

THESIS PROPOSAL – TECHNOLOGICALLY ENHANCE FOODS

CHAPTER I

INTRODUCTION

Two current and controversial issues in the area of food science are bioengineered food and irradiation of food. The technology of irradiation, exposure of a substance to radiant energy, has been tested for safety for many decades and is used extensively in many countries worldwide both for food and medical sterilization purposes (American Dietetic Association website <http://www.eatright.org/airradi.html>). During the 1970s, biotechnology was developed that enabled the transfer of genetic material from one organism to another. Using biotechnology, genes do not have to originate from the same species in order to perform their natural function. Thus, the transfer of genetic material can be done between any living organisms. Today, crop plants are being engineered to foster resistance to pests, diseases, or herbicides. In a similar fashion, desirable nutritional and functional properties in plants have been introduced to other plants with the use of this technology (Mermelstein, 2000).

Consumer attitudes toward these issues have been studied for many years by various methods. A population's attitude regarding biotechnological food enhancement and irradiation can easily be assessed using survey methods, allowing information to emerge that may be useful in predicting people's subsequent behavior in the marketplace (Alreck & Settle, 1995). Numerous studies have been done by telephone, using direct mail, and employing focus groups to try to assess consumer acceptance of these two technologies and how they relate to demographic characteristics of the people involved. This information can be useful for marketing, planning, and educational purposes.

The administration of surveys has also evolved throughout the years. Telephone, mail, or personal interviews are all ways in which surveys have been administered. Some of these methods can be time-consuming and expensive. Within the last decade, computer technological advances, coupled with the availability and development of the internet and world wide web, have led to other ways of administering surveys. Direct e-mail of surveys to targeted participants has been done and response rates have been reported to be similar to direct-mail surveys. Making a survey accessible to millions of potential respondents is easily accomplished by placing it on a website. The advantages for doing a survey on the world wide web are numerous. The cost is very low, there is anonymity for the participant and experimenter, and there are no pencils, postage, or paper involved (Hewson, Laurent & Vogel, 1996). The survey's potential exposure to a large, international audience is possible (Dillman, 2000). Major concerns of conducting a survey using this method include adequate exposure of a survey on the web, honesty and validity of the participants, and assurance to the participants that their privacy is protected (Schmidt, 1997). These are, of course, the very same concerns that accompany almost any self-report method of data gathering.

Purpose

The purpose of this research project was to conduct a consumer attitude study to gain further insight into the demographic characteristics of people's acceptance of technologically altered food. The survey was administered via completely electronic means. The survey itself was placed on a website on the internet, and potential respondents were notified via email and through invitations to participate posted on all the Usenet newsgroups dealing with food, diet, and health. This approach to conducting

a survey was chosen over other methods because of lower costs, the possibility of a reaching a large and diverse population, and to gauge the method as a feasible and useful one for survey administration.

Significance of the Study

In the current literature contains many studies where survey data was conducted on the WWW in the areas of medicine, psychology, marketing, business and computer science. Numerous studies detailing the demographic characteristics people who accept and use bioengineered and/or irradiated food have been done, though not via electronic means. These were usually accomplished using traditional data gathering techniques (i.e., telephone interviews, direct mail, focus groups, personal interviews). From this literature, research questions were developed in the hopes of gaining further insight into exactly who would buy the products in question, and what people think of such food products. The survey was administered from an Internet Website located on the University of Akron's server in the hopes of reaching a large and diverse audience with minimal effort and cost. This study may provide insight into the demographic variables on acceptance issues of the studied technologies and the survey method may be useful for future researchers.

Research Questions

Using the information that has been published both in the literature and Internet sources, the following research questions were developed in the hopes of gaining further insight into demographic issues regarding bioengineered food and irradiated food:

1. Do demographic factors such as gender, income, and education affect acceptance of biotechnology?
2. Does the majority of respondents believe biotechnology will be of benefit to themselves or their families within the next five years?
3. Does the majority of respondents feel the present FDA labeling requirements are adequate?
4. How do demographic factors such as gender, income, education, geographic location, and size of household affect acceptability of irradiation.

Assumptions

The food attitudes survey assumed these points:

1. Participants answered to the best of their knowledge in an honest and truthful manner.
2. Each participant filled out only one survey.

Limitations

The following points were inherent limitations of this study:

1. The results from the survey population cannot be expanded beyond the scope of Internet users.
2. Participation in the survey was solely voluntary.
3. The sample population may have been self-selected.
4. The researcher may have caused errors by unclear questions.

Definition of Terms

The following terms need to be defined for the study:

- Attitude: a personal feeling toward something; defined by three issues for the purposes of this study--support of the technology, foresight to see positive benefits within five years, and willingness to purchase this type of food (Hoban, 1996a)
- Biotechnology: in this study, it will imply the technology of genetic engineering; will be interchangeable with bioengineered/genetically engineered
- Close-ended survey question: a survey question that provides a full range of possible answers (Salant & Dillman, 1994).
- E-mail service on the Internet which can deliver a message that is addressed to another user on a different system
- Genetically engineered food: food that has been altered through the use of biotechnology and intentionally designed to improve a quality or a specific characteristic (will be used interchangeably with genetically modified food in this study)
- Genetically modified food: food (plant or animal) in which "...the application of recombinant deoxyribonucleic acid (rDNA) technology to the genetic alteration of microorganisms..." has taken place (Mermelstein, 1999)
- Internet: "...a worldwide series of interconnected computer systems and a series of several different types of computer services" (Grimes)

- Irradiated food: the process by which food is exposed to radiant energy (either gamma rays or electrons) for the purpose of reducing possible pathogens
(www.eatright.org/airradi.html)
- Open-ended survey question: a survey question that does not provide any answers
- Technologically altered food: in this research study it represents the use of bioengineered/genetically modified food and/or irradiated food
- UseNet: an electronic bulletin board allows viewers to go to a common area and has the ability to handle postings and replies; usually arranged by a specific topic
- UseNet newsgroups: electronic discussion groups usually tied to a specific topic
- World Wide Web: a multimedia service on the Internet which went online in 1992 that meshes text, graphics, sounds, animation, and virtual reality (Grimes, 1996)
- Web site: a place on the Web that has a specific address and is written in hypertext markup language (html)

Summary

Chapter one introduced the basic background information used to develop the topic for this study. The purpose, significance of the study, research questions, assumptions, limitations, and definition of terms were explained.

CHAPTER II

REVIEW OF LITERATURE

This chapter will explore the influence of demographics on consumer attitudes towards bioengineered food and irradiation of food, and the survey methods used to assess these attitudes. The American public's feelings toward the present FDA labeling policy on bioengineered food will be discussed, as well as a brief overview of survey administration through the internet.

Bioengineered Food

Attitudes of consumers towards food choices can change, depending on many factors. In the area of bioengineered food, demographic factors especially influence consumer acceptance. A recent telephone survey conducted by the Gallup Poll Organization of Princeton (September 1999) concluded that the higher the income and education (college degrees) of the respondents, the more willing they were to support biotechnology. The actual breakdown of respondents illustrated that 21% of respondents with no college education "strongly opposed" biotechnology where food treatment was concerned. Eight percent of respondents with a college degree or higher responded the same way. When asked specifically about paying more for labeling of products that contain genetically modified food, two-thirds of the respondents said they would pay for this type of labeling (Gallup's website: <http://www.gallup.com/poll/releases/pr991005>). Gallup also conducted the same survey seven months later (April 2000) and found generally favorable support for bioengineered food from their total sample of respondents

(<http://www.gallup.com/poll/surveys/2000/topline000330/q13t16.asp>). The Gallup Poll Organization uses random (to the area code) digit dialing telephone interviews to reach approximately 1,000 adults for each survey they conduct. The organization feels that this is a reliable way to get a representative view of opinions from the whole United States. (www.gallup.com/poll/faq/asp).

This overall general acceptance of biotechnology may be felt outside the borders of the United States. A study in Brazil obtained somewhat similar findings, for example. Personal interviews of 550 Brazilians were taken in an effort to obtain information about people's attitudes in that country. Higher education and family income were positive factors on public perception on biotechnology, while gender and age had no statistical influence or effect (Oda and Soares, 2000).

The International Food Information Council (IFIC) commissioned surveys conducted independently by a research firm called the Wirthlin Group, in March 1997, February 1999, and October 1999 (<http://inficinfo.health.org/press/quest.htm>). IFIC is a non-profit organization funded by the food, beverage and agricultural industries. Its goal is to communicate information to the public on food safety and agriculture. These surveys also came to the basic conclusion that Americans generally have a favorable acceptance of bioengineered food. The IFIC surveys were done by telephone using approximately 1000 respondent samples. Most of the questions comprising the survey instrument concerned attitudes in the survey were closed-ended. The reported results had no specific demographic breakdown of respondents, but those with the highest education levels were the most supportive of biotechnology. A strong majority (75%) of the

respondents believed that biotechnology would benefit their families in the next 5 years (ificinfo.health.org/press/positivebio.htm).

IFIC president Sylvia Rowe was reported in Chemical Market Reporter, backing up the organization's survey results about the positive American consumer support for biotechnology. She also referred to biotechnology in agriculture as an evolution in food development, explaining that she feels that educating the public will be the main factor in getting consumer acceptance, and will continue to be main challenge in the future (Mirasol, 1999).

Elizabeth Sloan used the results of the March 1997 and February 1999 IFIC surveys in her article in the August 1999 issue of Food Technology about upcoming food trends for the coming decade (Sloan, 1999). She is a contributing editor for Food Technology and president of Sloan Trends and Solutions. In her article, which is written with the publication's readership of professionals in the food industry in mind, she speculates that one of the top ten future trends will be that American consumers will continue trusting technology, and will be accepting of future benefits from agricultural and medical biotechnology innovations. Although no demographic breakdown was stated, Sloan explains that this projection of trust in technology is usually first embraced by individuals who are *technology optimists*. Sloan describes them as persons who are progressive and willing to accept new technology into their lives. They are influential people from different generations that are in the forefront of what will eventually be accepted by the majority of people. In demographic terms, *technological optimism* is most influenced by the possession of a college education. Age and gender are also asserted to be factors in favorable views of new technology, with a decline in acceptance

of technological advancements after the age of 30, as people start to resist learning about innovations and new technologies. Further, males generally have more technological optimism than females. *Generation X* females and young parents with children are also more open to new technologies, according to Sloan's projections. She considers technical optimists as an influential group of the population who will need to be targeted and educated as new food technologies are introduced, since they tend to lead the way to the marketplace for the rest of the population.

Although Sloan's outlook for Americans toward food technologies is positive, she points out that European consumers are showing stronger opposition to biotechnology use in food production. If true, this assertion has major implications for American companies and farmers who sell seed, grain and food products abroad, and will be discussed more fully in the latter portion of this chapter.

Thomas Hoban has done numerous studies in the late 1990s in both Japan and the United States on consumer acceptance of bioengineered food and his findings frequently find their way into the literature. The outcome of these survey based studies employed random telephone interviews and reached about 1,000 people for each sampling. The surveys in Japan were conducted during 1995 and 1998 and during 1995, 1997, and 1998 in the United States. He used both open and closed-ended questions in his instrument to gain insight into the respondent's feelings and opinions toward this subject. The demographics reported in the article only stated that there were equal number of women and men. Age and education were also reported as being representative of a large cross-section of the population. The respondents from both countries said they are likely to purchase produce that was a product of biotechnology. The survey conclusions show that

the majority of Japanese and American consumers are still positive and calm about biotechnology in their food (Hoban, 1999).

An article in AgriMarketing reported findings of a 1998 study concerning consumer attitudes toward genetically modified food. The Angus Reid Group, an international market research company, conducted the telephone survey study. One of the conclusions of the study was that the majority of supporters of this technology are more likely to be male (Agri Marketing, 1999).

A summary of five independent, national, telephone surveys on the acceptance of biotechnology by consumers that were conducted in 1992, 1994, 1995, 1996 and 1997 was published in an article in Cereal Foods World. The surveys reported here represent studies that were funded by the U.S. Department of Agriculture (USDA), Grocery Manufacturers of America (GMA), IFIC, and the Food Marketing Institute. Hoban contributed much of the survey design for most of these studies, the results of which were quite consistent with one another about previously published articles on Americans' attitudes towards biotechnology. In general, responses showed there is a strong support of biotechnology by consumers in the U.S. Those with a higher education level responded that they would more likely believe that biotechnology would benefit them. Respondents most likely to buy bioengineered food were men and younger people, and income level showed to be no influence in this area. Younger respondents and men tended to have the most positive attitude toward biotechnology. Income level did not show to be a determinant factor in positive acceptance of biotechnology (Hoban & Katic, 1998).

XXXXXXIn a mailed survey targeted to Iowa dietitians, educational levels did not appear to influence attitudes towards biotechnology. The sample was 97% women and the authors did find that age was positively related to a favorable attitude (Wie, Hsu, Strohbahn, 1998).

Hoban's first telephone survey study done in Japan during 1995 was reported an article published in 1996. In this article, he also compared results of this study to findings of survey studies he had done in the United States on consumer acceptance of biotechnology. Monsanto, who has a very large interest in the area of biotechnology and seed production, specifically funded this study. Hoban encompasses his definition of positive attitudes towards biotechnology to include "...support for its use, willingness to purchase, and recognition of benefits". The demographic factors, both in Japan and the U.S., that had the most positive effect on consumer acceptance were a high level of education, higher income level, and being male. Although women were less positive, he does comment about the importance of women as decision-makers and the main purchasers of food for households. Although women tend to be less positive about biotechnology, they tend to have more concerns about the safety of biotechnology (Hoban, 1996a).

Hoban writes in another article published in 1996 geared to dietitians about two national telephone surveys that were conducted in 1992 and 1994 for the USDA and the GMA. These two studies already have been mentioned in the summary article in Cereal Foods World (above). The 1992 study focused on specific applications of biotechnology in agricultural and medicinal areas. Although a national telephone survey was used in this study, focus groups were also conducted to gain further insight into people's opinions

and to get ideas for additional consumer educational needs. Consumer attitude toward the use of recombinant bovine somatotropin (BST) in milk production was the focus for the 1994 telephone survey. The same basic conclusions were published again:

1. In 1992, 75% of the respondents said that they thought they would benefit by biotechnology within the next five years.
2. In 1992 and 1994, 66% of the respondents supported biotechnological advances in agriculture and food production.
3. The level of education was a factor in acceptance of biotechnological advances.
4. Men were more likely than women to be accepting of biotechnology.
5. Higher income was a factor in acceptance of biotechnology.

The author summarized what he thought were the barriers to biotechnological acceptance by consumers: "...lack of understanding, perceived risks, and ethical concerns." Emotion, intuition, and selective assessment of information play a major role in the way people accept and try new foods. He also makes the point "...that women are not necessarily more negative, but they do have many more questions and they tend to see technology in a much broader perspective." Other points brought out in this article included sources of information which consumers were more likely to trust about food questions: physicians and independent scientific organizations. Also, this information should come from an unbiased expert (Hoban, 1996b).

Focus groups were used in another study geared toward gaining insight into consumer knowledge and concerns about biotechnology. Thomas Hoban was also one of the authors in this article. The study involved six focus groups, in five different states,

for a total of 67 participants. Because this was a focus group setting, the questions asked were open-ended and intended to generate questions and discussions. This study had three main objectives: gain insight about consumer feelings concerning biotechnology in agriculture and food production, find out who the public is turning to for information regarding this subject, and to figure out who the public feels should be responsible for the safety of these new foods. Again, education and income positively influenced trust in dieticians and health professionals. The more education a person had, the more trusting they were of the safety of the food supply and the less concern they had with this issue. Newspapers, magazines and television were the primary sources that the respondents mentioned for food information. Many participants mentioned that media sources could not be totally trusted. Information obtained from scientists and health professionals was mentioned to be most reliable and unbiased. For the issue of who should be responsible for the safety of bioengineered foods, the participants indicated that the government should have some of that responsibility. However, many questioned the competency of the government to handle such a large task. Almost half the responses indicated that they do not trust the government to protect them from the risks of bioengineered food (Zimmerman, Kendall, Stone and Hoban, 1994)

Although the literature sources mentioned above indicate general acceptance of biotechnology in the United States, there is still a changing atmosphere in the world regarding acceptance of this technology in everyday food. It is not clear at this point if the European backlash of using only genetically modified-free products will affect American consumer attitudes. Corporations doing business in Europe such as Burger King, Kentucky Fried Chicken, Nestle, Kellogg, PepsiCo and Kraft Foods are banning

genetically modified food from menus and ingredients (Milmo, 1999; Kriz, 2000). To appease European consumers, some European supermarkets have stated that their own private label products will be free of genetically modified organisms. Due to licensing agreements, most genetically modified crops are grown in North and South America and then sold to European markets (Milmo). For the planting season of 2000, American farmers were planning to decrease the amount of genetically modified seed to be planted (Tangley, 2000).

Presently, the Food and Drug Administration (FDA) governs the labeling policy for genetically modified food in the United States. Their policy states that if an allergen is introduced or if there has been a significant change in the nutritional composition from the original counterpart, then the product label must indicate this difference (Thompson, 2000). The two recent national telephone surveys conducted by the IFIC and Gallup in 1999 suggest that Americans support the present FDA labeling policy. In a specific question in the Gallup poll, two-thirds of the respondents also indicated that they might be willing to pay more for mandatory labeling of all genetically modified food (www.gallup.com/poll/releases/pr991005.asp). In the IFIC survey, seven out of ten respondents said they agree with the FDA policy (<http://ificinfo.health.org/press/positivebio.htm>).

The published literature on the numerous survey studies on the general acceptance of biotechnology by consumers came to very similar findings. The level of education, gender and income were found, in most cases, to be a strong indicator of acceptance. However, most of the studies had some connection with one person, Thomas Hoban. His

expertise in conducting and administering surveys in this area of consumer acceptance is remarkable and, hopefully, unbiased.

IRRADIATED FOOD

As in the case of acceptance of bioengineered food, acceptance of irradiated food by consumers also has demographic factors. Some of the published literature combines these two food technologies together in their research. The technology optimists, as has been discussed in Sloan (above), are likely supporters of irradiation. She also adds that those living in the Midwest, families with three or more children, households where older children have returned, men and those with a college education are more likely to be supporters of this technology.

Recent problems with ground meat and meat products have consumers changing their way of thinking of irradiation. The media coverage of the outbreaks of *E. coli* 0157:H7 at a Jack in the Box restaurant and tainted meat at processing plants that resulted in deaths have captured the public's attention toward this very serious food safety issue. In a very recent article, the author (Hunter, 2000) enumerates factors that may affect attitudes toward the irradiation process. Locale (as in nation), age, education, and gender were the basic factors of influence. A nation's positive or negative attitude towards nuclear technology will influence its constituents' attitudes. Older people are more trusting in authority as compared to younger people. The author writes that younger people tend to be more resistant to new technologies. This "new technology concept" is opposite of what other authors have written (Sloan). Education level can act both as a hindrance or a plus, depending if one is trying to educate a "know-it-all". If taste of the food is unaffected, men are not that concerned. Mothers of young children have a great

concern for the safety of food served at home and are very open to irradiated products. Sloan also agrees with this point. Hunter mentions that in a recent poll by the Food Marketing Institute and Grocery Manufacturers' Association in 1998, 80% of the respondents expressed some willingness to purchase irradiated food.

In a review of studies done in the past decade, this article finds that gender, age, income and education were factors in willingness to accept irradiated food. Although the article was published in 1999, the studies the authors conducted were done in 1994 and 1995. The sample total was 171 observations in which 70% of the participants were female. All the participants were from a college town in Iowa. The study participants represented households in which about one-third of them had at least one child under the age of 12. The findings showed that lower-income and lower education respondents showed more concern about radiation effects. Those with a child present in the household expressed more concern about irradiation, but were not considered significant. This study's results indicate that men, a higher income, and a college education are factors that indicate support of this technology. Their article concludes with the recommendation that marketing efforts for irradiated beef be geared toward the younger, college educated, male (Lusk, Fox, McIlvain, 1999).

In another Iowa study with registered dietitians, a mailed survey was used for attitude and knowledge assessment of genetically engineered and irradiated foods. The sampling was geared toward a professional society, and therefore, the education level would be considered high. The authors found that age was a positive factor in acceptability of irradiated food, but the level of education was not a factor. The respondents were 97% women (Wie et al, 1998).

A review of some market and consumer attitude studies around the world suggest that consumers will purchase irradiated food. The demographic factors that were highlighted in this article were that women, people with less formal education and lower incomes were more likely to express concerns regarding food treated by this process (Bruhn, 1995).

In a mailed survey study to consumers in Georgia, the primary food shopper was asked to fill out the questionnaire. Not surprisingly, the respondents were 76% female. The total sample size was 446 people. The demographic findings of this survey found that income and education were acceptance factors, but that age was not related. People with lower incomes and education levels thought irradiation was a serious problem. Forty-five percent of the respondents said they were willing to purchase properly labeled, irradiated food. Thirty-six percent said they were undecided (Resurreccion, Galvez, Fletcher & Misra, 1995).

A focus group study was conducted to obtain information for future consumer education on food irradiation. The study involved 131 male and female participants. The authors's definition of acceptance of irradiated food encompassed four dependent variables. Opinion of the process, perceived health risk, activism (probability of openly expressing opposition to irradiation), and actual taste panel participation of irradiated chicken meat were the dependent variables. Several demographic factors were the independent variables. Gender and income significantly affected the variable of activism. Males were more likely to express an opinion. Although the participants were highly educated, this did not seem to have significant affect on the dependent variables. Males had a better opinion and less perceived health risk about irradiation than females. There

was no significant gender difference associated with willingness to taste irradiated chicken (Sapp, Harrod, and Zhao, 1995).

Market test studies were done in Florida with irradiated strawberries. The berries out-sold the unirradiated fruit during a five-day sale. Literature on irradiation, knowledgeable salespeople, and a home economist were available for customers's questions. There were also consumer activists outside the store trying to influence and deter shoppers from purchasing irradiated fruit. No demographic information was given in the article, but it is an example of consumers' willingness to purchase irradiated food (Marcotte & Kunstadt, 1993).

As far back as 1989, it was well known that women expressed more concern about irradiated food than men. A study involving 195 women was conducted using a self-administered survey and focus groups. It was exclusively limited to women. There were definitely a higher percentage of women expressing concern about irradiation during those times and they were more supportive of banning irradiated food. Also women with children were also more likely to be less comfortable about feeding her family this type of product. In this particular case, the researchers found that women with higher education were less willing to serve this type of food and more willing to support a ban on irradiation (Bord & O'Connor, 1989).

Over the past decade, attitudes toward irradiation have changed due to illnesses and deaths that have occurred because of tainted food. The literature on factors that influence attitudes toward irradiation are in generally agreement with one another. These factors were identified in the different studies by surveys, focus group, and market studies. Some sources do not agree in all the factors. Men and women with young

children have a generally favorable outlook on irradiation. In general, women and people with lower incomes and education are more negative.

INTERNET SURVEYS

The Internet as a survey tool has only been used since the 1990's. There are many advantages to using this tool. The articles reviewed here will pertain to general issues of administering a survey located on its own Internet website. Technical information on this subject will not be possible in this space.

Privacy invasion is a major obstacle to overcome in online surveys. Assurance of privacy to the potential survey respondent is one of the first priorities that must be conveyed to that person. The potential survey respondent should know the purpose, use of the data, and that there has been appropriate research review and approval (Karlinsky, 1998). In the programming of the survey, data should be separated from an e-mail address by making sure a special file is attached to the original file so that the data is sent to an external file. This way no e-mail address is associated with a set of data. No identifying computer file (cookies) should be placed on any respondent's computer. Confidentiality disclosures and credentials of the principal research investigator should be available to the potential respondent. Sponsorship by a university may also increase response rates of a survey (Cho & LaRose, 1999).

Another author also gave design advice for a Web site survey. Supovitz (1999) mentions that the length of the survey should be taken into consideration. This will translate into length of time the survey will take to load onto a participant's computer. Some people have fast modems; others have much slower ones. The time it takes to load the survey may cause discouragement to some potential participants. If the research

involves a participant returning to a site for more questions over a period of time, there needs to be a way to link data to an individual. In a case like this, some type of identification system must be put into place, without jeopardizing privacy. This may involve some type of password or identification number that a participant must remember. In a simple survey, such as was involved in this research project, there is no need to be this elaborate with identification numbers. The drawback is that the researcher hopes each participant filled out the survey only once. Pull down menus should be used for some questions with many choices or if only one choice (forced-choice) is desired. A designer may want to add a default choice that may distinguish a non-response from a response. Because of the variety of computer equipment that is being used (hardware and software), there is a good possibility that not everyone has the same view of the survey as was the original design. Therefore, keep it as simple as possible. This includes colors and fonts.

Lazar and Preece (1999) simplify the basic steps of doing electronic survey research:

- “1. Design the survey on paper.
2. Choose a methodology (network access and population definition).
3. Turn the paper survey into a web-based survey.
4. Inform the population of interest of the existence of the survey.”

Attracting volunteers to a survey site plays a major role in determining whether or not the survey will have success. The site's Uniform Resource Locator (URL) address can be registered with many WWW search engines, but pre-planning for this registration is necessary. It may take some time and can take longer than expected. Banners can also

be used (Pettit, 1999). A posted message to appropriate usenet newsgroups or listservers are also options (Schmidt, 1997; Michalak and Szabo, 1998).

Main points for conducting an Internet survey have been described above. A well-worded survey, simple website design, assurance of privacy and validity, and attracting volunteers are necessary for conducting a successful Internet survey.

SUMMARY

Chapter two summarized the literature related to the influence of demographics on consumer attitudes toward bioengineered and irradiated foods, and some main points of conducting a website-based Internet survey. The past surveys that have been done on bioengineered and irradiated foods suggest that American consumers are generally accepting of this technology.

In the area of bioengineered food, nation-wide telephone surveys suggest that being male, and the level of education and income, are influential factors in acceptance of bioengineered food. Results from a recent telephone survey indicates that two-thirds of the respondents stated that they would be willing to pay more for labeling of products that contain bioengineered food.

The acceptance of irradiated food has been very favorable also. Recent *E. coli* 0157:H7 problems that started in meat processing plants and ended with deaths have the public wondering about the safety of food. The studies conducted on this subject included different types of surveys, focus groups, and market studies. Most of the authors tended to agree that level of education and income, being male, and whether there are young children in the household are positive demographic factors in acceptance of

irradiated food. In some studies, age and being from the mid-west U.S. were also positive factors.

In conducting a website-based Internet survey, simplicity, assurance of privacy and anonymity, and attracting volunteers are fundamental factors of this type of survey administration. The advantages of doing a survey on the Internet are that it is inexpensive, convenient for respondents, and may attract a large number of participants.

Using the information from the literature, combined with the hope of gaining further insight into consumer attitudes on these two food technologies, a website-based Internet survey was designed to explore demographic issues associated with bioengineered food and irradiated food. The following research questions were explored in this study:

1. Demographic factors such as gender, income, and education will affect acceptance of biotechnology.
2. The majority of respondents believe biotechnology will be of benefit to themselves or their families within the next five years.
3. The majority of respondents feel the present FDA labeling requirements are adequate.
4. Demographic factors such as gender, income, education, geographic location, and size of household will affect acceptability of irradiation.

CHAPTER III

METHODOLOGY

This chapter will cover the methodological and procedural techniques used to test the research questions of this study, which includes a description of the instrument design, electronic form of the survey, survey administration and subjects, the statistical analyses, and the limitations of the study.

Design of the Instrument

After reviewing the literature and searching the Internet, a 26-question survey instrument for assessing consumer attitudes toward technologically altered food was designed and approved by the University of Akron's Institutional Review Board (See Appendix 1 & 2). The survey addressed two technologies in food production: bioengineered food and irradiated food. The term "consumer attitude" in this study was defined by three issues: support of the technology, foresight to see positive benefits within five years, and willingness to purchase this type of food (Research Question 1 & 4). This was the basic concept used in a survey study conducted in Japan (Hoban, 1996a). Additionally, the Gallup Organization polls, conducted in September 1999 and April 2000 (www.gallup.com/poll/surveys/2000/topline000330), and the IFIC telephone surveys of 1997 and 1999 used similar questions (<http://inficinfo.health.org>). Questions on FDA labeling and willingness to pay more for labeling were also adapted from the Gallup and IFIC surveys (Research Question 2 & 3). A five point scale was used to

assess respondent's feeling on these issues (i.e., 1-strongly support, 2-moderately support, 3-don't know, 4-moderately oppose, 5-strongly oppose).

The second part of the survey was designed to obtain a general demographic background of each respondent. Age, gender, marital status, number in household, education level, geographic area, and income were asked. One question dealt with free time interests. Because some of the previous studies (from the literature review) specifically asked about sources of nutrition information, one question was also included to cover this topic.

A paper version of the survey was informally administered to a food science class and a nutrition class at the University of Akron for overall evaluation and feedback of the questions on the survey (See Appendix 3). Respondents were asked to write down any concerns or ambiguities. From the sixteen returned surveys, improvements were made on some of the questions and possible responses.

Electronic Form of the Survey

After revisions were made from the paper version of the survey, the survey was placed in hypertext markup language (html) format on a website located on the University of Akron's Internet server for access by the Internet community. All survey responses were sent to an external file on the server. This insured anonymity of a respondent because no e-mail address was attached with the data file. After data collection ceased, all the responses were transferred into one file for data analysis. The responses were then manually coded.

Survey Administration and Subjects

The survey was located on a website on The University of Akron's server. Because of time restrictions, registration with search engines was not possible. The location of the website was posted on all Usenet food and nutrition related newsgroups asking for survey volunteers. One food science class at The University of Akron was also told where the survey was located. Word of the website address may also have spread by e-mail. It was not possible to find out how respondents initially found the site since it was open to anyone who was able to locate the website and potential respondents had to go there voluntarily.

The total time it took to take the survey ranged from 5-10 minutes. Close-ended questions were employed in writing most of the survey questions. Pull-down menus were used for the demographic, Internet, and e-mail questions. This enabled the overall survey to look clean and simple. Answering the questions entailed clicking a mouse button. Respondents also had the choice of not answering any question by not clicking anything they did not want to respond to. Within two weeks of the initial posting of the website on the electronic bulletin boards, there were 172 responses and data collection was ceased.

Statistical Analysis

The responses were initially entered into a Microsoft Excel program. Data was then converted using the Statistical Package for the Social Sciences (SPSS).

Frequency distributions were used to test Research Questions 2 and 3. Inferential statistics (i.e., t-tests and Pearson's correlation coefficients) were used to test the

independent effects (i.e., gender, income, education, age, geographic location and household size) on Research Questions 1 & 4.

Limitations

This study was limited to computer users who had access to the Internet and who probably had some interest in food issues. This may have resulted in a self-selected sample of respondents. The results of this study cannot be expanded beyond the scope of Internet users.

Summary

This chapter reviewed the research design and included the background for the development of the questions used in the survey instrument. The electronic form of the survey, the administration of the survey, and the subjects were explained. Finally, the statistical analyses of the data and the limitations of the study were described.

Revised/Witt August 15, 2000

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