

EXPLORING KNOWLEDGE, ATTITUDES AND PERCEPTIONS OF NEWSPAPER JOURNALISTS IN METROPOLITAN MARKETS IN THE UNITED STATES REGARDING FOOD BIOTECHNOLOGY

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Abstract

Mass media are the primary source that increases people's awareness about agriculture and are an important resource for the diffusion of innovations. Educating journalists is important because journalists play a significant role in shaping public perceptions. The public has a stake in the outcomes of science because of the social, economic and environmental implications of innovations; therefore, a scientifically literate public is important to a democracy. This descriptive study may encourage agricultural educators who work in the contexts of extension education and agricultural communications to collaborate with journalists and the social institution of mass media to inform consumers about food biotechnology.

Eighty-eight journalists for 62 of the nation's largest metropolitan newspapers provided data for the study. Major findings and recommendations are as follows: journalists' knowledge of food biotechnology was relatively low; most journalists considered genetic modification of plants as "acceptable" and of animals as "somewhat acceptable," and journalists had greatest faith in "university scientists" as sources. Journalists perceived genes moving to other organisms, food safety, and environmental harm as obstacles to the acceptance of biotechnology innovations. These journalists considered that farmers would accept food biotechnology as a farm practice within three years while consumer acceptance would take almost eight years.

Introduction and Theoretical Framework

Most agricultural innovations are marketed to the users of the technology--farmers; thus, there is little effort to inform consumers. Food biotechnology differs because people perceive it to affect the food they eat (Hoban, 1996). This direct effect launches food biotechnology into a public discourse, one that is often played out in the media (Peterson, 1996).

An unprecedented profusion of technology has been diffused into society with inadequate inquiry and communications regarding negative consequences (Rogers, 1983). Extensive review of agricultural news by numerous investigators revealed that mass media coverage of agriculture is collectively distorted, and long-term negative

news on agriculturally related issues could affect public confidence and support for agriculture (Reisner, 1991; Hall, Connell & Curti, 1977; Protess & McCombs, 1991; Fowler, Hodge, Dress & Trew, 1979).

Mass media have great influence on public perception, influence that Rogers called the *Hypodermic Needle Model*. According to the model, media cause "direct, immediate and powerful effects" (p. 272) by figuratively injecting information into society. Rogers (1995) determined that 52% of potential agricultural adopters use mass media channels for information regarding innovations. Denton's (1996) research found that 74% of US consumers point to their local Sunday newspaper as their primary source of information. "The media are often blamed for

making science seem revolutionary rather than evolutionary and are frequently held responsible for consumer confusion” (Cosby, 1998, p. 4).

The prominence of news media as a primary information source continues to have significant influence on society. This was validated in a 1993 survey of adults when 81% considered news media their primary source of information on science topics, especially environmental and natural resources (American Opinion Research, Inc., 1993). Because consumers acquire most of their scientific information from mass media (Terry, 1994), and agricultural scientists and extension educators continuously search for improved methods to educate the masses, researchers in this study wanted to know journalists’ knowledge, attitudes, and perceptions of the science of food biotechnology.

Agriculture is perceived by most consumers as slow paced and sustaining. Yet, consumers may not know the rapid rate of change that biotechnology has brought to agriculture. The U.S. Food and Drug Administration, the U.S. Department of Agriculture, and the Environmental Protection Agency approved the first genetically modified seed for commercial row crop production in 1996. Dispersed throughout approximately 400 million U. S. crop acres, genetically modified seeds were planted on an estimated 5 million, 30 million, and 60 million acres during 1996, 1997, and 1998, respectively (NABC, 1998).

To learn how journalists and scientists perceived one another, Chappell and Hart (1998) sampled 2,000 journalists and 2,000 scientists. They discovered that neither group believed it was doing a good job of explaining science to the public. They concluded that those transferring scientific information to the public should engage in systematic, continuing education exposing journalists to scientists and the research processes. According to the literature, it is important for educators, researchers, and industry professionals

to collaborate with journalists to enhance their collective efforts of informing the public about food biotechnology.

Purpose and Objectives

The purpose of this study was to explore the knowledge, attitudes, and perceptions of metropolitan journalists regarding food biotechnology. The objectives of this study were to (a) investigate and determine the knowledge, attitudes, and perceptions held; and (b) describe the relationships between knowledge, attitudes, and perceptions regarding food biotechnology, and selected personal and situational characteristics of selected metropolitan journalists.

Methods/Procedures

The target population was metropolitan journalists (daily newspaper circulation >100,000) at 96 of the nation’s largest newspapers based on daily circulation (Editor & Publisher, 1997). The newspapers had a cumulative circulation of 30 million readers. Three hundred seventy-six journalists with “beats” in business, environment, agribusiness, features, food, health/medical, and science/technology from Editor and Publisher Yearbook (1997) made up the sampling frame. These beats were selected because benefits and risks associated with food biotechnology cross a variety of disciplines and public discourse in the news is framed in many contexts (Peterson, 1996).

The researcher developed a 38-item instrument based on research by Duhe’ (1993), Barton (1992), and Hoban and Kendall (1993). The instrument measured knowledge, attitudes, and perceptions. These three constructs were quantified with six scales or sets of items to determine (a) knowledge about biotechnology, (b) attitudes toward: acceptance of genetically modified organisms; specific food biotechnology practices; effects of biotechnology; the level of importance placed on food biotechnology research; faith in sources of food biotechnology

information; level of importance placed on investigative reporting style when the subject is food biotechnology; potential obstacles to acceptance of food biotechnology, and (c) perceptions regarding producer adoption and consumer acceptance of food biotechnology on the farm.

Journalists' knowledge about food biotechnology was measured using multiple-choice items. Attitudes and perceptions were measured from responses on Likert-type scales. Twelve experts from the sciences of journalism, horticulture, agricultural education, agronomy, entomology, and biochemistry at Texas A&M University and Texas Tech University determined the content validity of the instrument. A pilot study of journalists with 50 similar newspapers established the face validity of the instrument. To test the internal consistency of summated conceptual scales, sets of items were subjected to Cronbach's coefficient alpha (α). The instrument used in the study included the following scales: knowledge of biotechnology (9 items, $\alpha = .67$); acceptance of genetically modified organisms (5 items, $\alpha = .87$); perceived effects of biotechnology (4 items, $\alpha = .78$); importance of biotechnology research (7 items, $\alpha = .83$); faith in sources of biotechnology information (7 items, $\alpha = .80$); perceived obstacles to acceptance of biotechnology (4 items, $\alpha = .86$); and perceived rates of producer adoption and consumer acceptance.

Telephone calls to all 96 newspapers were initiated to update the list of selected journalists with each newspaper. Data collection involved seven contacts with the journalists: (a) an introductory letter, (b) the original questionnaire and cover letter, (c) a postcard reminder following the questionnaire, (d) follow-up telephone calls to a random sample of one-third of the non-respondents ($n = 115$), (e) a second questionnaire and cover letter, (f) a postcard reminder following the second questionnaire, and (g) telephone calls to a random sample of one-half of the non-

respondents ($n=169$).

Questionnaires were returned by 88 of the 376 journalists (23% response rate) from 62 of the 96 newspapers (Figure 1). The usable questionnaires received during a 90-day data collection period ending April 30, 1998, served as the data source for this study. Innovation diffusion research involving journalists is difficult. In messages on returned questionnaires, some journalists viewed that this research was not specific to their "beat." Too, they were pressed by organizational policies disallowing their participation in the study, had questions of professional ethics about sharing their opinions or attitudes on subjects they may write about, and lacked time to complete the questionnaire. Inference to the population of this study is inappropriate because of the low response rate; this study might justifiably be viewed as exploratory in nature with a purpose of documenting baseline information about the participating journalists' knowledge, attitudes, and perceptions regarding food biotechnology. Thus, the results are descriptive rather than inferential. Data were analyzed with SPSS® (SPSS, Inc., 1998). The researchers, considering the exploratory nature of this study, used the Davis (1971) convention to describe correlation coefficients.

Results/Findings and Discussion

Half of the journalists identified their primary responsibility as "editor" and the other half considered their primary responsibility as "writer." Fifty-seven percent ($n=50$) of the responses were from females. Ninety-five percent ($n=83$) had earned bachelor's degrees; among these 16% ($n=14$) held master's degrees, and 2% ($n=2$) had doctorates. Their median number of years of journalism experience was 19.7.

Twenty percent ($n= 18$) of respondents said their families owned agricultural property while 23% ($n=20$) indicated they had lived on a

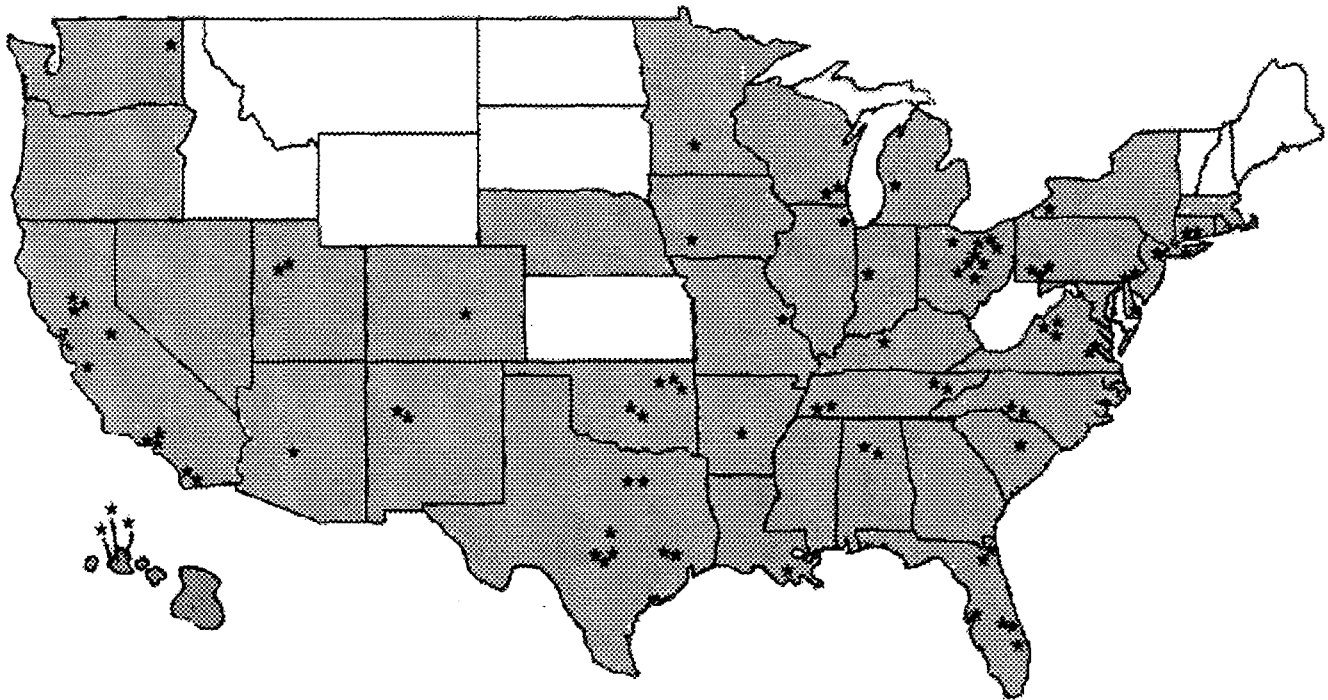


Figure 1. Geographical locations of 88 responding journalists at 62 of the nation's largest newspapers. Shaded states were home to at least one of 96 newspapers in the study. Each star represents the location of the newspaper of a responding journalist.

farm/ranch. Eighty-three percent ($n=72$) of the respondents indicated they had read about or studied biotechnology within the previous six weeks. Ninety-two percent ($n=81$) of the journalists indicated they were "aware" or "somewhat aware" of how biotechnology affects their food, health, and environment. Thirty-nine percent ($n=34$) of the journalists had contributed to articles on biotechnology. The beats these journalists identified as covering were business (17%, $n=15$), environment (10%, $n=9$), agribusiness (9%, $n=8$), food (30%, $n=26$), features 12%, $n=11$), health/medicine (14%, $n=12$) and science/technology (8%, $n=7$).

Findings Related to Journalists' Knowledge

Nine items measured journalists' knowledge about food biotechnology. Knowledge scores for the journalists revealed a lack of knowledge about food biotechnology as quantified by a mean of 30% correct answers (Figure 2) on

the multiple-choice test (Vestal, 1998). One could expect a mean of 25% on a multiple-choice test with four choices if respondents simply guessed at the answers. Their low level of knowledge was similar to knowledge levels of consumers (Bruhn, 1997). Interestingly, almost 75% of the respondents indicated that their level of overall scientific knowledge was "average," "somewhat high," or "high." Their perceived level of overall scientific knowledge was higher (at least in a qualitative sense) than their assessed knowledge of biotechnology.

Findings Related to Journalists' Attitudes and Perceptions

The instrument contained 29 items designed to assess journalists' attitudes and perceptions regarding food biotechnology. The first set of items assessed journalists' acceptance of genetic modified organisms (GMOs). Means resulting from the 4-point scale were interpreted as

follows; 1-1.5 = highly unacceptable; 1.5-2.5 = somewhat unacceptable; 2.5-3.5 = somewhat acceptable, and 3.5- 4 = highly acceptable. Journalists believed genetic modification of humans to be a “somewhat unacceptable” (M=2.01 on 4 point scale; Figure 3) use of biotechnology. These journalists considered

genetic modification of animals as “somewhat acceptable” (M=2.52) with nearly 59% selecting “highly acceptable” or “somewhat acceptable.” Journalists’ attitudes toward genetic modification of forest/landscape plants (M=3.16), food crops (M=3.11), and microorganisms (M=2.99) were also considered “somewhat acceptable,” but

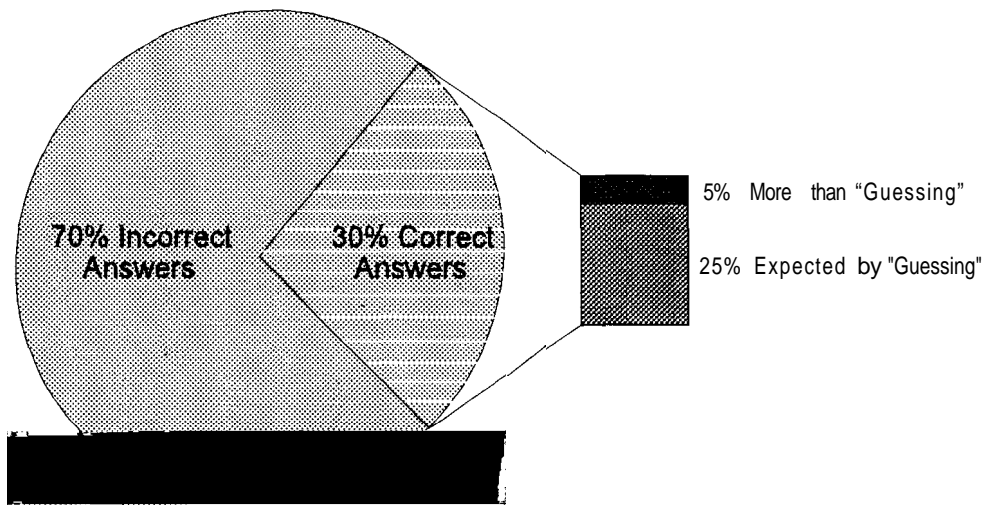


Figure 2. Journalists’ knowledge scores about food biotechnology (expected knowledge scores by chance/guessing = 25% on the 4-item multiple choice knowledge questions). Cronbach’s coefficient alpha = .67; scale mean = 30%.

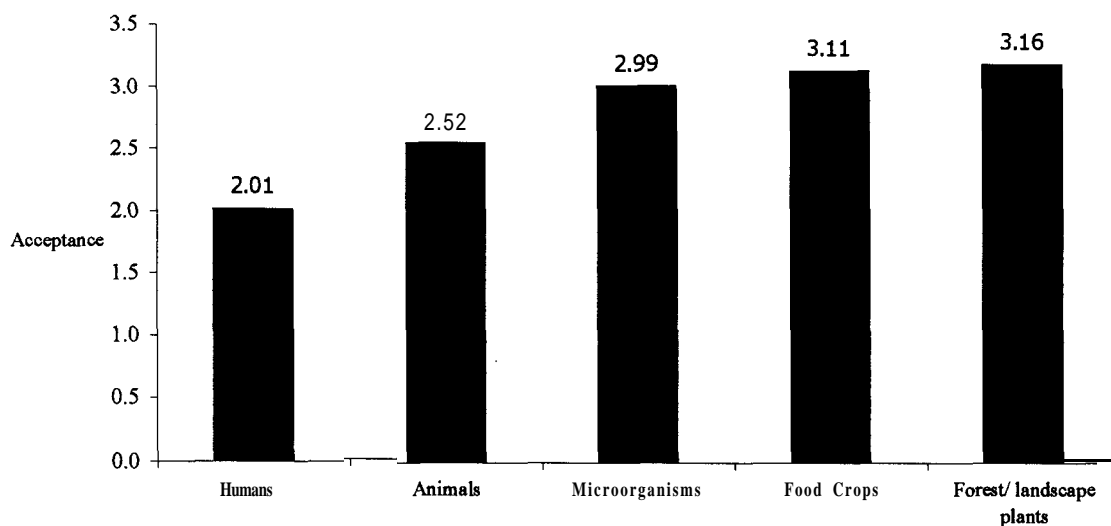


Figure 3. Journalists’ acceptance of genetic modification of specific organisms (1=highly unacceptable; 2=somewhat unacceptable; 3=somewhat acceptable; 4= highly acceptable).

almost 40% of the journalists considered one or more of these practices as “highly acceptable.” Another scale revealed that, in general, journalists believed the effects of food biotechnology would have a “positive” effect on world hunger ($\underline{M}=2.72$ on a 3 point response scale, 1=Negative, 2=Neutral, 3=Positive).

Journalists then were asked their opinions of the importance of biotechnology research leading to four possible outcomes. Journalists indicated food biotechnology research that benefits

the environment ($\underline{M}=3.48$ on a 4 point scale, 1=Not at all important to 4=Extremely important) and reduces the use of pesticides ($\underline{M}=3.48$) as most “important.” Journalists also rated biotechnology research regarding food safety ($\underline{M}=3.40$) and controlled release of genes ($\underline{M}=3.16$) as “important.” Hoban's (1996) earlier research found higher levels of consumer acceptance for agricultural biotechnology that offers relative advantage (e.g., human health, food quality).

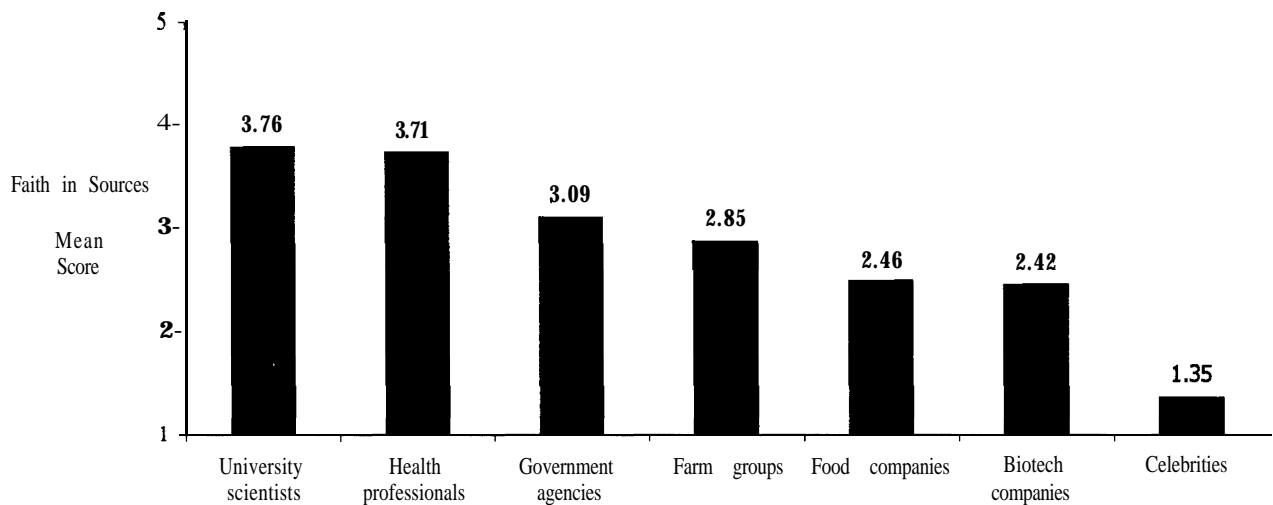


Figure 4. Journalists’ faith in sources (1=very low, 2=low, 3=neutral, 4=high, 5=very high).

Journalists revealed “high” levels of faith (i.e., accurate and unbiased) in statements about food biotechnology from university scientists ($\underline{M}=3.76$ on a 5-point scale, Figure 4) and health professionals ($\underline{M}=3.71$). Journalists’ faith in statements made by government agencies ($\underline{M}=3.09$) and farm groups ($\underline{M}=2.85$) were “neutral.” They rated their faith lower for statements made by biotechnology companies ($\underline{M}=2.46$) and food companies ($\underline{M}=2.42$), and “very low” for statements made by celebrities ($\underline{M}=1.35$).

Journalists were asked to express the degree to which they believe selected obstacles influence their acceptance of biotechnology in

food production. Religious/ethical concerns about “tampering with nature” was rated “low” ($\underline{M}=2.48$ on a 5 point scale, Figure 5) as an obstacle to acceptance. Fears of environmental harm ($\underline{M}=3.68$), of genes moving unchecked to other life forms ($\underline{M}=3.65$), and of food safety consequences ($\underline{M}=3.49$) were rated as “high.” To assess their perceptions regarding the rate of adoption, journalists were asked how many years they thought it would take farmers and consumers to accept U.S. government-approved biotechnology as farm practices. Journalists, in general, perceived that farmers would accept biotechnology within 3.1 years while consumer acceptance would take 7.7 years. Still, 1% of the

journalists perceived that farmers would never accept biotechnology as a farm practice, and 3% perceived that consumers would never accept biotechnology as a farm practice.

Findings Related to Relationships

One low, positive correlation (F.22) indicated that as journalists’ awareness of biotechnology’s effects on food, health, and the environment increased, assessed knowledge also increased. No other personal characteristics of journalists were related to knowledge. Their job responsibility was related to their acceptance of

genetically modified organisms (GMOs); editors (coded “1”) were less accepting of GMOs than were writers (coded “2”) ($r=.40$). Journalists’ acceptance of GMOs was to a low relationship. There were two low relationships between journalists’ beliefs concerning the effects of biotechnology and other variables: (a) journalists whose families owned agricultural property tended to believe biotechnology would have more positive than negative effects on fish and wildlife, world hunger, family farms, and healthful foods ($r=.24$), and (b) as journalists’ perceived level of scientific knowledge increased, they were more likely to consider biotechnology positive ($r=.25$).

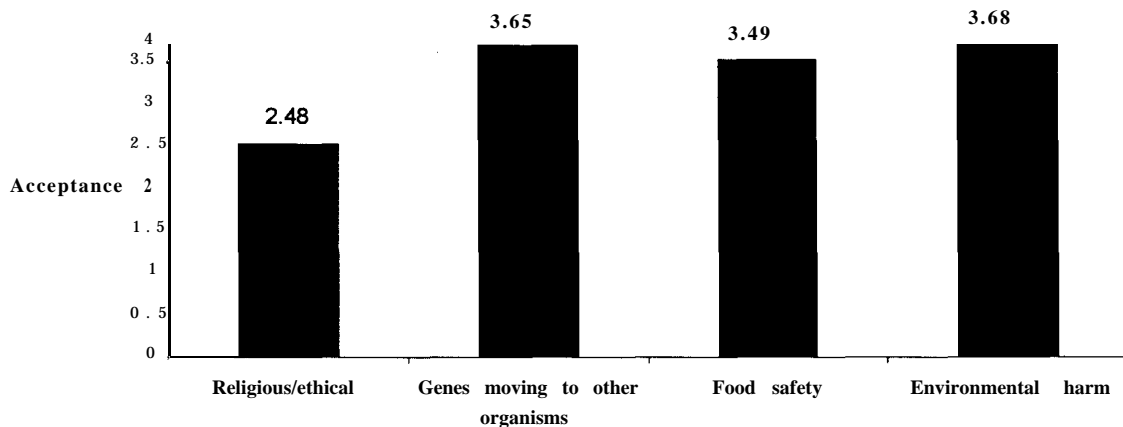


Figure 5. Obstacles to acceptance of using food biotechnology (1=very low, 2=low, 3=neutral, 4=high, 5=very high).

There were two low relationships between journalists’ expressed faith in sources of food biotechnology information and background variables. First, their level of faith was related to their primary responsibility at the news organization. In other words journalists’ faith in sources was higher among “writers” than “editors” ($r=.27$). This outcome agrees with Schudson (1995) who discovered that the social interaction between reporter (writer) and sources builds confidence in the exchange. Second, journalists’ level of faith in sources was higher if they had

lived on a farm or ranch ($r=.23$). This finding is supported by marketing research of Schoell and Gultinan (1995) who asserted that consumers’ wants, perceptions, attitudes, knowledge, personality, and lifestyle are influenced by family, friends, and the culture in which they live.

The degree to which journalists perceived various obstacles to acceptance of biotechnology was lowly related to a) their level of awareness of biotechnology’s effects, and b) their primary responsibility in the news organization. The higher

the journalists' awareness of food biotechnology's effect on food, health, and the environment, the lower the strength of specific obstacles to acceptance of food biotechnology ($r = -.19$). This conclusion supports Bruhn (1997) who contended that lack of awareness of agricultural practices and limited knowledge about biotechnology drove people to oppose products of biotechnology. Too, journalists who were "editors" indicated higher strength in obstacles to acceptance of food biotechnology than did "writers" ($r = -.32$). Finally, the researchers investigated the relationship between perceptions of journalists regarding rate of acceptance (in years) of biotechnology as a farm practice and selected personal and situational characteristics. Correlation statistics indicated that journalists who had contributed to an article on biotechnology perceived that farmers rather than consumers would accept food biotechnology as a farm practice sooner ($r = .25$). Also, evidence supported that "writers" rather than "editors" perceive a more rapid rate of acceptance of biotechnology as a farming practice ($r = .25$).

Conclusions, Implications, and Recommendations

Assessing the knowledge, attitudes, and perceptions of metropolitan journalists may enhance the technology transfer and consumer awareness efforts of professional educators who work in communications and extension. These professionals must embrace consumers as well as producers in the new agricultural innovation diffusion equation (Peterson, 1996). The knowledge, attitudes, and perceptions held by metropolitan journalists were similar to those of consumers in previous studies (Barton, 1992; Bruhn, 1997; Hoban & Kendall, 1993; Hoban, 1996). Journalists, because they are involved in communicating science to the public, play an important role in the diffusion of innovations and public acceptance (American Opinion Research, 1993; Chappell & Hart, 1998; Peterson, 1996). Thus, they are an important target audience for education on biotechnology.

The level of knowledge of journalists was "low" with an average of 30% correct answers on a multiple-choice test of biotechnology information. Journalists' knowledge about biotechnology challenges Eveland's (1996) knowledge gap theory and potentially places journalists in the lower half of the knowledge continuum. The incongruence between journalists' perceptions of their general scientific knowledge and assessed knowledge of the "newer science" of biotechnology builds a compelling case for a need to inform journalists about biotechnology. If their knowledge was so low, then on what were their attitudes and perceptions based? They were not based on a thorough knowledge of the technology; thus, their perceptions may be based on other experiences with science and technology: Alar, Agent Orange, or Three Mile Island (May, 1969, Sanbonmatsu & Fazio, 1990). Most news reporters do not have experience by which to reference happenings in agriculture (Fowler, Hodge, Dress & Trew, 1979).

May (1969) concluded that people base their perceptions on past experience and knowledge; therefore, if a person has limited knowledge and experience about a topic, then he or she cannot accurately perceive it. Sanbonmatsu and Fazio (1990) have shown that perceptions are often based on already present global attitudes toward similar topics or technologies when knowledge about the topic is low. They also showed that attitudes based on global judgments lead to more unexpected behavior than do attitudes based on direct personal experiences.

Correct or not, perceptions people hold about the safety of biotech foods are likely to sway regulatory decisions, affect research and development, and ultimately affect the rate of diffusion of innovations (Armstrong, 1991). Journalists in this study confessed that they do not have or desire "walking around knowledge" about biotechnology. Only 20% of the journalists had lived on a farm and gained experiences by which to reference happenings in agriculture.

Journalists' level of acceptance of biotechnology increased among journalists with greater perceived level of scientific knowledge. Also, the researchers found that journalists who had not yet contributed to an article on biotechnology and perhaps who had not attempted to become informed were less accepting of genetically modified organisms. Because journalists' knowledge was low and because there was a positive correlation between journalists' knowledge and their acceptance levels of biotechnology as a farm practice, it is inferred that biotechnology education targeting journalists is warranted. The placement of useful biotechnology information into an educational environment that is attractive to journalism professionals should be a goal of agricultural communicators and extension educators.

Journalists indicated that they had a higher level of acceptance of genetic modification of plants when compared to genetic modification of animals or humans. Based on the responses of journalists, the researchers conclude that journalists in this study believe that biotechnology will have a positive effect on world hunger.

Because respondents considered that "fear of genes moving unchecked to other plants, insects and microorganisms," "fear of food safety consequences," and "fear of environmental harm" were obstacles to their acceptance for using food biotechnology as a farm practice, the researchers rationalized and journalists reported that they placed a high level of importance on research that ensures that food biotechnology "benefits the environment" and "reduces the use of pesticides." Thus, it is recommended that biotechnology researchers and agricultural communicators and educators incorporate methods into their basic and applied research plans to create a knowledge based on risks and should address these important concerns through "in the news" publications and public education.

When asked to indicate how much faith

they have in statements made by various spokespersons, the respondents indicated they held highest faith in university scientists as sources of correct and reliable information about biotechnology and less faith in biotechnology and food companies. Given these findings, university scientists, biotechnologists, agricultural extensionists, and agricultural communicators should be encouraged and rewarded for communicating and publishing "in the news" for public consumption in addition to publishing in scientific and societal journals. Too, because of the credibility of university scientists among journalists, private biotechnology companies may build more and stronger relationships with public and private universities. On the other hand, because respondents have lower faith in companies, universities must concern themselves with the fact that such strong relationships with for-profit companies may harm their image as a "public good" research and teaching institution.

In addition, the diffusion equation, in the case of food biotechnology, should include adoption not only by farmers but also adoption (acceptance) by consumers. It is recommended that agricultural communicators and extension educators provide electronic access to food biotechnology information (Vestal, 1998). Extension educators should also develop a systematic approach that allows journalists to have personal experiences with people who operate agricultural and food biotechnology enterprises (Chappell & Hart, 1998). Agricultural communicators and extension educators should feature educational messages about biotechnology innovations that address the social, economic, and cultural impacts of innovations (Hoban, 1996).

This study revealed these journalists considered that farmers would accept food biotechnology as a farm practice within three years while consumer acceptance would take almost eight years. This perceived gap between the acceptance of biotechnology by farmers and acceptance by consumers suggests the need for

educational efforts by agricultural educators in communications and extension ("Chefs at the Barricade," 2000; "Let's Please Stop the Bio-tech Food Fight," 2000; "Of Genes, Grain, and Grocers," 2000).

Because some journalists (1% to 3%) perceived that farmers and consumers would never accept biotechnology as a farm practice and the culture in the news environment contributes to negative and sensational news, one might expect food biotechnology news to receive prominent play (location) in the news. These elements and the presence of vocal activist groups who have access to media equate to a need for universities to develop proactive (public education) and reactive (dispute resolution) approaches to controversies about food biotechnology.

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