerely,

Jeanie Long
Senior Investigator
Department of Agricultural Leadership, Education, and Communications
Texas A&M University

APPENDIX B

INFORMATION AND CONSENT FORM

SURVEY INSTRUMENT

Perceptions of the National Animal Identification System among College Students in the College of Agriculture and Life Sciences

Information and Consent Form

Thank you for participating in this study, Perceptions of the National Animal Identification System among College Students in the College of Agriculture and Life Sciences. The purpose of this study is to assess college students' perceptions of the National Animal Identification System. Your responses will be used to understand how important issues in the livestock industry are communicated to the public. This study will involve 297 college students, who are over 18 years of age and enrolled in livestock-related courses. Do not add your name or other identifying data to the survey.

The study is conducted using methods and protocols approved by the Institutional Review Board of Texas A&M University. **Click here** for a printable statement of research protocols.

All students who complete the entire survey will be entered into a drawing for a $25 iTunes gift card.

If you want a copy of this Information and Consent Form, you can print this page using your Internet browser.

I agree to the information above and want to take the survey with my assigned

Password (guest): Sign In

I do not agree to the information above and want to Exit.

If you have questions about this research project, please contact Jeanie Long

Q1. How often do you listen to or read news information?
- A. Daily
- B. 3 – 4 times a week
- C. Once a week
- D. Once a month
- E. Never

Awareness

How aware are you of the National Animal Identification System (NAIS)? Please indicate your awareness levels.

Q2. Are you aware of how the National Animal Identification System will affect food safety in the United States?
- A. No
- B. Somewhat
- C. Yes

Q3. Are you aware of how the National Animal Identification System will affect the United States economy?
- A. No
- B. Somewhat
- C. Yes

Q4. Are you aware of how the National Animal Identification System will affect United States national security?
- A. No
- B. Somewhat
- C. Yes

Q5. Do you think there is a risk of a foreign animal disease outbreak in the United States?
- A. No
- B. Somewhat
- C. Yes

Q6. Do you think the risk would be severe enough to warrant the use of the National Animal Identification System?
- A. No
- B. Somewhat
- C. Yes

Knowledge

How knowledgeable are you of the NAIS? Please answer each statement by selecting True or False.

Q7. The National Animal Identification System is a program that was created by the United States Department of Agriculture.
- A. True
- B. False

Q8. The National Animal Identification System was created to track diseased livestock.
- A. True
- B. False

Q9. The National Animal Identification System will allow the government to pinpoint a farm's location and record the number of livestock on the property through the use of a global positioning system (GPS).
- A. True
- B. False

Q10. The National Animal Identification System will include livestock and pets (dogs& cats).
- A. True
- B. False

Q11. The National Animal Identification System will include all animal livestock species: cattle, horses, swine, sheep, goats, bison, poultry, cervids (elk & deer), and camelids (llamas & alpacas).
A. True
B. False

Q12. The National Animal Identification System provides the government a way to continuously monitor livestock records.
A. True
B. False

Q13. Participation in the National Animal Identification System is voluntary at the Federal level.
A. True
B. False

Q14. The National Animal Identification System will track and identify the movement of all livestock in the United States.
A. True
B. False

Perceptions

What is your perception of the NAIS? Please indicate how strongly you agree or disagree with the following statements.

Q15. The National Animal Identification System is an important program.
A. Strongly Disagree
B. Disagree
C. Agree
D. Strongly Agree
E. Not Sure

Q16. The National Animal Identification System does not affect me.
A. Strongly Disagree
B. Disagree
C. Agree
D. Strongly Agree
E. Not Sure

Q17. The National Animal Identification System is important to national security.
A. Strongly Disagree
B. Disagree
C. Agree
D. Strongly Agree
E. Not Sure

Q18. I am well informed about the National Animal Identification System.
A. Strongly Disagree
B. Disagree
C. Agree
D. Strongly Agree
E. Not Sure

Q19. My belief system influences my perceptions of the National Animal Identification System.
A. Strongly Disagree
B. Disagree
C. Agree
D. Strongly Agree
E. Not Sure

Q20. The National Animal Identification System is an invasion of my privacy.
A. Strongly Disagree
B. Disagree
C. Agree
D. Strongly Agree
E. Not Sure

Q21. The National Animal Identification System will help prevent the spread of disease in livestock.
A. Strongly Disagree
B. Disagree
C. Agree
D. Strongly Agree
E. Not Sure

Q22. The National Animal Identification System will help track sick animals back to the source of contamination or infection.
A. Strongly Disagree
B. Disagree
C. Agree
D. Strongly Agree
E. Not Sure

Q23. I am not concerned about the voluntary National Animal Identification System becoming mandatory.
A. Strongly Disagree
B. Disagree
C. Agree
D. Strongly Agree
E. Not Sure

Q24. The National Animal Identification System will have an economic benefit to the producer.
A. Strongly Disagree
B. Disagree
C. Agree
D. Strongly Agree
E. Not Sure

Importance of the NAIS

How important is the NAIS, from the consumer's perspective? Please indicate how important or not important the NAIS is for each of the following questions.

Q25. It is important to trace food through the food supply chain, back to its point of origin.
A. Not Important
B. Important
C. Very Important
D. Not Sure

Q26. As a consumer, it is important to have traceability in the food supply.
A. Not Important
B. Important
C. Very Important
D. Not Sure

Q27. The National Animal Identification System will be important to national homeland security.
A. Not Important
B. Important
C. Very Important
D. Not Sure

Q28. The National Animal Identification System will be important to the U.S. economy?
A. Not Important
B. Important
C. Very Important
D. Not Sure

Q29. The National Animal Identification System will be important to maintain a safe food supply in the U.S.
A. Not Important
B. Important
C. Very Important
D. Not Sure

Opinion Leaders

What sources have you used to gather information on the NAIS? Listed below are ten sources. Please indicate all information sources you have used by checking the box in Column 1. Then, for each source checked in column 1, rate the influence that source has on your opinion of the NAIS in column 2. Use the scale: 1 = NO Influence, 10 = MOST Influential.

		Check all Sources Used ▼		Rate only Checked Sources ▼
Q28.	Cooperative Extension Service	☐	Q38.	☐
Q29.	Family member	☐	Q39.	☐
Q30.	Internet	☐	Q40.	☐
Q31.	Newspapers	☐	Q41.	☐
Q32.	Popular magazines *(Time, Newsweek, People, etc)*	☐	Q42.	☐
Q33.	Private organizations (Texas Beef Council, Farm Bureau, etc)	☐	Q43.	☐
Q34.	Television	☐	Q44.	☐
Q35.	Trade publications *(Beef, Dairy Herdsman, Drovers, etc)*	☐	Q45.	☐
Q36.	Radio	☐	Q46.	☐
Q37.	University courses	☐	Q47.	☐

Media Sources

When was the last time you used the following sources to gather information about livestock industry issues? Please indicate the last time you used each of the following sources.

Q48. Cooperative Extension Service
- A. Less than 1 week
- B. Less than 6 months
- C. Less than 1 year
- D. More than 1 year
- E. Never

Q49. Internet
- A. Less than 1 week
- B. Less than 6 months
- C. Less than 1 year
- D. More than 1 year
- E. Never

Q50. Newspapers
- A. Less than 1 week
- B. Less than 6 months
- C. Less than 1 year
- D. More than 1 year
- E. Never

Q51. Popular magazines (*Time, Newsweek, People, etc*)
- A. Less than 1 week
- B. Less than 6 months
- C. Less than 1 year
- D. More than 1 year
- E. Never

Q52. Private organizations (Texas Beef Council, Farm Bureau, etc)
- A. Less than 1 week
- B. Less than 6 months
- C. Less than 1 year
- D. More than 1 year
- E. Never

Q53. Television
- A. Less than 1 week
- B. Less than 6 months
- C. Less than 1 year
- D. More than 1 year
- E. Never

Q54. Trade publications (*Beef, Dairy Herdsman, Drovers, etc*)
- A. Less than 1 week
- B. Less than 6 months
- C. Less than 1 year
- D. More than 1 year
- E. Never

Q55. Radio
- A. Less than 1 week
- B. Less than 6 months
- C. Less than 1 year
- D. More than 1 year
- E. Never

Q56. University courses
- A. Less than 1 week
- B. Less than 6 months
- C. Less than 1 year
- D. More than 1 year
- E. Never

Demographics

Q57. How do mainstream media present livestock industry issues?
- A. Media present issues as they are.
- B. Media presents issues with a pro-livestock view.
- C. Media presents issues with an anti-livestock view.
- D. I'm not sure how mainstream media presents livestock industry issues.

Q58. Which of the following describes your overall knowledge of the NAIS?
- A. I am very knowledgeable about the NAIS.
- B. I am more knowledgeable about the NAIS than my peers.
- C. I have about the same knowledge about the NAIS as my peers.
- D. I have less knowledge about the NAIS than my peers.
- E. I have no knowledge about the NAIS.

Q59. What is your gender?
- A. Male
- B. Female

Q60. Did you grow up on or around a farm/ranch?
- A. Yes
- B. No

Q61. Have you ever worked on a farm or ranch?
- A. Yes
- B. No

Q62. Do you or any of your family members own livestock?
- A. Yes
- B. No

Q63. If yes, how many head? (Species combined, if more than one species)
- A. <50
- B. 51 – 100
- C. 101 – 500
- D. 501 – 1000
- E. >1000

Q64. What is the primary species?

_____

Q65. Does your family farm/ranch or the ranch/farm where you work currently participate in the NAIS program?
A. Yes
B. No
C. I don't know

Q66. Does your family's farm or the farm where you work have a premise ID?
A. Yes
B. No
C. I don't know

Livestock Organization Participation

Were you involved with livestock organizations or programs that involved livestock? Please indicate your participation by answering Yes or No to the following statements.

Q67. In high school, I was a member of the 4H.
A. Yes
B. No

Q68. In high school, I was a member of the FFA.
A. Yes
B. No

Q69. In high school, I was a member of a livestock show team.
A. Yes
B. No

Q70. In high school, I exhibited livestock at shows and fairs.
A. Yes
B. No

Q71. In high school, I was a member of a youth livestock organization (Texas Junior Livestock Association, etc).
A. Yes
B. No

VITA

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Honors and Activities:	Outstanding Poster Presentation, Association for International Agricultural Extension Educators Annual Conference (2007) Outstanding Masters Student (2007) Vice President, Texas A&M Agricultural Education Graduate Student Society (2006–2007)